The Impact of Risk on the Decision to Exercise an ESO

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Abstract

This paper examines the impact of firms' risk on executives' decisions to exercise their executive stock options (ESOs). As the proportion of executives' remuneration linked to the value of their firm (and therefore shareholder wealth) has increased, so the extent to which these executives hold undiversified personal portfolios has also increased. This lack of personal diversification gives executives a strong incentive to exercise early. It has been shown that this incentive can be sufficiently strong to outweigh the beliefs an executive may have regarding the firm's valuation. I hypothesise that as the risk of a firm increases, so an ESO exercise is less likely to be induced by an executive's private information. Consistent with the need to diversify, I find that it is only exercises in low risk firms that precede significantly negative abnormal returns.

JEL Classification: G14

Keywords: Diversification, Executive Stock Options, Risk.

Introduction

The primary reason for offering executive stock options (ESOs) is to link executive remuneration more closely to the performance of the company. This link ensures that the executives' incentives are the same as those of the shareholders, that is their primary motivation is to increase shareholder wealth by increasing the market capitalisation of the company.[1] Increasingly, however, the effectiveness of ESOs as a means of aligning management and shareholder objectives has been questioned. An important factor behind this has been research identifying a significant disparity between the cost to shareholders of granting ESOs, and the value placed on them by the executive recipients. The reason for this stems from the nature of an ESO. An executive stock option is nontradable, it cannot be hedged by short selling, and there are restrictions imposed on the executive regarding when it can be exercised. As a consequence, these options will have considerably less value to an executive than they would to have an outside investor.

If executives do not value their ESOs as highly as would be expected given standard option pricing theory, then it must follow that their ability to motivate managers to perform in such a way that shareholder wealth is maximised will be reduced. In addition to the inherent features of an executive stock option, their value to an executive will be further reduced by the fact that the executive is unlikely to be equivalent to an outside investor. For an ESO to be effective in aligning incentives, the extent to which an executive's remuneration is linked to stock price performance

[1] There may be additional reasons for the provision of options, including the attraction and retention of executives.

must be relatively significant. Consistent with this, firms (particularly in the US) have been increasing the proportion of executives' remuneration that comes in the form of share options. The increasing use of share options to motivate managers may not, however, have its desired effect, because as their remuneration is increasingly linked to the performance of the firm, so executives will hold personal portfolios which are heavily weighted in their own firm's stock. The result is that their portfolios will be insufficiently diversified, exposing them to risk which would be diversified away in a more balanced portfolio. Exposure to this risk will further reduce the value of their stock options. Not only will this diminish the benefit executives derive from their ESOs, but it will also reduce their incentive effects. As the value of their ESOs is reduced, so is the proportion of their effective remuneration that comes from ESOs. Moreover, this reduction in value will reduce the executives' pay-performance sensitivity.

Executives can diversify the resulting risk that they face in one of two ways. They can either attempt to diversify the firm, or they can attempt to diversify their personal portfolios. In terms of the former, Kahl, Liu and Longstaff (2003) argue that managers whose compensation is linked closely to share prices have a strong incentive to diversify their firms, irrespective of the impact that this may have on shareholder wealth. This aspect of executives' behaviour, however, is outside the scope of this study. Alternatively, they can diversify their personal portfolios by reducing their shareholdings as soon as they are able. In the UK, the Finance Act 1984 imposed a minimum vesting period of 3 years, and a maximum life of 10 years, on ESOs. The imposition of this minimum vesting period restricts their ability to diversify, increasing the extent to which executives hold an undiversified portfolio at any point in time. If the resulting need to diversify were an important factor

motivating their trading behaviour, I would expect executives to exercise and sell as soon as the vesting period ends.

There is consistent research evidence that supports this. Huddart and Lang (1996) argue that for US executives, early exercise of their options is routine. Similarly, Main (1999) suggests that UK executives usually exercise within a year or so of the options vesting. Given that early exercise is normally regarded as irrational (the holder of the option foregoes the time value of the option by exercising early), then there must be a significant value to executives to exercising early. Consistent with our premise that the need to diversify may be an important factor motivating the decision to exercise, and in particular the decision to exercise early, Hemmer, Matsunaga and Shelvin (1996) identify a positive link between the decision to exercise early and the investment risk of the option position. Furthermore, it appears that firms may be aware of this problem. There is increasing evidence to suggest that the sensitivity of pay to the performance of the firm is lower when firm-specific risk is high.

In addition to these findings consistent with executives needing to diversify, there is related research that suggests that transactions designed to bring about this diversification do not appear to impact on the stock price. There is increasing evidence in the US that the decision to sell stock, whether classified as a standard sale transaction or as one that is related to an option exercise, has little impact on the stock price. In contrast to stock purchases, the absence of post-event abnormal returns for these transactions implies that they are uninformed, consistent with the possibility that they may be motivated principally by the desire to diversify.

This paper seeks to determine if there is a link between the risk imposed on the executive by the firm and their exercise decision. Assuming that the executive is

insufficiently diversified, the executive will be aversely affected by both firm-specific risk and total risk. I find that exercises in firms that can be categorised as lower risk produce significantly negative post-event abnormal returns, while those that take place in firms that are categorised as higher risk do not. The absence of a market response to exercises in relatively high-risk firms suggests that here executives are exercising to diversify, in contrast with executives in the low-risk firms whose need to diversify is considerably less, and who may therefore be able to incorporate their private information into their exercise decision.

Literature

The likelihood that executives are insufficiently diversified is due to the attempt to link pay with performance. This link is often achieved by incorporating ESOs into executives' remuneration. Murphy (2003) suggests that this cannot be a sufficient explanation for the use of options, given the increasingly widespread granting of options among lower-ranked employees. Ittner, Lambert and Larcker (2003) find that the retention objective is an important factor driving new hire grants (but not ongoing grants) among the new economy firms. They also argue that there is some evidence that grants and/or holdings of options that are less than might be expected have an adverse impact on subsequent operating performance. Chen (2003) has recently observed that firms that impose restrictions upon themselves in terms of their ability to reprice ESOs following poor stock price performance suffer from higher executive turnover than those that operate flexible repricing policies. Furthermore, he shows that firms with restrictive policies are more likely to grant new options after price falls compared to those that are more flexible.

Whatever the motivation for granting options, Hall and Murphy (2002) show that executives in the US now receive a significant proportion of their total pay from ESOs. They find that 'the grant date value of stock options accounted for 47% of total pay for S&P 500 CEOs in 1999, up from 21% of total pay in 1992.' As a result, the sensitivity of pay to performance is likely to have increased, a result documented by a comparison of the results in Jensen and Murphy (1990) and Hall and Liebman (1998). Furthermore, it appears that the impact that this increased sensitivity will have on the risk that executives bear, particularly as a result of their lack of diversification, has been recognised by firms themselves. Consistent with the predictions of the principal-agent model, Aggarwal and Samwick (1999) find that pay-performance sensitivity is lower for executives in firms with higher stock return variance. Thus the more volatile a stock's returns, the less sensitive is executives' pay to the value of the stock. Jin (2002) and Garvey and Milbourn (2003) extend this by decomposing risk into its systematic and idiosyncratic components, and find that it is the firm-specific (or idiosyncratic) risk that impacts negatively on the sensitivity of pay to performance. Moreover, Garvey and Milbourn (2003) argue that the lack of relative performance evaluation for the average executive suggests that executives must be able to hedge market risks at low cost. That is, the absence of both pay-performance sensitivity to market risks, and relative performance evaluation, implies that executives are able to reduce their exposure to the market component of a firm's returns by hedging. However, looking at the cross-section of executives, they find that pay-performance sensitivity is negatively related to systematic risk among the younger executives. Furthermore, Garvey and Milbourn find that a significant proportion of market risk is removed by firms for these executives through the use of relative performance

evaluation, consistent with the notion that the younger executives are less able to hedge.

For any executive, the obvious way to hedge their risk is to diversify. Executive stock options are not tradable, and therefore must be exercised before the stock can be disposed. Whilst theory would suggest that the early exercise of an option is not rational, it might be consistent with the need to reduce risk, thereby enabling executives to diversify their personal portfolios. Huddart (1994), Muelbroek (2001) and Hall and Murphy (2002) argue that executives will have a strong incentive to exercise early in order to diversify. Huddart and Lang (1996) find that executives exercise their options soon after the end of the vesting period. This is confirmed by Ofek and Yermack (2000), who find that executives in the US sell almost all the shares acquired at exercise. The fact that executives in the US appear to exercise their options early, very often as soon as the vesting period ends, together with their decision to sell all the shares acquired at exercise, suggests that the need to reduce risk and diversify plays an important role in executives' decision making.

Hemmer, Matsunaga and Shelvin (1996) find a positive relation between the early exercise of an ESO and an option position's investment risk. Given that early exercise reduces the intrinsic value of an option, this positive relation suggests that executives might be increasingly prepared to give up some of an option's value as the variability of returns increases. It follows that the decision to exercise early appears to be related to the desire to reduce risk, which in turn arises as a result of insufficient diversification.

A number of more recent papers, including Meulbroek (2000), Meulbroek (2001), Hall and Murphy (2002) and Kahl, Liu and Longstaff (2003) have examined the extent to which a combination of liquidity restrictions and undiversified portfolios

impact on the value of executives' shareholdings. Meulbroek (2000) focuses on the effect of executives' lack of diversification, and shows that executives in riskier stocks (which she characterises as highly volatile Internet-based firms) will benefit from selling stock to diversify their shareholdings, irrespective of substantial stock undervaluation. Meulbroek (2001) demonstrates that executives holding undiversified personal portfolios will similarly place a significantly reduced value on their stock options. The deadweight loss associated with this reduction in value relative to the value that would be placed on the stock options by a diversified investor could be considerable. She shows that this loss increases the longer the executive is required to maintain an undiversified portfolio and the greater the volatility of returns, whilst it falls as the correlation between the stock's return and the market's return increases. Furthermore, an executive in the average firm (β of 0.77 and volatility of 65%) and with just 25% of his wealth in a diversified portfolio will value options with a three-year vesting period at 65% of their value to a fully diversified investor. Similarly, Hall and Murphy (2002) show that risk aversion and a lack of personal diversification has a significant impact on the value of ESOs. They find that because of this risk aversion and lack of diversification, the early exercise and sale of the associated stock is rational because it will increase the value of the stock options, while at the same time reducing the cost to the firm of granting them. Kahl, Liu and Longstaff (2003) focus on restricted stock rather than stock options. Again, they identify a considerable loss in value resulting from liquidity restrictions and a lack of portfolio diversification.

Whilst diversification may be an important motive for an exercise, associated research indicates that executives do not appear to use their private information when

exercising.[2] Carpenter and Remmers (2001) find that since 1991 when executives have been free to sell the shares they acquire at exercise, post-exercise abnormal returns are insignificant. The exception is exercises by top managers in small firms, in which case exercise is followed by significantly negative abnormal returns. Most recently, Huddart and Lang (2003) examine employee stock option exercise, and find that an increase / decrease in option exercise relative to that which would be expected may have significant predictive ability for returns over the succeeding 6 months. Moreover, they show that exercise decisions taken by junior employees may be more informative than those taken by more senior employees. They suggest that this may be because more senior employees face greater restrictions and/or monitoring of their trading activities. I suggest that it may also be consistent with the need for diversification outweighing a senior employee's information. This follows because Huddart and Lang determine seniority (or employee level) by the number of options granted. As a result, their measure of employee level will be inversely related to the extent to which that employee holds a diversified portfolio.

The fact that executives may be willing to ignore their private information, together with the fact that junior employees do appear to have access to, and use,

[2] Associated research has found that insider sales are increasingly uninformative. Muelbroek (2000) finds that sales by executives in Internet-based firms do not produce negative abnormal returns, and that this abnormal return is significantly higher than the abnormal return following corresponding sales in non-Internet-based firms. Muelbroek concludes that a possible explanation for this is 'that managers in Internet-firms have a strong incentive to diversify, irrespective of their beliefs about the accuracy of the firm's value.' Lakonishok and Lee (2001) find that insider sales in general are not associated with low returns, and therefore appear to be uninformative, except for a subset of small stocks. They conclude that as a result of an increasing proportion of executives' wealth being comprised of their firms' stock, 'the need to diversify results in a substantial increase in selling activity.'

private information highlights the benefit that executives gain from diversifying. Given that this benefit will be greatest for executives in the riskiest firms, I hypothesise that exercises that take place in firms in which risk is high are more likely to be motivated by a desire to diversify. Alternatively, exercises in low risk firms are more likely to be information driven because the need to diversify will be less important. As a result, I would expect to find that post-event abnormal returns are broadly neutral following exercises in risky firms, while it should be negative in the less risky firms.

Furthermore, Garvey and Milbourn (2003) find that there is evidence that firms remove market risk from younger executives' compensation. They suggest that this is because of the younger executives' reduced ability to hedge. Moreover, younger executives are also less likely to have built up as much wealth outside of their shareholdings compared to older executives, and therefore will be less diversified.[3] I therefore hypothesise that the desire to exercise in order to diversify will be stronger amongst the younger executives, and therefore their exercise decisions should be relatively less informative[4].

[3] Garvey and Milbourn (2003) argue that younger executives will face higher hedging costs because their human capital will comprise a relatively greater proportion of their total wealth.

[4] It could equally be argued that younger executives are likely to be less informed than their older counterparts, particularly because they may fill the more junior positions in an organisation. The results in Huddart and Lang (2003), however, illustrate that even junior employees possess price-sensitive information.

Data and Methodology

Our data runs from January 1991 to July 1998, and comprise all executive stock option exercises in the UK recorded by Directus Ltd. Associated with each exercise, I estimate the firm's volatility and beta. Following Meulbroek (2001), I estimate the stock's beta using a market model. The corresponding volatility estimate is the standard deviation of the firm's daily log returns over the year prior to exercise[5]. The abnormal return associated with each event is determined by the difference between the firm's return and the mean return on a matching control portfolio.

In measuring abnormal returns around an ESO exercise, the matching control portfolio incorporates two factors that may be important in explaining the cross-section of expected stock returns. Firstly, as identified by Fama and French (1992), the size, or market capitalisation, of the firm appears to be a significant predictor of future stock returns. As a result, controlling for the size of the firm when attempting to measure abnormal returns has become fairly standard in the literature (see, for example, Lougran and Ritter (1995)).

The incorporation of a control for momentum is also necessary given the strong evidence that firm returns exhibit persistence over horizons of up to one year (see, Jegadeesh and Titman (1993) and Jegadeesh and Titman (2001)). Consistent evidence of medium-term return persistence in the US has been confirmed by Rouwenhorst (1998) for a number of other countries, including the UK. Controlling for the possible impact of a momentum effect is particularly important in this analysis, given that an ESO exercise is likely to take place after a period of strong stock price performance. This follows logically from the fact that an option will be exercised only

[5] See also Huddart and Lang (1996).

if it is in the money (i.e. the current stock price is greater than the exercise price). Furthermore, there is some evidence that psychological factors may provide important motives for the exercise of stock options. One such factor is stock price performance over the year prior to exercise (see Heath, Huddart and Lang (1999) and Huddart and Lang (2003)).

On any particular event day, I assign all stocks to one of ten portfolios, based on a ranking of their market capitalisations. I then take account of their previous return, or momentum, by further sorting each of these ten portfolios by the stock's return over the previous twelve months. Each portfolio decile is subdivided into four, based on this measure of stock momentum. This procedure therefore yields a total of forty portfolios, against which an individual firm's return can be benchmarked. The abnormal return associated with a particular event is determined by the firm's realised return, and its expected return as proxied by the mean return to its matching size and momentum sorted portfolio (given the firm's own market capitalisation and previous return).

I determine the significance of the estimated abnormal stock returns around an exercise by means of the calendar time methodology employed by Carpenter and Remmers (2001). The calendar time approach has been advocated by a number of researchers, including Fama (1998) and Mitchell and Stafford (2000). The calendar time approach overcomes the problem of cross-sectional dependence between the respective abnormal returns. The cross correlations in the abnormal returns of the different events arise because of the extent to which these abnormal returns overlap. This is evident from Table 1, which illustrates the degree to which this is a factor in the data. In the complete sample of exercises, there are 6825 exercises (or events) that take place on a total of 1625 days. Not only will many events, or exercises, take place

at the same time, but as the window over which the abnormal returns are measured increases, so the number of contemporaneous abnormal return measurements will become quite large. This problem of a lack of independence in the abnormal returns is likely to be exacerbated by the fact that these exercises relate to just 952 firms. Whilst there are clear advantages from using a calendar time methodology, the mean abnormal returns estimated are not exactly equivalent to those that would be experienced by an investor. The calendar time methodology detailed below is equivalent to a strategy that each day achieves the equally weighted return to the portfolio of firms that had a qualifying exercise such that they are in the chosen event window.

A firm's abnormal return on day i is given by the difference between its return R_{it} and its expected return $E(R_{it})$, as proxied by the mean equally weighted return to its benchmark portfolio:

$$AR_{it} = R_{it} - E(R_{it}). \qquad (1)$$

When estimating the mean abnormal return across all events for a specific event window (τ_1,τ_2), I first calculate the abnormal return for each event for each day in that window. I then assign each firm's abnormal return to the day (in calendar time) on which that abnormal return occurs. For every calendar day, I calculate a mean abnormal return for the portfolio of firms (n_t) that have a qualifying abnormal return on that day, given the event window (τ_1,τ_2). This gives a time series of abnormal returns for one specific event window:

$$AR_t = \frac{1}{n_t}\sum_{i=1}^{n_t} AR_{it}\ . \qquad (2)$$

The mean abnormal return for a specific event window $MAR(\tau_1,\tau_2)$ is then simply the mean of the time series of abnormal returns:

$$\mathrm{MAR}(\tau_1,\tau_2)=\frac{1}{T}\sum_{t=1}^{T}\mathrm{AR}_t \quad , \tag{3}$$

where T is the number of days with a qualifying abnormal return, given the event window (τ_1,τ_2). The t-statistic testing the null hypothesis that the mean abnormal return MAR(τ_1,τ_2) is zero, is:

$$\mathrm{t\,MAR}(\tau_1,\tau_2)=\frac{\mathrm{MAR}(\tau_1,\tau_2)}{\sigma(\mathrm{AR})/\sqrt{T}} \quad , \tag{4}$$

where σ(AR) is the standard deviation of the time series abnormal returns AR_t.

I choose several event windows, ranging from 10 days prior to an exercise, to 2 months after an exercise. The results discussed below are not sensitive to minor changes in the event windows chosen. The event windows are designed to investigate the short-term price effects associated with an exercise. These price effects should be relatively small, given that insiders are forbidden from trading on price-sensitive information in general, and specifically from trading during a two-month window prior to the publication of a firm's results.

Results

As outlined above, whilst all executives are likely to hold undiversified portfolios, the impact of this lack of personal diversification will be positively related to the riskiness of the firm. As a result, executives in the riskier firms should derive the greatest benefit from exercising their ESOs, and therefore should be more inclined to ignore their private information. Thus, whereas an exercise would normally be perceived negatively by outside investors, I hypothesise that option exercises by executives in high risk firms are more likely to be motivated by diversification. Conversely, the need to diversify is less pressing for executives in low risk firms, and

therefore option exercises are more likely to incorporate their private information. If this is the case, then categorising exercises by the riskiness of the firm at the time of exercise should yield significantly smaller post-exercise abnormal returns in low risk firms compared to high risk firms.

Table 1 gives summary statistics for the complete sample of exercises, together with three subsamples; Low, Medium and High. These subsamples are obtained by partitioning the complete sample in three, based on a ranking of the firms' volatility (standard deviation). It is apparent that the resulting low, medium and high risk subsamples differ in terms of their mean market capitalisations. The mean market capitalisation of the firms comprising the low risk subsample is substantially smaller than that of the medium or high risk subsamples.

Table 2 presents the results of an analysis of the abnormal returns for the complete sample and for the three volatility-sorted subsamples. Volatility (or the standard deviation) is a broad measure of the total risk of the firm, and would be particularly relevant for undiversified investors. There is a consistent and significantly positive price run-up immediately prior to exercise. This abnormal return prior to the event is in line with Heath, Huddart and Lang (1999) and Huddart and Lang (2003), who show that stock option exercise is sensitive to pre-exercise stock returns. Post-exercise abnormal returns are not significant for the complete sample, again in line with previous results. Carpenter and Remmers (2001) find that where executives in the US are able to sell the stock they acquire at exercise, post-exercise abnormal returns are positive but not significant. The results in Table 2 show that when the complete sample is subdivided according to firm risk, there is some evidence that exercises in low risk firms are followed by negative abnormal returns. The two-month post-exercise abnormal return is –0.7 percent (t-statistic of –2.24). The two-month

post-event window corresponds most closely to the closed trading period prior to a firm publishing its results. Over this period, there is a significant difference in post-exercise abnormal returns between the low risk and high risk firms. These results are consistent with the hypothesis that the exercise of an ESO in a relatively low risk firm is less likely to be driven by a need to diversify, and is more likely to incorporate the executive's negative private information.

As an alternative to volatility as a measure of risk, Table 3 presents an equivalent set of results for three beta-sorted subsamples. The pattern of results is the same as for the sort by volatility. Post-exercise abnormal returns are broadly neutral following exercises in the riskier firms, whilst it is negative in the less risky firms. Over a two-month holding period, exercises in low risk firms yield mean abnormal returns of –1.48 percent (t-statistic of –3.13), compared to 0.10 percent (t-statistic of 0.20) for the high risk firms.

Finally, I examine whether there is any evidence consistent with Garvey and Milbourn (2003), who suggest that young executives are more restricted in their ability to hedge. If this were the case, then their need to diversify should be relatively strong, and their exercise decisions relatively uninformed. Table 4 presents the results of subdividing the sample of exercises into three, based on the age of the executive at the time of exercise. Because the data on the age of the executive are not comprehensive, the results for the complete sample (All) are not the same as in Tables 2 and 3. Apart from consistently significant positive pre-exercise abnormal returns, there is no evidence of significant post-exercise abnormal returns. As a result, there is nothing to indicate that younger executives' motives for exercising differ from those of the older executives.

Conclusion

As shareholders attempt to provide their executives with incentives to maximise shareholder wealth, so executives' remuneration and wealth becomes increasingly linked to the performance of just one share. This will naturally have a significant impact on the portfolio that these executives hold, and the extent to which this portfolio is diversified. If executives hold an undiversified portfolio, they will be exposed to firm-specific risk for which they will not be compensated, and they will be more sensitive to the total risk of the firm.

This paper examines the possibility that this lack of personal portfolio diversification gives executives an incentive to diversify, irrespective of their beliefs about the value of the stock they hold. This incentive should be positively related to the risk of the stock. Consistent with this, I find that ESO exercises in firms that are characterised as being low risk are more informative than those in the high risk firms. Specifically, there is evidence of significantly negative post-exercise abnormal returns only for exercises in low risk firms. Put another way, this suggests that executives' need to diversify in the high risk firms is sufficiently great that they ignore their private information. This result holds whether risk is proxied by total risk or firm-specific risk.

Finally, I examine if young executives' need to diversify is stronger than it is for older executives, assuming that they are less able to hedge and are therefore relatively less diversified. However, I find that there is no evidence that the decision to exercise by younger executives is different to that of the older executives.

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Table 1 Summary Statistics: Firm Characteristics

Executive Option Exercises January 1991 – July 1998					
	No. of Exercises	No. of Firms	No. of Event Days	Mkt. Cap. (£m)	Volatility
All	6825	952	1625	2543 (483)	1.36 (1.26)
Low	2275	482	975	1435 (236)	0.85 (0.89)
Medium	2275	489	1019	3386 (1180)	1.27 (1.26)
High	2275	581	999	2809 (647)	1.97 (1.76)

All denotes the complete sample of exercises. Low, Medium and High represent three samples of exercises, sorted by the volatility of the firm at the time of exercise. The No. of exercises gives the total number of exercises (or events) in the complete sample, and in each of the three volatility-sorted subsamples. No. of firms represents the number of firms having at least one option exercise in each sample. No. of Event Days denotes the number of days on which one or more exercises takes place. Mkt. Cap. is the mean market capitalisation of the firm at the time of exercise. Volatility is the standard deviation of the firm's daily log returns over the year prior to the exercise. Respective median values are in brackets.

Table 2 Mean Abnormal Returns around ESO Exercises Sorted by Firm Volatility

Executive Option Exercises January 1991 – July 1998				
	-10 to 0	+3 days	+10 days	+2 months
All	0.89 [3.38]	0.01 [0.13]	0.10 [0.98]	-0.34 [-1.54]
Low	0.87 [3.02]	-0.08 [-1.15]	-0.13 [-0.89]	-0.70 [-2.24]
Medium	0.85 [5.13]	0.04 [0.70]	0.12 [0.86]	-0.56 [-1.42]
High	1.09 [3.80]	-0.01 [-0.10]	0.12 [0.61]	0.12 [0.26]

Options are exercised on day 0. -10 to 0 represents an 11-day window prior to and including the event day itself, whilst +3 days represents a 3-day window from day 1 to day 3 after the exercise. All gives the mean percentage abnormal return for all the exercises within the sample period. Low, Medium and High denote the corresponding abnormal returns associated with exercises that take place in firms that are characterised as respectively low, medium and high volatility. The abnormal returns are determined by the difference between the firm's return and the mean return of its size and momentum sorted portfolio return at the time of exercise. Mean abnormal returns for each window are calculated using a calendar time methodology. For any given window, a firm's abnormal returns are included if it has a qualifying exercise that matches the particular window. Newey-West adjusted t-statistics are in brackets.

Table 3 Mean Abnormal Returns around ESO Exercises Sorted by Firm Beta

Executive Option Exercises January 1991 – July 1998				
	-10 to 0	+3 days	+10 days	+2 months
All	0.89 [3.38]	0.01 [0.13]	0.10 [0.98]	-0.34 [-1.54]
Low	0.80 [3.51]	-0.04 [-.055]	-0.17 [-0.71]	-1.48 [-3.13]
Medium	0.93 [5.02]	-0.10 [-1.38]	-0.26 [-1.64]	-0.89 [-2.18]
High	0.64 [2.25]	-0.01 [-0.11]	0.04 [0.23]	0.10 [0.20]

Options are exercised on day 0. -10 to 0 represents an 11-day window prior to and including the event day itself, whilst +3 days represents a 3-day window from day 1 to day 3 after the exercise. All gives the mean percentage abnormal return for all the exercises within the sample period. Low, Medium and High denote the corresponding abnormal returns associated with exercises that take place in firms that are characterised as respectively low, medium and high beta. The abnormal returns are determined by the difference between the firm's return and the mean return of its size and momentum sorted portfolio return at the time of exercise. Mean abnormal returns for each window are calculated using a calendar time methodology. For any given window, a firm's abnormal returns are included if it has a qualifying exercise that matches the particular window. Newey-West adjusted t-statistics are in brackets.

Table 4 Mean Abnormal Returns around ESO Exercises Sorted by the Age of the Executive

Executive Option Exercises January 1991 – July 1998				
	-10 to 0	+3 days	+10 days	+2 months
All	0.95 [8.07]	0.01 [-0.16]	0.09 [0.89]	0.00 [0.00]
Young	0.97 [5.19]	-0.01 [-0.02]	0.06 [0.43]	0.09 [0.28]
Middle	0.94 [5.70]	0.05 [0.57]	0.14 [0.87]	-0.51 [-1.50]
Old	0.83 [5.03]	-0.05 [-0.70]	0.22 [1.68]	0.25 [0.75]

Options are exercised on day 0. -10 to 0 represents an 11-day window prior to and including the event day itself, whilst +3 days represents a 3-day window from day 1 to day 3 after the exercise. All gives the mean percentage abnormal return for all the exercises within the sample period for which there is data on the age of the executive. Young, Middle and Old denote the corresponding abnormal returns associated with exercises by executives characterised as respectively young, middle aged and old. The abnormal returns are determined by the difference between the firm's return and the mean return of its size and momentum sorted portfolio return at the time of exercise. Mean abnormal returns for each window are calculated using a calendar time methodology. For any given window, a firm's abnormal returns are included if it has a qualifying exercise that matches the particular window. Newey-West adjusted t-statistics are in brackets.