

# THE INFORMATION CONTAINED IN THE EXERCISE OF EXECUTIVE STOCK OPTIONS

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## Abstract

This paper investigates the use by insiders of private information in their decision to exercise executive stock options. It is the first to categorise the exercise of an executive stock option by the proportion of stock sold at exercise. Consistent with existing research, exercises overall do not yield subsequent abnormal returns. However, we find a marked and significant difference in subsequent performance between exercises categorised as 'high' and 'low' sale proportion respectively. Therefore, while the exercise decision may appear uninformed, this study demonstrates that executives do use private information in their exercise and corresponding sale decisions. Further, near-the-money exercises produce negative abnormal returns, consistent with such exercises being relatively expensive. These results need to be reflected in the valuation of executive stock options, and hence the compensation executives derive from them.

*JEL classification:* G14

*Keywords:* Insider trading; Executive stock options.

## **1. Introduction**

Economists have frequently investigated the impact of insiders' trades in their own stock. Superficially, such research identifies the predictive ability of insiders' trades and therefore the benefit to outside investors of conditioning their own trades on those of the insiders. More importantly, the principal motivation for research in this area is to determine if insiders' trades are informative. If this is the case, then it must follow that insiders are able to profit from their informational advantage. The predominant focus of existing research has been to examine the information implied in the purchase and sale of stock in their own firms by executives. This research shows consistently that there is information content in these trades, most significantly in relation to stock purchases, and has been documented both for the US and the UK. More recent research extends this analysis to investigate the information content of executive stock option exercises.

Executives are increasingly being remunerated by means of performance based remuneration packages that incorporate executive stock options. Their ability to use their private information in determining when to exercise their stock options will impact directly upon the level of remuneration they receive from the firm. In turn, if insiders' private information does influence their exercise decisions, this needs to be accounted for in the valuation of executive stock options.

The initial view regarding stock option exercises was that they should have little predictive ability given that executives may have only a limited ability to time their exercises. Any discretion they may have to use their private information would imply an exercise and sale prior to a period of poor stock price performance. The exercise of an option requires the executive to pay the exercise price, and therefore it is argued that an executive has no

incentive to exercise unless he intends to sell the stock immediately. If the executive expects the price of the underlying stock to rise, it is cheaper to hold the option. Thus the option should only be exercised if the holder expects the market price to fall. It is therefore generally agreed that if insiders use their private information in exercising a stock option, an exercise should be viewed by investors as a sell signal, assuming that the executive is free to sell the shares purchased through the option exercise.<sup>1</sup>

Carpenter and Remmers (2001) examine the information contained in stock option exercises by executives in the US in some detail. They find that where an executive can sell immediately, post-exercise returns are marginally positive but not significant. This is in contrast to the expectation that post-exercise returns should be negative. They conclude that the positive abnormal returns are caused by momentum (despite the fact that they control for a momentum effect). The implication of their results is that insiders do not appear to use their information advantage with respect to option exercises. Their analysis, however, is predicated upon the assumption that directors sell all the stock relating to the exercise. This is based on Ofek and Yermack's (2000) finding that 'for executives who exercise stock options, we find near-total selling of the shares acquired'. This is clearly not the case in the UK, where we find that executives sell on average approximately 45% of the shares purchased at exercise. Table 1 presents additional summary statistics.

The main focus of this research is to extract the information that may be contained in option exercises. In particular, we distinguish between exercises where executives sell a small or large proportion of the stock purchased at exercise. Such a distinction is important if we are to determine whether the exercise of stock options is information or liquidity driven.

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<sup>1</sup> This scenario may be confused by option expiry, which forces the executive to exercise irrespective of his expectations regarding future performance.

If there is any information content in the exercise of an executive stock option, then a priori we would expect negative post-exercise performance after an exercise that is accompanied by a proportionately large sale of stock. An exercise and low sale proportion might be more analogous to a stock purchase, and would therefore be followed by positive post-exercise performance. Table 2 shows that this is indeed the case.

The remainder of the paper investigates further the factors that may impact on the nature of these post-exercise returns. Controlling for the moneyness of the option at exercise is important as the moneyness has implications for the costs associated with exercising the option. A priori, we would expect a near-the-money option exercise to be a ‘better’ signal of poor future performance than a deep in-the-money exercise. While we obtain results that are consistent with this intuition, the importance of the proportion sold persists when we control for the impact of option moneyness. Finally, we examine the relevance of both the size of the firm and the age of the executive at the time of exercise.

The existing research identifies both private information and issues relating to the nontransferability of executive stock options as being possible motivations for their exercise. The findings of this existing research are, however, very limited. In particular, there is no conclusive evidence that executives use their private information when exercising their stock options. This paper represents a significant contribution to this literature on insider trading. We provide evidence that insiders *do* incorporate private information in their exercise decisions. This private information is reflected both in the timing of their option exercises and in the related decision of how much of the stock purchased through exercise should be sold.

## 2. Literature

There has been a plethora of literature on insider trading in equity markets, particularly over the last three decades since Fama (1970) stimulated the debate on tests of strong-form efficiency. Recognising that it is difficult to identify private information *ex ante*, one strand of the literature attempts to isolate those individuals who are most likely to be privy to information which is not in the public domain. Research in this area examines the stock price reaction to insider trades. This includes the U.S. studies by Jaffe (1974), Finnerty (1976), Givoly and Palman (1985), Seyhun (1986, 1988, 1992), Rozeff and Zaman (1988), Pettit and Venkaatesh (1995) and Eckbo and Smith (1998). These examine the information content of insider trades by looking at the behaviour of abnormal returns around insider transactions. Similar studies have been conducted in the UK by King and Roell (1988), Pope, Morris and Peel (1990), Gregory, Matatko, Tonks and Purkis (1994), and Gregory, Matatko and Tonks (1997). The general consensus is that there is information contained in insider trades. In particular, insider purchases, which are less likely to be liquidity driven, are more informative than sales. The most recent research relating to the impact of insider trading in the US by Jeng, Metrick and Zeckhauser (2000) and Lakonishok and Lee (2001) uses a more robust method of calculating abnormal returns than the earlier research. The conclusion is that insider purchases have predictive ability over holding periods up to a year, but insider sales have no information regarding future stock returns. Finally, the information content of purchases is limited to the smaller firms.

Whereas the focus of the above literature has been on standard equity transactions, the aim here is to examine the information content of executives' trades with regard to the

exercise of executive stock options. Executive stock options are a form of performance based incentive compensation. Their desired effect is to align the long-term interests of shareholders and managers by making managers' payoff contingent on the stock market performance of the firm. The majority of the existing literature examines the exercise policies of the holders of stock options. This research has been both in an empirical and theoretical context, with emphasis being given to identifying the factors that motivate exercise behaviour. The main determinants of exercise behaviour that have been proposed are private information and option nontransferability.

Perhaps the earliest study to examine how private information may motivate early exercise is that of Lorie and Niederhoffer (1968). They examine the statistical properties of their data on insider transactions, and report that non-option purchases account for only 30 per cent of total purchases. They interpret the lack of previous studies on the predictive implications of insider option exercise as surprising. Intuition, they argue, would suggest that option exercise is a bearish signal. However, this is only so if exercise is followed by a subsequent sale. Given the lack of data on compensating sales in the same month as an option exercise, it may be difficult, they argue, to interpret the information signal given by an option exercise.

The first study to concentrate solely on the information signal given by insider option exercises is that of Carpenter and Remmers (2001). Using data for all corporate insider option exercises taking place in the U.S. during the period 1984-1995, they examine stock price performance following insider option exercise. Specifically, they examine whether corporate insiders use private information about the expected price of their firms' stock in the timing of their option exercises. A priori, they hypothesise that in a regime (post-May 1991) where insiders can sell freely shares bought by exercising options, the use of private information

should manifest itself in negative abnormal stock returns following such exercises. In this current regime, they find that executives do not appear to use private information to inform their exercise decisions. Post-exercise returns are marginally positive but insignificant. Accepting that there may be non-information reasons behind an exercise decision<sup>2</sup>, they attempt to isolate information-based exercises by partitioning their sample in various ways. First, arguing that the informational asymmetry between insiders and outsiders is likely to be inversely related to firm size, they examine option exercises in firms categorised as large, medium and small. Second, they consider the possibility that higher ranked insiders may be better informed about the future prospects of the firm by distinguishing between exercises carried out by presidents or chairmen of the board (higher ranked) and lower ranked insider exercises. They find no evidence consistent with insiders using their information advantage in their exercise decision in the current regime, except for a very small subsample composed of top managers in the smaller firms. This subsample yields six-month post-exercise abnormal returns of  $-5.22\%$  (t-statistic of  $-2.45$ ).

An important feature of executive stock options is their nontransferability. Huddart (1997) notes that the inability to hedge such an option position may allow factors such as risk preferences and wealth to affect the timing of the exercise decision. For example, an option holder with liquidity requirements or one who wishes to diversify firm-specific risk may, quite rationally, decide to exercise some proportion of their holdings before maturity. Early exercise can therefore occur because no market exists where these instruments can be traded. Huddart and Lang (1996) examine patterns in the exercise of employee stock options, and find that exercise typically occurs well before expiration with often over half the time-value

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<sup>2</sup> Examples may include option expiration, employment termination, dividend realisation, diversification and liquidity or tax purposes.



of the option being sacrificed. Furthermore, they show that exercise activity is a function of the remaining option term, recent stock price movements, option moneyness, the vesting schedule and the proportion of the grant remaining unexercised. The results are consistent with Huddart (1994) who examines the effects of nontransferability and risk aversion in a theoretical framework. While risk-neutral employees only exercise at expiration, it is shown that risk-averse individuals may find it optimal to exercise prior to expiration.

In a related study, Hemmer, Matsunaga and Shelvin (1996) investigate the exercise of options prior to expiration. Examining 110 option exercises by top executive officers in 1990, they show a positive relation exists between option exercise and the investment risk inherent in holding an option position as proxied by the variability of returns. Thus the greater the volatility of executive stock option returns, the more investment risk the executive is exposed to, and the more likely they are to exercise early. Since executives are unable to sell the options or short sell the underlying asset, early exercise occurs primarily to diversify an investment portfolio.

### **3. Data**

As observed by previous researchers, investigating the information content of exercises can be complicated by changes to both the rules regarding the exercise of options and the way in which any resulting gains are taxed. (See, for example, Carpenter and Remmers (2001) and Huddart (1997)). In the UK an important change in the tax treatment of profits on executive stock options was introduced as a result of The Greenbury Report, published on Monday 17 July 1995. This report represented an attempt by the Greenbury committee to examine executive remuneration and make recommendations for a code of best

practice against which the remuneration policy of public companies could be judged. Among the report's findings was the recommendation that the exercise of executive stock options should incur income tax rather than capital gains tax, and was implemented by the Government with immediate effect. Given that the capital gains tax rate is the same as the upper level income tax rate, the predominant impact of the change is that income tax is now due at the time of exercise. Previously, capital gains tax had been due not at exercise but on the sale of the shares purchased at exercise. Under this new regime, there is no longer an incentive to exercise and hold in order to postpone a tax liability. Further, there may be an incentive to sell some shares not just to pay the exercise price but also to meet a resulting income tax liability.

We analyse the period from 17 July 1995. This period covers the new tax regime for executive stock options, and as a result means that there should be no tax related impact on the exercise of an executive stock option. In addition, there are no restrictions placed on executives' subsequent sale decisions. Our sample period runs to 3 July 1998. The data include all executive transactions taking place during this period and is provided by Directus Ltd. Table 1 has summary statistics relating to the exercises during this period. Of the 3392 executive stock option exercises, 148 were removed due to missing returns data. The remaining 3244 exercises comprise our sample.

Table 1

For each option exercise, we determine the proportion of stock sold by the executive at the time of the exercise. Perhaps the most striking finding is that the average proportion of stock sold is approximately 45% of the stock purchased through the exercise of the option. This contrasts strongly with the finding of Ofek and Yermack (2000) that US executives sell

most of the stock purchased through exercise.<sup>3</sup> This disparity is difficult to reconcile given that there are no significant differences in the respective personal tax regimes or in the restrictions placed on exercising and selling of stock. Conyon and Murphy (2000) contrast the differences in CEO remuneration between the United States and the United Kingdom. They find that average CEO compensation in the United States is 500% greater than that in the United Kingdom. More importantly, valuing stock options at their grant date, US CEOs earn 42% of their total remuneration from options, as compared to just 10% in the UK. If the exercise of a stock option in the US is regarded as being in lieu of cash remuneration, then it is possible that these exercises are generally motivated by liquidity. Stock options in the UK represent a much smaller proportion of total executive remuneration, so their exercise is less likely to be due to liquidity, and they may therefore be relatively more informative.

The number of event days denotes the number of days on which at least one exercise takes place. In the context of standard event study methodology, it is evident that there is considerable clustering of exercises, with an average of approximately four and a half exercises taking place on any particular day. This means that we are unable to use standard event study methodology to determine the significance of post-exercise abnormal returns. The approach we use is outlined in the methodology section below.

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<sup>3</sup> It is possible that executives make subsequent sales of stock. However, sales that occur some time after the exercise cannot have an impact on the information content of the exercise, and are therefore ignored. Further, an analysis of our data shows that subsequent sales within a month of an exercise are rare.

#### **4. Methodology**

Standard event study methodology examines the impact of an event on a firm's returns by calculating post-event abnormal returns using a market model. The estimation of a market model would be an inappropriate methodology to use in this context given that the exercise of an option will only take place when that option is in the money. This means that each event is likely to occur after a period of strongly positive returns, (which we find below). Estimation of a market model's parameters prior to the exercise of the option will therefore create a downward bias in the abnormal returns estimated subsequently. We avoid this problem by comparing post-exercise returns relative to the returns on a benchmark portfolio. These benchmark portfolios are composed according to size and momentum. The formation of portfolios on the basis of size and momentum is a similar approach to that taken by Carpenter and Remmers (2001). Measuring abnormal returns through the use of matching portfolio deciles sorted by size is a common method in the literature. (See, for example, Loughran and Ritter (1995) and Esplenaub, Gregory and Tonks (1998)). The use of a further sort by momentum reflects consistent findings of medium-term return persistence observed by Jegadeesh and Titman (1993) and more recently confirmed by Jegadeesh and Titman (2001).

Each day, all firms are allocated to one of forty portfolios on the basis of their size and previous return (or momentum). We first rank all firms by size, size being measured by market capitalisation. This yields ten size-based portfolios. Each of the ten size portfolios (or deciles) is then subdivided in four based on a ranking of the cumulative firm returns over the year preceding the exercise, a period measured from  $t - 12$  months to  $t - 30$  days (where  $t$  denotes the day on which the exercise occurs). Equally weighted returns are then calculated

for each of these forty benchmark portfolios over the following nine months. The abnormal return for any firm on a particular day around an exercise is given by the difference between that firm's return and its matching size/momentum portfolio.

The second methodological issue arises from the event clustering that is apparent in our data. Overall, 3244 option exercises take place on just 707 days within our sample period. As a result, we are unable to assume that the abnormal returns and the cumulative abnormal returns associated with each option exercise are independent of each other. This means that we cannot simply aggregate the abnormal returns relating to the option exercises, obtain a mean and standard deviation and estimate the significance of the resulting cumulative abnormal returns. We overcome this problem of event clustering by using a calendar time approach (see, for example, the discussion in Lyon, Barber and Tsai (1999) and its application in Brav and Gompers (1997)). We measure the abnormal returns around each exercise as above and then place these daily abnormal returns in calendar time between July 1995 and July 1998. To estimate the abnormal return for an event window of, for example, 1 to 30 days post-event, each day in calendar time we calculate the mean abnormal return to all firms that have an exercise between 1 and 30 days prior to that day. Thus the abnormal return we calculate for each day in calendar time denotes the mean abnormal return to all those exercises that are between 1 and 30 days post-event on that particular day. This gives us a time series of abnormal returns from which we can calculate a mean and corresponding standard deviation in the normal way, and enables us to estimate the resulting significance from zero of the mean abnormal return for any given event window.<sup>4</sup>

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<sup>4</sup> As Lyon, Barber and Tsai (1999) note, the drawback to such an approach is that these computed returns do not correspond to returns that would be experienced by investors.

We choose a range of event windows, including a pre-event window from day  $t-30$  to day  $t$  (to measure the immediate pre-exercise return performance), and post-event windows up to 9 months after the exercise. The 3 month post-event window may be an especially important window given that London Stock Exchange rules do not permit executive transactions immediately prior to earnings announcements. Thus the 3 month window might best capture the ability of the executive to trade on the basis of information relating to a forthcoming earnings announcement.<sup>5</sup>

## 5. Results

As noted above, the predominant focus of this research is to determine whether there is information contained in executive stock option exercises. Specifically, we investigate the possible importance of the proportion sold at the time of exercise. The summary statistics detailed in Table 1 distinguish between ‘Low’ and ‘High’ proportion exercises. We split our sample approximately into two, those exercises where more than 50% of the stock is sold, and those exercises where 50% or less stock is sold. This yields a slightly higher number of exercises in the Low sale group. There is some indication of differences between the two samples, Low exercises tending to be in firms with a smaller market capitalisation. In addition, there is a substantial difference in the moneyness of the respective samples, the moneyness of Low exercises being greater than that of High exercises. As a result, we control for both firm size and option moneyness.

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<sup>5</sup> Insiders are entitled to trade providing they do not base their decisions on price sensitive information.

### *5.1. Proportion Sold*

This section investigates the information content of an option exercise, taking account of the amount of stock sold at the time of exercise. At exercise, an executive can choose either to hold or to sell the stock acquired through exercise. This choice is likely to be influenced by a number of factors, one of which may be the executive's expectations about the future performance of the stock. It is normally assumed, however, that an executive will sell all the stock acquired. The reason for this is that there are no costs associated with holding the option other than the dividends foregone, while exercising requires payment of both the exercise price and income tax on the paper profit at the time of exercise. The costs related to exercising suggest that exercise will occur only if the executive expects the stock to underperform, and should therefore be accompanied by a sale of all the stock purchased at exercise. Thus an exercise might realistically be viewed by investors as a signal akin to a stock sale.

It is not necessary that the decision to exercise and sell be ascribed to expectations of poor performance. Irrespective of an executive's expectations about the firm's prospects, a decision to exercise and sell might reflect a rational desire to diversify the executive's portfolio. If this were the case, there does not appear to be any clear rationale for the exercise and sale of a proportion of stock. Diversification of some fraction of an option holding can be achieved by exercising that fraction and selling all the stock exercised. Exercising options relating to more stock than is actually sold will incur unnecessary costs. Therefore, an exercise purely for diversification should be accompanied by the sale of all stock purchased.

Alternatively, a decision to exercise could be due, for example, to the expiration of the option. In this case, the executive's choice concerning the amount of stock to sell will be complicated by the need to balance both the costs associated with the exercise and the executive's expectations about the future performance of the stock. The decision to exercise and hold requires the executive to make an actual investment in the stock, given that exercising the option can incur substantial costs. Thus an executive may sell a proportion of the stock acquired even if he expects superior future performance of that stock.

We hypothesise, therefore, that post-event abnormal returns will be influenced by the proportion of stock that is sold following a stock option exercise. Specifically, we argue that where an executive sells a large proportion of the stock purchased, we would expect post-event abnormal returns to be consistent with those following a stock sale. Alternatively, where an executive sells a small proportion of the stock purchased, we would expect subsequent abnormal returns to be more in line with those observed for stock purchases<sup>6</sup>. A subdivision of exercises by proportion sold should yield a set of information signals consistent with either a purchase or a sale if executives use their private information in motivating their exercise and related sale decisions. The alternative factors behind a decision to exercise, such as diversification or option expiration, will naturally blur the quality of the

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<sup>6</sup> Previous research has documented post-transaction negative and positive abnormal returns for stock sales and purchases respectively. While purchases have consistently given stronger signals than sales, the most recent research suggests that only stock purchases produce significant post-transaction abnormal returns. The reason for this is based on liquidity - the executive has to fund a purchase. In our analysis, a Low proportion exercise will not be exactly equivalent to a purchase since the sale of a small proportion of the stock exercised may yield an approximately zero net cash position for the executive. The possible absence of a funding requirement for the transaction therefore suggests that a Low proportion exercise may not be as informative as a standard purchase.



proportion sold as an information signal. As a result, the proportion sold at the time of exercise may be a noisy indicator of future stock performance.

#### Table 2

The results for the complete sample of exercises in Table 2 show that exercises follow significant positive abnormal returns in the 30 days prior to exercise. Post-exercise, we find small, but insignificant, negative abnormal returns. For example, the mean abnormal return over the six-month period following exercise is -0.31% (t-statistic of -0.60). This is not out of line with Carpenter and Remmers, who find that when an executive can sell exercised stock immediately, post-exercise abnormal returns are marginally positive but not significant. (They obtain a mean abnormal return over the corresponding period of 0.18%). The implication of these results is that the exercise decision may be timed to capitalise on previous superior stock price performance, but contains little information about a firm's future performance.

Rows 2 and 3 in Table 2 give the corresponding results for exercises categorised as low and high proportion respectively. A 'Low' exercise is one where the executive sells 50% or less of the stock acquired, while 'High' denotes an exercise with an accompanying sale of more than 50%. Both Low and High exercises take place after a period of significantly positive abnormal returns over the preceding 30 days (1.01% and 4.02% respectively). The difference between them is significant, indicating that executives sell a greater proportion of stock after larger recent abnormal returns. This suggests that the exercise and sell decision may be influenced by the recent performance of the stock price, i.e. the extent of the price run-up during the 30 days prior to exercise impacts upon the proportion of stock sold at exercise. Thus not only do executives appear to time their exercises, the choice regarding

how much of the stock acquired at exercise that they then sell appears to be related to a desire to capture these short-term gains.

This analysis is reinforced by the post-event abnormal returns of the two subsamples. Low exercises yield subsequent abnormal returns that are consistently positive, while High exercises are followed by negative abnormal returns. For example, the six-month post-exercise abnormal return is 1.32% (t-statistic of 2.13) and  $-2.19\%$  (t-statistic of  $-2.95$ ) after Low and High exercises respectively. The difference in returns is 3.52% (t-statistic of 3.63), and 5.23% (t-statistic of 3.99) when measured over a nine-month post-exercise window.

It is apparent that executives sell a larger proportion of stock after a period of superior stock price performance, and prior to a period of relative underperformance. These results are consistent with our initial hypothesis that it may be possible to categorise exercises as being approximately equivalent to stock sales or stock purchases depending on the proportion of stock that the executive sells at exercise. Despite the fact that there may be a number of non-information based reasons for executives to exercise, there is clear evidence that executives not only time their exercises to take advantage of short-term price appreciation, but that the associated decisions regarding how much stock to sell are well informed. In contrast to previous research, we are therefore able to conclude that insiders do make use of their information advantage when exercising their executive stock options.

In arriving at this conclusion, we assume that stock return performance post-exercise is independent of stock return performance pre-exercise. If this were not the case, and insiders' decisions on how much exercised stock to sell is simply determined by pre-exercise performance, we would be unable to conclude that insiders make use of an information advantage over outsiders. We identify in Table 2 above that there is an apparent relation between pre- and post-exercise performance. Specifically, exercises accompanied by the sale

of a high proportion of stock follow significantly greater abnormal returns prior to exercise. This pre-exercise return performance is then reversed over the following nine months. In Table 3 we present the results of samples of exercises categorised according to the nature of the immediate pre-exercise stock returns. We split our sample of exercises into two on the basis of a ranking of their pre-exercise abnormal returns measured from day t-30. We denote these two subsamples as ‘Good’ and ‘Poor’ respectively. Exercises with good prior return performance exhibit generally positive post-exercise abnormal returns, while the reverse is the case for those exercises with poor pre-exercise returns. The Poor sample significantly underperforms the Good sample over the subsequent 6 and 9 month windows. Table 3 also presents the results of a further subdivision of these two samples according to the proportion of stock sold at exercise. Both the Good (Low – High) and Poor (Low – High) are positive and significant for windows of 3 months or more post-exercise, i.e. irrespective of pre-exercise returns, the low sale proportion exercises consistently outperform the high sale proportion exercises. This indicates that post-exercise return performance cannot be explained by immediate pre-exercise returns. It is therefore clear that conditioning on the proportion of stock sold at the time of exercise yields significant information regarding future return performance over and above any information contained in previous returns.

Table 3

## *5.2. Option Moneyness*

This section presents results relating to exercises categorised by the moneyness of the option at the time of exercise. The moneyness of the option exercise is the ratio of the stock price to the exercise price. Moneyness may be an important consideration for executives

when deciding to exercise. While the option must be in the money, the extent to which it is in the money not only impacts on the explicit cost of exercising (as outlined above), but also on the implicit cost of exercising. As a result of these costs, we argue that near-the-money exercises are more likely to be information driven. Equivalently, deep-in-the-money exercises are more likely to be diversification or liquidity motivated.

When an option is exercised, the option holder loses the time value of the option. This time value is greater for a near-the-money option, so exercising such an option is relatively expensive. Conversely, a deep in-the-money option has relatively little time value. This relation between cost of exercising and moneyness suggests that an executive should be more likely to exercise a near-the-money option if he has negative information concerning the stock. Equivalently, the exercise of a deep in-the-money option is less likely to be information induced. We therefore hypothesise that, other things being equal, a near-the-money exercise will be followed by negative abnormal returns.

Approximately ten percent of our exercises were missing an exercise price and were therefore excluded from this part of the analysis. All remaining exercises were ranked by moneyness, yielding a total sample of 2938 events. These events were split into two equal samples, which we categorise as near-the-money and deep in-the-money.

#### Table 4

Table 4 presents the results. Deep in-the-money exercises take place after a period of large positive abnormal returns that are significantly greater than those prior to near-the-money exercises. This is not surprising since pre-exercise run-up is likely to be a factor that determines the moneyness of the exercise. More interestingly, we find negative abnormal returns at all horizons for the near-the-money exercises, while corresponding returns for the deep in-the-money exercises are positive but insignificant. For example, over the six months

after exercise, the abnormal returns are  $-1.40\%$  (t-statistic of  $-1.93$ ) and  $0.61\%$  (t-statistic of  $0.79$ ) respectively.

Near-the-money exercises follow positive abnormal returns, and produce significantly negative post-exercise abnormal returns. Pre-exercise abnormal returns are significantly larger for deep in-the-money exercises, and are followed by marginally positive abnormal returns. These results are consistent with the notion that an executive is more likely to exercise and capture the profits associated with a near-the-money option if he expects poor stock price performance. This is in line with our intuition that a near-the-money exercise is relatively more expensive. A near-the-money exercise should therefore be viewed as a negative signal, consistent with our hypothesis that such an exercise is likely to be induced by negative private information.

While our results are intuitively appealing, they implicitly assume that the sale proportion and moneyness are independent. It would, however, be realistic to expect executives to sell a higher proportion of a near-the-money exercise given that a near-the-money exercise requires proportionately more stock to be sold to fund the exercise. As noted in Table 1, this indeed appears to be the case. Disentangling these two factors is crucial in determining whether post-exercise negative abnormal returns are related to a high sell proportion or the moneyness of the option at exercise. We overcome this by subdividing the near and in-the-money samples by the proportion sold. This creates four samples, a Low and High sale proportion for both the near and deep in-the-money exercises.

#### Table 5

The results in Table 5 broadly confirm our earlier findings that the proportion sold is an important indicator of post-exercise returns. There are significant differences between low and high sale proportions whether the option is near or deep in-the-money, although there is

some evidence to suggest that this difference is stronger for the near-the-money options, i.e. near-the-money exercises are generally more informative than deep in-the-money exercises. At the same time, it is interesting to note that the moneyness of the option is also important. High sale proportions produce significant negative abnormal returns only for the near-the-money options, whereas low sale proportions yield significant positive abnormal returns only for the deep in-the-money options. This suggests that a combination of proportion sold and moneyness is driving the post-event abnormal returns.

These results indicate that there may be information only in high sale proportion near-the-money exercises and low sale proportion deep in-the-money exercises. Thus a near-the-money exercise will indicate poor subsequent performance, particularly if accompanied by a high sale proportion. The six-month post-exercise returns are 0.76% (t-statistic of 0.84) and –3.57% (t-statistic of –3.59) for near-the-money low and high sale proportions respectively. Similarly, a deep in-the-money exercise has little significant information value, unless accompanied by a low sale proportion. We obtain corresponding six-month post-exercise abnormal returns of 1.61% (t-statistic of 1.92) and –0.81% (t-statistic of –0.63).

Overall, these findings provide additional support for insiders' use of their information advantage when making their exercise decisions. Further, the use of this private information is consistent with a priori expectations, in particular that near-the-money exercises are indicative of poor future return performance. We have shown, however, that near-the-money exercises only indicate post-exercise negative abnormal returns if the executive sells a high proportion of the stock. The distinction between high and low sale proportions is clearly an important indicator of subsequent abnormal returns following deep in-the-money exercises.

### 5.3. Firm Size

In this section, we examine whether our results are driven by a small firm effect. It is possible that exercises by executives in smaller firms are more informative than exercises by executives in larger firms. This follows if investors are at a greater informational disadvantage in the smaller firms. We also need to consider firm size given that the mean market capitalisation of the Low exercises is less than that of the High exercises. We first rank all exercises by the size of the firm at the time of exercise, and partition our sample in two. We then subdivide each by the proportion sold in order to ensure that our results are not due to differing sale proportions within the two subsamples. Our findings are presented in Table 6.

Table 6

We find that there is no difference between the small and large firm abnormal returns. Low and high proportion sales continue to produce signals in line with those observed above in Section 5.1, both for the small and larger firms. The difference in six-month post-exercise abnormal return between low and high sale proportion exercises in the smaller firm sample is 3.5% (t-statistic of 2.64). The corresponding difference for the larger firm sample is 3.22% (t-statistic of 2.34). There is no asymmetry in the informational advantage of executives depending on the size of the firm. Further, these results stress the importance of the proportion sold at the time of exercise over and above a factor such as firm size.

### 5.4. Age of Executive

Finally, we investigate the importance of the type or rank of executive in determining the nature of the post-exercise abnormal returns. It is generally considered that the rank of executive is an important factor in determining the information content of an insider's transaction. The higher the rank of the executive, the better informed they should be about the firm's future prospects. Carpenter and Remmers distinguish between exercises by high ranked and low ranked insiders, high-ranking managers being board chairmen or presidents. In the current regime where insiders can sell on exercise, they obtain six-month post-exercise abnormal returns of  $-0.12\%$  and  $0.84\%$  for top and lower-ranked managers respectively. It is only when they subdivide further by size of firm that they obtain significant post-exercise abnormal returns of  $-5.22\%$  for exercises by high ranked insiders in the smaller firms.

Our data does not enable us to determine the ranking of the executive. However, we do have some information concerning the age of the executive at the time of the exercise. The age of the executive may be an important information signal. There is likely to be a correlation between executive age and position within the firm, implying that older executives should be better informed. Alternatively, the wish to diversify or satisfy liquidity requirements may vary with age. A priori, it is not obvious how these various factors will impact on the timing of an exercise, as they may produce conflicting motives for transacting and hence produce ambiguous information signals.

#### Table 7

Unfortunately, the data on age is not comprehensive, being available only for a subset of exercises. However, because the analysis of age is unique to the examination of not just the exercise of executive stock options but also to executive trades in general, we believe we are justified in continuing with a restricted sample. Excluding exercises without data on the age of the executive gives us a sample of 2302 exercises, a reduction of approximately 30%.



The first row of Table 7 gives the results for the whole of our reduced sample. Both pre- and post-exercise returns are in line with those for the complete sample of exercises presented in Table 2 above. There is therefore no evidence that this restricted sample is biased in relation to the complete sample.

We first rank exercises by age of executive at the time of exercise, and divide the sample equally in two – young and old. This produces a somewhat arbitrary division, with young being categorised as those aged approximately 52 or below, old as being above 52. We then subdivide each on the basis of proportion sold, again to reflect the importance of this as a factor in explaining post-exercise returns. The reduction in sample sizes means that the resulting significance levels of the computed abnormal returns are generally lower than those obtained above. Table 7 shows that while there is little evidence of a significant difference between old and young post-exercise returns, an interesting pattern emerges. For example, the mean 6-month post-exercise abnormal return for a low sale proportion exercise is 2.22% (t-statistic of 2.12) and 1.09% (t-statistic of 1.28) for young and old executives respectively. The corresponding returns after a high sale proportion exercise are –2.3% (t-statistic of –2.40) and –1.5% (t-statistic of –1.57). Although these differences are not significant, they suggest that the signals generated from exercises by younger executives are consistently more informative than those generated from the corresponding exercises by older executives. While we are unable to draw firm conclusions from this, a more detailed examination on a larger sample would be of interest, given that we would expect the older executives to have a higher rank and therefore possess more private information.

## **6. Conclusion**

Executives derive increasing proportions of their remuneration from executive stock options. Their ability to use private information in their exercise decisions impacts directly upon both the value of these options and the remuneration they receive. This study identifies that there is information content in executive stock option exercises, contrary to the conclusions of previous research. Principally, the proportion of stock sold at the time of exercise determines the direction of post-exercise abnormal returns. The sale of a low proportion of the stock acquired through exercise is consistent with subsequently superior stock return performance, while the reverse is observed for an exercise and sale of a high proportion of stock. These findings indicate that insiders do make use of their private information when deciding when to exercise their stock options, and how much of the stock acquired through this exercise they should sell. In contrast to previous research on standard insider purchases and sales, we find that the sale of a high proportion of stock (which we categorise as a sale) is consistently more informative than the sale of a low proportion of stock (categorised as a purchase).

The importance of the proportion of stock sold by the insider at the time of exercise is robust to both the moneyness of the option and the size of the firm. Our moneyness results are consistent with the hypothesis that the exercise of a near-the-money option is likely to indicate negative private information because the exercise of such an option is relatively expensive due to the time value of the option foregone. Finally, we present the results of an examination of the relation between the age of the executive at the time of exercise and the post-exercise stock price performance. This is an analysis unique to any investigation of the information content of trading by insiders, and one which further research in this area might explore.

## REFERENCES

- Brav, A. and Gompers, P. (1997). 'Myth or Reality? The Long-Run Underperformance of Initial Public Offerings: Evidence from Venture and Nonventure Capital-Backed Companies.' *Journal of Finance*, vol. 52, pp. 1791-1821.
- Carpenter, J. and Remmers, B. (2001). 'Executive Stock Option Exercises and Inside Information.' Forthcoming, *Journal of Business*.
- Chan, L.K.C., Jegadeesh, N. and Lakonishok, J. (1996). 'Momentum Strategies.' *Journal of Finance*, vol. 51, pp. 1681-1713.
- Canyon, M. and Murphy, K. (2000). 'The Prince and the Pauper? CEO Pay in the United States and United Kingdom.' *Economic Journal*, vol. 110, pp. 640-671.
- Ecbo, B.E. and Smith, D.C. (1998). 'The Conditional Performance of Insider Trades.' *Journal of Finance*, vol. 53, pp. 467-498.
- Esplenaub, S., Gregory, A. and Tonks, I. (1998). 'Assessing the Long-Term Under-Performance of UK Initial Public Offerings.' *Bristol Economics Discussion Papers*, No.98/458.
- Fama, E.F., (1970). 'Efficient Capital Markets: A Review of Theory and Empirical Work.' *Journal of Finance*, vol. 25, pp. 383-417.
- Finnerty, J.E., (1976). 'Insiders and market efficiency.' *Journal of Finance*, vol. 31, pp. 1141-1148.
- Givoly, D. and Palmon, D. (1985). 'Insider Trading and the Exploitation of Inside Information: Some Empirical Evidence.' *Journal of Business*, vol. 58, pp. 69-87.
- Greenbury, R., (1995). '*Directors' Remuneration: Report of a Study Group Chaired by Sir Richard Greenbury*.' London: Gee Publishing.
- Gregory, A., Matatko, J., Tonks, I. and Purkis, R. (1994). 'U.K. Directors' Trading: The Impact of Dealings in Smaller Firms.' *The Economic Journal*, vol. 104, 37-53.
- Gregory, A., Matatko, J. and Tonks, I. (1997). 'Detecting Information from Directors' Trades: Signal Definition and Variable Size Effects.' *Journal of Business Finance and Accounting*, vol. 24, pp. 309-343.
- Hemmer, T., Matsunaga, S. and Shevlin, T. (1996). 'The Influence of Risk Diversification on the Early Exercise of Employee Stock Options by Executive Officers.' *Journal of Accounting and Economics*, vol. 21, pp. 45-68.
- Huddart, S., (1994). 'Employee Stock Options.' *Journal of Accounting and Economics* vol, 18, pp. 207-231.

Huddart, S., (1997). 'Patterns of Stock Option Exercise in the United States.' In: Carpenter, J., Yermack, D., (Eds.), *Executive Compensation and Shareholder Value*, *Kluwer Academic Publishers*, pp. 115-142.

Huddart, S. and Lang, M. (1996). 'Employee Stock Option Exercises: An Empirical Analysis.' *Journal of Accounting and Economics*, vol. 21, pp. 5-43.

Jaffe, J.F., (1974). 'Special Information and Insider Trading.' *Journal of Business*, vol. 47, pp. 410-428.

Jegadeesh, N. and Titman, S. (1993). 'Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency.' *Journal of Finance*, vol. 48, pp. 65-91.

Jegadeesh, N. and Titman, S. (2001). 'Profitability of Momentum Strategies: An Evaluation of Alternative Explanations.' *Journal of Finance*, vol. 56, pp. 699-720.

Jeng, L., Metrick, A. and Zeckhauser, R. (2000). 'Estimating the Returns to Insider Trading: A Performance-Evaluation Perspective.' *NBER Working Paper* No. W6913.

King, M. and Roell, A. (1988). 'Insider Trading.' *Economic Policy*, vol. 7, pp. 163-193.

Lakonishok, J. and Lee, I. (2001). 'Are Insiders' Trades Informative?' *Review of Financial Studies*, vol. 14, pp. 79-111.

Lorie, J.H. and Niederhoffer, V. (1968). 'Predictive and Statistical Properties of Insider Trading.' *Journal of Law and Economics*, vol. 11, pp. 35-51.

Lougran, T. and Ritter, J. (1995). 'The New Issues Puzzle.' *Journal of Finance*, vol. 50, pp. 23-52.

Lyon, J., Barber, B. and Tsai, C. (1999) 'Improved methods for Tests of Long-Run Abnormal Stock Returns.' *Journal of Finance*, vol. 54, pp. 165-201.

Ofek, E. and Yermack, D. (2000). 'Taking Stock: Equity-Based Compensation and the Evolution of Managerial Ownership.' *Journal of Finance*, vol. 55, pp. 1367-1384.

Pettit, R.R. and Venkatesh, P.C. (1995). 'Insider Trading and Long-Run Return Performance.' *Financial Management*, vol. 24, pp. 88-103.

Pope, P.F., Morris R.C. and Peel, D.A. (1990). 'Insider Trading: Some Evidence on Market Efficiency and Directors' Share Dealings in Great Britain.' *Journal of Business Finance and Accounting*, vol. 17, pp. 359-380.

Rozeff, M.S. and Zaman, M.A. (1988). 'Market Efficiency and Insider Trading: New Evidence.' *Journal of Business*, vol. 61, pp. 25-44.

Seyhun, H.N., (1986). 'Insiders' Profits, Costs of Trading, and Market Efficiency.' *Journal of Financial Economics*, vol. 16, pp. 189-212.

Seyhun, H.N., (1988). 'The Information Content of Aggregate Insider Trading.' *Journal of Business*, vol. 61, pp. 1-24.

Seyhun, H.N., (1992). 'The Effectiveness of Insider-Trading Sanctions.' *Journal of Law and Economics*, vol. 35, pp. 149-182.

Table 1 UK Executive Stock Option Exercises - Summary Statistics

| Stock Option Exercises July 1995 – July 1998 |                  |              |                   |                |           |
|--|------------------|--------------|-------------------|----------------|-----------|
|  | No. of Exercises | No. of Firms | No. of Event Days | Mkt. Cap. (£m) | Moneyness |
| All  | 3244             | 765          | 707               | 2909           | 6.86      |
| Low  | 1727             | 583          | 600               | 2687           | 8.18      |
| High   | 1517             | 484          | 566               | 3162           | 4.74      |

All represents all exercises occurring between July 1995 and July 1998 for which we have corresponding returns data. Low represents those exercises that are accompanied by a sale of 50% or less of the stock purchased through the exercise. High represents exercises accompanied by a sale of more than 50% of the stock purchased. No. of firms is the number of firms for which there is at least one option exercise in the respective categories. No. of Event Days denotes the number of days during the sample period on which at least one exercise occurs. Mkt. Cap. is the mean market capitalisation of the firm at the time of exercise. Moneyness is the mean of the ratio of the stock price to the exercise price at the time of exercise.

Table 2 Abnormal Returns around Option Exercises Categorised by Proportion Sold

| Stock Option Exercises July 1995 – July 1998 |                  |                  |                  |                  |                  |
|--|------------------|------------------|------------------|------------------|------------------|
|  | -30 to 0         | +30 days         | +3 months        | +6 months        | +9 months        |
| All  | 2.26<br>[8.79]   | -0.10<br>[-0.51] | -0.45<br>[-1.30] | -0.31<br>[-0.60] | -0.75<br>[-1.06] |
| Low  | 1.01<br>[3.02]   | 0.23<br>[0.53]   | 0.73<br>[1.80]   | 1.32<br>[2.13]   | 1.77<br>[2.08]   |
| High   | 4.02<br>[11.73]  | -0.42<br>[-1.34] | -1.72<br>[-3.36] | -2.19<br>[-2.95] | -3.46<br>[-3.47] |
| Low - High                                   | -3.00<br>[-6.27] | 0.65<br>[1.61]   | 2.45<br>[3.75]   | 3.52<br>[3.63]   | 5.23<br>[3.99]   |

All denotes the mean percentage abnormal return for the complete sample of exercises, while Low (High) represent the corresponding abnormal return for exercises accompanied by a sale of 50% or less (more than 50%) of the stock purchased at exercise. Low - High is the difference between the Low and High abnormal returns. Mean percentage abnormal returns are measured over the respective windows using a calendar time methodology. Calendar day abnormal returns are the mean abnormal returns to all those firms that have an event such that they lie within the particular window on that day. A firm's abnormal return each day is that firm's return minus the firm's respective size/momentum portfolio return. The corresponding t-statistics, measuring significance from zero, are in brackets.

Table 3 Abnormal Returns around Option Exercises Categorised by Previous Stock Performance and Proportion Sold

| Stock Option Exercises July 1995 – July 1998 |                   |                  |                  |                  |                  |
|--|-------------------|------------------|------------------|------------------|------------------|
|  | -30 to 0          | +30 days         | +3 months        | +6 months        | +9 months        |
| Good   | 8.87<br>[22.28]   | -0.05<br>[-0.17] | -0.22<br>[-0.44] | 0.99<br>[1.33]   | 1.14<br>[1.14]   |
| Poor   | -4.74<br>[-15.97] | -0.36<br>[-1.30] | -0.88<br>[-1.95] | -1.72<br>[-2.56] | -2.67<br>[-2.97] |
| Good - Poor                                  | 13.61<br>[27.41]  | 0.31<br>[0.77]   | 0.66<br>[0.98]   | 2.72<br>[2.70]   | 3.81<br>[2.84]   |
| Good<br>Low-High                             | 0.29<br>[0.39]    | 1.06<br>[1.91]   | 1.87<br>[2.10]   | 2.61<br>[1.94]   | 5.38<br>[2.94]   |
| Poor<br>Low-High                             | -2.86<br>[-4.82]  | 0.94<br>[1.08]   | 3.51<br>[3.95]   | 5.06<br>[3.90]   | 6.35<br>[3.76]   |

Good and Poor represent the mean percentage abnormal return for exercises that follow relatively superior and inferior previous returns respectively. The previous returns are the abnormal returns measured over the 30 days prior to the option exercise. Good – Poor is the difference between the Good and Poor abnormal returns. Low (High) represent exercises accompanied by a sale of 50% or less (more than 50%) of the stock purchased at exercise. Good (Low - High) is the difference between the Low and High abnormal returns for exercises following superior previous returns. Poor (Low - High) is the difference between the Low and High abnormal returns for exercises following inferior previous returns. Mean percentage abnormal returns are measured over the respective windows using a calendar time methodology. Calendar day abnormal returns are the mean abnormal returns to all those firms that have an event such that they lie within the particular window on that day. A firm's abnormal return each day is that firm's return minus the firm's respective size/momentum portfolio return. The corresponding t-statistics, measuring significance from zero, are in brackets.



Table 4 Abnormal Returns around Option Exercises Categorised by Moneyness

| Stock Option Exercises July 1995 – July 1998 |                  |                  |                  |                  |                  |
|--|------------------|------------------|------------------|------------------|------------------|
|  | -30 to 0         | +30 days         | +3 months        | +6 months        | +9 months        |
| All  | 2.28<br>[8.55]   | -0.19<br>[-0.89] | -0.58<br>[-1.61] | -0.39<br>[-0.72] | -0.75<br>[-1.01] |
| NTM  | 1.44<br>[4.43]   | -0.62<br>[-2.17] | -1.27<br>[-2.64] | -1.40<br>[-1.93] | -1.79<br>[-1.83] |
| ITM  | 3.19<br>[8.17]   | 0.18<br>[0.59]   | 0.14<br>[0.26]   | 0.61<br>[0.79]   | 0.28<br>[0.26]   |
| NTM - ITM                                    | -1.74<br>[-3.46] | -0.80<br>[-1.90] | -1.41<br>[-1.95] | -2.00<br>[-1.90] | -2.07<br>[-1.45] |

All denotes the mean percentage abnormal return for the complete sample of exercises, while NTM and ITM represent the corresponding abnormal return for exercises that are near-the-money and deep in-the-money respectively. NTM - ITM is the difference between the near-the-money and the in-the-money abnormal returns. Mean percentage abnormal returns are measured over the respective windows using a calendar time methodology. Calendar day abnormal returns are the mean abnormal returns to all those firms that have an event such that they lie within the particular window on that day. A firm's abnormal return each day is that firm's return minus the firm's respective size/momentum portfolio return. The corresponding t-statistics, measuring significance from zero, are in brackets.

Table 5 Abnormal Returns around Option Exercises Categorised by Moneyness and Proportion Sold

| Stock Option Exercises July 1995 – July 1998 |                  |                  |                  |                  |                  |
|--|------------------|------------------|------------------|------------------|------------------|
|  | -30 to 0         | +30 days         | +3 months        | +6 months        | +9 months        |
| NTM<br>Low                                   | 0.20<br>[0.49]   | -0.29<br>[-0.80] | 0.26<br>[0.44]   | 0.76<br>[0.84]   | 1.09<br>[0.88]   |
| NTM<br>High                                  | 3.00<br>[7.59]   | -1.08<br>[-2.63] | -2.84<br>[-4.28] | -3.57<br>[-3.59] | -4.59<br>[-3.53] |
| NTM<br>Low – High                            | -2.80<br>[-4.85] | 0.79<br>[1.44]   | 3.10<br>[3.50]   | 4.33<br>[3.21]   | 5.68<br>[3.17]   |
| ITM<br>Low                                   | 1.79<br>[3.47]   | 0.48<br>[1.37]   | 0.96<br>[1.67]   | 1.61<br>[1.92]   | 2.32<br>[2.05]   |
| ITM<br>High                                  | 5.93<br>[9.61]   | -0.14<br>[-0.27] | -1.03<br>[-1.04] | -0.81<br>[-0.63] | -2.81<br>[-1.66] |
| ITM<br>Low – High                            | -4.14<br>[-5.16] | 0.62<br>[0.99]   | 1.98<br>[1.74]   | 2.42<br>[1.58]   | 5.13<br>[2.52]   |

NTM and ITM represent the mean percentage abnormal return for exercises that are near-the-money and deep in-the-money respectively. Low (High) represent exercises accompanied by a sale of 50% or less (more than 50%) of the stock purchased at exercise. Thus NTM (Low) represents the abnormal return for near-the-money exercises that have a corresponding low sale proportion, while NTM (High) represents the abnormal return for near-the-money exercises that have a corresponding high sale proportion. NTM (Low - High) is the difference between the Low and High abnormal returns for the near-the-money exercises. ITM (Low - High) is the difference between the Low and High abnormal returns for the in-the-money exercises. Mean percentage abnormal returns are measured over the respective windows using a calendar time methodology. Calendar day abnormal returns are the mean abnormal returns to all those firms that have an event such that they lie within the particular window on that day. A firm's abnormal return each day is that firm's return minus the firm's respective size/momentum portfolio return. The corresponding t-statistics, measuring significance from zero, are in brackets.

Table 6 Abnormal Returns around Option Exercises Categorised by Size of Firm and Proportion Sold

| Stock Option Exercises July 1995 – July 1998 |                  |                  |                  |                  |                  |
|--|------------------|------------------|------------------|------------------|------------------|
|  | -30 to 0         | +30 days         | +3 months        | +6 months        | +9 months        |
| Small<br>Low                                 | 1.40<br>[2.88]   | 0.32<br>[0.96]   | 1.06<br>[1.84]   | 1.37<br>[1.60]   | 1.57<br>[1.37]   |
| Small<br>High                                | 3.85<br>[7.76]   | -0.27<br>[-0.60] | -1.32<br>[-1.76] | -2.14<br>[-2.11] | -3.42<br>[-2.64] |
| Small<br>Low - High                          | -2.45<br>[-3.52] | 0.59<br>[1.04]   | 2.37<br>[2.52]   | 3.50<br>[2.64]   | 4.98<br>[2.88]   |
| Large<br>Low                                 | 0.48<br>[1.19]   | 0.03<br>[0.09]   | 0.18<br>[0.29]   | 1.13<br>[1.22]   | 2.05<br>[1.62]   |
| Large<br>High                                | 4.08<br>[9.63]   | -0.52<br>[-1.39] | -2.13<br>[-3.30] | -2.09<br>[-2.07] | -3.40<br>[-2.51] |
| Large<br>Low - High                          | -3.61<br>[-6.17] | 0.56<br>[1.04]   | 2.31<br>[2.61]   | 3.22<br>[2.34]   | 5.45<br>[2.94]   |

Small and Large represent the mean percentage abnormal return for exercises in firms categorised as small and large market capitalisation respectively. Low (High) represent exercises accompanied by a sale of 50% or less (more than 50%) of the stock purchased at exercise. Thus Small (Low) represents the abnormal return for exercises of firms with a small market capitalisation that have a corresponding low sale proportion, while Small (High) represents the abnormal return for exercises of firms with a small market capitalisation that have a corresponding high sale proportion. Small (Low - High) is the difference between the Low and High abnormal returns for the small firms. Large (Low - High) is the difference between the Low and High abnormal returns for the large firms. Mean percentage abnormal returns are measured over the respective windows using a calendar time methodology. Calendar day abnormal returns are the mean abnormal returns to all those firms that have an event such that they lie within the particular window on that day. A firm's abnormal return each day is that firm's return minus the firm's respective size/momentum portfolio return. The corresponding t-statistics, measuring significance from zero, are in brackets.

Table 7 Abnormal Returns around Option Exercises Categorised by Age of Executive and Proportion Sold

| Stock Option Exercises July 1995 – July 1998 |                  |                  |                  |                  |                  |
|--|------------------|------------------|------------------|------------------|------------------|
|  | -30 to 0         | +30 days         | +3 months        | +6 months        | +9 months        |
| All  | 2.62<br>[8.88]   | -0.15<br>[-0.62] | -0.61<br>[-1.55] | -0.48<br>[-0.81] | -0.77<br>[-0.93] |
| Old<br>Low                                   | 0.53<br>[1.17]   | 0.20<br>[0.56]   | 0.65<br>[1.17]   | 1.09<br>[1.28]   | 2.23<br>[1.83]   |
| Young<br>Low                                 | 2.45<br>[4.20]   | 0.35<br>[0.81]   | 0.87<br>[1.28]   | 2.22<br>[2.12]   | 3.52<br>[2.55]   |
| Old – Young<br>Low                           | -1.93<br>[-2.61] | -0.15<br>[-0.27] | -0.21<br>[-0.24] | -1.11<br>[-0.84] | -1.28<br>[-0.70] |
| Old<br>High                                  | 3.96<br>[8.43]   | -0.33<br>[-0.84] | -1.26<br>[-2.03] | -1.50<br>[-1.57] | -2.93<br>[-2.24] |
| Young<br>High                                | 3.83<br>[8.69]   | -0.46<br>[-1.17] | -1.84<br>[-2.80] | -2.30<br>[-2.40] | -3.76<br>[-2.94] |
| Old – Young<br>High                          | 0.13<br>[0.20]   | 0.13<br>[0.23]   | 0.58<br>[0.64]   | 0.80<br>[0.60]   | 0.83<br>[0.45]   |

All denotes the mean percentage abnormal return for the complete sample of exercises that have associated data on the age of the executive at the time of exercise. Old and Young represent the abnormal return for exercises categorised as being by the older and younger executives respectively. Low (High) represent exercises accompanied by a sale of 50% or less (more than 50%) of the stock purchased at exercise. Thus Old (Low) represents the abnormal return for exercises by the older executives that have a corresponding low sale proportion, while Old (High) represents the abnormal return for exercises by the older executives that have a corresponding high sale proportion. Old - Young (Low) is the difference in abnormal return between the Old and Young exercises that have a corresponding low sale proportion. Old - Young (High) is the difference in abnormal return between the Old and Young exercises that have a corresponding high sale proportion. Mean percentage abnormal returns are measured over the respective windows using a calendar time methodology. Calendar day abnormal returns are the mean abnormal returns to all those firms that have an event such that they lie within the particular window on that day. A firm's abnormal return each day is that firm's return minus the firm's respective size/momentum portfolio return. The corresponding t-statistics, measuring significance from zero, are in brackets.