Private Information and the Exercise of Executive Stock Options

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We find evidence that executives use private information in exercising stock options. The most informed executives exercise early, exercise after the vest date rather than at the vest date, do not exercise in anticipation of dividends, exercise a high percentage of their options, sell a large proportion of acquired stock, and exercise and leave the firm. The most costly options to exercise are associated with the most private information, and the least costly are associated with the least private information. We also find that higher ranked executives show significantly greater exploitation of private information than do lower ranked executives.

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1. Introduction

The use of private information by executives in executing stock transactions has been an important and controversial issue to academics, practitioners, and especially regulators. But stock transactions are not the only manner in which executives can exploit private information. The extensive use of stock options as compensation and incentives provides executives with another means of exploiting private information. This paper examines a large sample of exercises of executive stock options over a ten year period to determine if these exercises take advantage of private information.

Exercise of an option starts with the purchase of the stock at the exercise price. Hence, it initially can be viewed as an insider purchase. If the stock is sold, however, the transaction is clearly an insider sale. Evidence reported elsewhere and confirmed in this study shows that most stock acquired upon exercise is sold. Hence, option exercises are analogous to insider stock sales. Thus, it is reasonable to question whether executives avoid loss of value by exercising their options on private information.

Of course, there are numerous reasons for exercising executive stock options unrelated to private information, and indeed empirical research has shown that such options are commonly exercised early. In addition to the standard justification of capturing dividends, exercise adds a measure of liquidity to what would otherwise be an illiquid instrument.[1] To determine if private information is being used, exercises that could be motivated by private information should be separated from those that would not.

The primary hypothesis of this study is that executives exercise options prior to periods of significant negative abnormal stock performance. To fully explore this issue, we develop several plausible hypotheses and separate exercises that are likely to be based on private information from those that are not. Our tests are conducted on a large data set of insider option exercises reported to the SEC between 1996 and 2005. For some of the tests we use the full sample of all exercises with available stock return data and for others we use a sub-sample of exercises that have the necessary supplemental data available from ExecuComp.

We find strong evidence supporting the private information hypothesis. Exercises that should be motivated by private information are associated with post-exercise stock price performance that is significantly lower than that for exercises that should not be associated with private information. Our study does not address the source of private information. An ongoing stream of research identifies that the private information is likely to be in the form of earnings manipulation through accounting flexibility.

[1]Moreover, early exercise on private information may not always be detrimental to shareholders. Laux (2007) argues that early exercise can induce executives to abandon poorly performing projects.

Our concern is focused on whether executives use private information, not specifically what information they use.

The remainder of the paper is organized as follows. Section 2 discusses the relevant literature. In Section 3, we discuss our data, hypothesis development, and methodology. Section 4 reports the empirical findings. Section 5 discusses several extensions, and Section 6 presents our conclusions.

2. Previous Research

Insider trading is one the most widely-examined topics in all of empirical research in finance. Seyhun (1998) provides an excellent summary of the research on insider trading, which includes Jaffe (1974), Finnerty (1974), Rozeff and Zaman (1988), Lin and Howe (1990), Jeng, Metrick, and Zeckhauser (2003), and Lakonishok and Lee (2001). The findings suggest that inside information has value in earning abnormal returns after transaction costs, with most of the information contained in insider purchases. There is some evidence that the value of inside information is greater in small firms than in large firms and that insider trading is more profitable for top executives than for other insiders. Insider trades are also more informative when they involve a larger number of shares.

Although there is a plethora of literature devoted to insider trading in general, there have been few studies of insider trading in the form of executive or employee stock option exercises. To understand this line of research, we must first note that prior to May 1991, insiders were required to hold shares acquired upon exercise for at least six months. After May 1991 insiders could dispose of acquired shares immediately provided that the options had been held for at least six months. Hence, prior to May 1991 insiders would not necessarily exercise their options when they had strong reason to believe that the stock would perform poorly in the short-run. If they were in possession of such information after May 1991, they would likely be far more inclined to exercise, given that they could usually sell the stock right away. Thus, it is in the post-1991 period that we concentrate our focus.

The frequent occurrence of early exercise is well-documented in the literature. The early exercise behavior of executives is studied by Hemmer, Matsunaga, and Shevlin (1996) and Bettis, Bizjak, and Lemmon (2005). Non-executive employees also exercise options early as found in Huddart and Lang (1996), who conclude that early exercise is extremely common and results in an average loss of nearly half of the option's Black-Scholes-Merton value. We now take a look at why such options are exercised early.

2.1. Private Information as a Motivating Factor in Early Exercise

Seyhun (1998) examines insider option exercises in the post-1991 period and finds that the shares underperform the market by 0.8% following exercises. Carpenter and Remmers (2001) examine periods prior to and after May 1991 and find that exercises precede positive abnormal performance prior to May 1991. Following May 1991, however, they find no significant abnormal returns for their broad sample,

but do find some evidence that top executives at small firms exploit their private information in exercising their options. In a study of exercises in the United Kingdom over 1995-1998, Kyriacou and Mase (2003) find some evidence that these options are exercised based on private information. Significant negative abnormal returns occur following exercises in which a relatively high proportion of acquired stock is sold. Core and Guay (2001) and Huddart and Lang (1996) examine whether exercises by junior employees are informative and find no evidence to support the notion that lower-level employees exercise based on private information. In a later study, however, Huddart and Lang (2003) do find such evidence. Cicero (2007) examines the interaction of exercising on private information and backdating of exercises. He finds that when the shares are sold immediately, there is evidence of the use of private information. When the shares are not disposed of immediately, he finds evidence of both timing and the backdating of the exercise date, though the incidence of backdating was reduce by the Sarbanes-Oxley Act of 2002. Cai (2007) finds similar evidence and concludes that five to twelve percent of exercises involve manipulation of dates or exercise prices.

Another thread of research has examined the relationship between option exercises by insiders and the flexibility afforded by accounting rules. Bergstresser and Philippon (2006), Bartov and Mohanram (2004), Wei (2004), and Safdar (2004) all find evidence that exercises are commonly associated with earnings manipulation, often in the form of discretionary accruals. Safdar, however, concludes that the degree to which earnings are manipulated appears to be somewhat small.

The literature suggests many rational explanations other than private information for the early exercise of these options. In order to identify exercises that could have been motivated by private information, it is necessary that we identify those that are motivated by other reasons. In the following sub-sections, we discuss the various justifications given for the early exercise of ESOs.

2.2. Departure

Cuny and Jorion (1995) note that executive departure typically forces early exercise of ESOs. Thus, one possible explanation for early exercise is that the executive could have left the company or is planning to leave the company before the option expires. If the executive leaves the company, whether by choice or by force, she typically has 90 days to exercise her options or else forfeit their entire value. Regardless of the reason for leaving the company, in-the-money options would be exercised early.

2.3. Portfolio Rebalancing to Achieve Greater Diversification

Lambert, Larcker, and Verrecchia (1991) is the seminal paper in a large body of literature that identifies how the inability of executives to either sell the option or the underlying stock can explain early exercise. Typically, executives hold investment portfolios that are sub-optimally diversified, with the company's stock constituting too large a portion of the executive's overall wealth. Early exercise is beneficial to the executive because it can increase diversification. A risk-averse executive could

rationally exercise early and sell the stock if the diversification benefit is greater than the time value sacrificed from the early exercise. The empirical work of Hemmer, Matsunaga, and Shevlin (1996) supports this hypothesis by finding a positive relationship between option exercise and the risk inherent in holding an unhedged option position. Of course, exercise does not eliminate exposure, as option exposure could be merely traded for stock exposure, but Ofek and Yermack (2000) find that managers typically sell nearly all shares of stock acquired through the exercise of ESOs immediately. They also find that grants are correlated with vesting so if the options are not exercised upon vesting, the executive not only retains the vested options but acquires more options, which makes him even less diversified. Thus, there is a strong incentive to exercise options at the vest date.

Although in recent years, opportunities have increased for executives to diversify through such transactions as collars, prepaid forwards, and diversified investment funds tailored for executives, it is unlikely that diversification has become any less a motivation for the exercise of options. Hence, we must attempt to identify exercises that are likely to be motivated by diversification.

2.4. Tax Timing

Early exercise of ESOs could be attractive to executives because of tax benefits. Goolsbee (2000) shows empirically that the anticipation of a tax increase has apparently led to increased exercise of options. Carpenter and Remmers (2001), and McDonald (2003) demonstrate that there are superior strategies than exercise-and-hold. McDonald notes, however, that exercise in anticipation of a tax increase or moving to a higher tax bracket could be justified. The papers by Cicero (2007) and Cai (2007) consider the possibility that exercises without immediate disposition of the stock might be part of a tax-minimization strategy and could induce manipulation of the exercise date. Following Carpenter and Remmers and given the difficulty of identifying how tax-related considerations could motivate an exercise, we leave this question to separate study.

2.5. Dividend Capture

As noted earlier, a dividend can be captured by exercising and holding the acquired stock past the ex-dividend date. Thus, another possible reason for early exercise is to capture dividends that are sufficiently large to justify discarding the option's remaining time value. Although Carpenter and Remmers (2001) find that controlling for exercises that fall between a dividend announcement date and an ex-dividend date leaves their results unchanged, we shall attempt to identify exercises motivated by capture of a dividend in a different manner.

2.6. Liquidity

Although insiders holding ESOs cannot sell or transfer their options, they could exercise early for liquidity purposes. For example, the executive could be planning to pay tuition or purchase an expensive

automobile or house.[2] But if any of these scenarios apply, we should expect that a small portion of the vested options would be exercised. In other words, exercises motivated by information are likely to involve exercise of the largest number of options, if not all of them. Exercise motivated by the generation of liquidity is likely to require only the exercise of a smaller fraction of eligible options.

3. Data and Hypothesis Development

In this section we identify the data set and formally develop the hypotheses to be tested. We also describe the methodology to be used to test the hypotheses.

3.1. Data

The primary data set used in this study consists of option exercises by corporate insiders that were obtained from the Table II File of the Thomson Financial Insider Filing Data (TFI). TFI defines corporate insiders as those that have "access to non-public, material, insider information" who are required to file SEC forms 3, 4, or 5 when trading in their company stock as required by Section 16(a) of the Securities and Exchange Act of 1934.[3] Prior to the enactment of Sarbanes-Oxley in 2002, insiders were required to report transactions by the tenth day of the calendar month following the month in which the trade occurred. Sarbanes-Oxley reduced the reporting time to two business days following exercise.

We collect insider derivative transactions from TFI, which contains all Table II transactions and holdings information reported on SEC Forms 3, 4, or 5. The information reported consists of derivative transactions such as options, warrants, and convertible securities. The data fields include open market derivative transactions as well as information on the award, such as the type of option received, the number of shares involved, the strike price, the vest date, and the expiration date. After removal of amended transactions, information on 447,089 exercises is obtained. Because we measure stock performance following exercise, we restrict the potential sample to firms that have returns available on CRSP, leaving 411,366 exercises by 59,733 insiders from 7,569 firms. This data set is referred to as the "full sample" and is used to test some of the hypotheses outlined in the next sub-section.

Certain hypotheses require additional information about the exercises and the executives. For these purposes, we construct a subset of the original data set containing all insider trades in the original data set that can be matched with the necessary insiders' compensation data reported in Standard and Poor's ExecuComp. These restrictions reduce the total number of exercises to 92,960 and include 9,703 executives from 2,105 firms.

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[2]See Liu and Yermack (2007) for an exploration into home purchases by CEOs and option exercise. Their evidence leads one to infer that a home purchase could be used to conceal an option exercise based on private information.

[3]Form 3 is called "Initial Statement of Beneficial Ownership of Securities." Form 4 is called "Statement of Changes in Beneficial Ownership," which covers purchases, sales, option grants, option exercises, gifts, and any other transaction that changes an insider's ownership position. Form 5 is called "Annual Statement of Changes in Beneficial Ownership of Securities" and contains information regarding activity for exempt transactions, which includes small transactions and small transfers within the company that are not required in Form 4.

3.2. Hypotheses

The general approach of the tests is to examine the behavior of long-term abnormal returns around the exercise date. If the abnormal returns are significantly negative following exercise, there is support, though not confirmation, for the use of private information. Tests comparing the differences in abnormal returns between two groups are then used to examine the case for whether the negative abnormal returns reflect the use of private information. In Section 3.3 we describe our methodology for measuring abnormal returns. At this juncture, let us assume that abnormal returns can be measured.

A straightforward test of whether executives effectively time option exercises can be conducted by measuring abnormal returns following exercise. To conduct a test on the entire sample, however, reveals only whether the sample is dominated by information-motivated exercises or by non-information motivated exercises. We will examine the overall characteristics of the sample with respect to abnormal returns, but the formal hypotheses will be developed by stratifying the sample into groups that should be motivated by private information, or by different degrees of private information, and those that should not.

There is no reason to believe that private information is associated with exercises at expiration. Thus, we should expect exercises that occur at expiration are conducted merely to capture the value of expiring in-the-money options, while exercises that occur prior to expiration are motivated by private information. Hypothesis 1 addresses this point as follows:

H1: Options exercised early are based on private information and therefore exhibit significant negative abnormal returns while options exercised at expiration are not based on private information and therefore exhibit no significant abnormal returns.

To test Hypothesis 1 we first define an exercise at expiration as any exercise that occurs within 30 days of the expiration date. We then partition our sample according to whether the transaction date reported by the insider occurred prior to the expiration of the option. H1 is supported if early exercises are followed by abnormal returns that are negative and significantly lower than the abnormal returns that follow exercises at expiration.

Executives typically hold investment portfolios that are sub-optimally diversified, with the company's stock constituting an abnormal proportion of the executive's overall wealth. Risk-averse executives could rationally choose to exercise ESOs to rebalance their portfolios. Since ESOs cannot be exercised prior to vesting, one would expect a large amount of rebalancing activity to occur on the vest date. Insiders that hold private negative information would still choose to exercise at this time and therefore some negative abnormal returns should be present; however, the private information effect should be dominated by portfolio-rebalancing transactions that contain no private information. Thus, our hypothesis is stated as follows:

H2: Early exercises on the vest date contain less private information and therefore exhibit smaller negative abnormal returns than those exercised after the vest date.

To test this hypothesis we define an exercise on the vest date as one occurring within 30 days after the vest date and partition our sample accordingly. H2 is supported if abnormal returns following exercises not on the vest date are negative and significantly lower than abnormal returns following exercises on the vest date.

The standard (and only) justification for exercise of a traded call option is to capture the underlying stock's dividend payment. ESOs could also be exercised early to capture a dividend, but these exercises should not contain private information.[4] This hypothesis is therefore:

H3: Early exercises occurring prior to but close to the ex-dividend date contain less private information and therefore exhibit smaller negative abnormal returns than those exercised just after the ex-dividend date.

To test this hypothesis we examine the pattern of exercises in relation to the ex-dividend date. Based on this information, we define a dividend-motivated exercise as one occurring within 15 business days prior to the ex-dividend date reported in CRSP. We define exercises not motivated by dividends to be those that occur in weeks -7, -8, -9, and -10 and all exercises of non-dividend paying firms. We then test for the presence of negative abnormal returns around the exercise dates.

The first three hypotheses use the full data set. The remaining hypotheses require additional information about the exercises and executives and are tested using the merged data set. For example, some early exercises are motivated by the fact that the executive leaves the firm. We hypothesize that these exercises are less informative than early exercises in which the executive remains with the firm. This hypothesis is therefore:

H4: Early exercises motivated by departure of the executive are based on less private information than are early exercises that are not motivated by departure.

The departure date variable in ExecuComp enables us to identify options that are exercised early because the executive left the company and would otherwise have had to forfeit the options.

Some exercises could be undertaken because the executive needs cash. These liquidity-motivated exercises are likely to be non-informative. While it is not possible to perfectly identify these exercises, it seems likely that information-motivated exercises would involve exercise of a greater percentage of vested options. If an insider exercises 100% of vested options, one would expect this trade to likely contain more information than a trade from an insider exercising say only 10% of vested options. This

[4]It is possible that the dividends themselves contain information. A decrease (increase) in the dividend could, for example, signal the expectation of poor (good) firm-specific performance. Exercises that appear to be motivated by dividend capture could contain private information, but consistent with our hypothesis, dividend-motivated exercises should contain less private information than exercises not motivated by dividends.

stronger private information should be revealed in higher negative abnormal post-exercise returns, leading to the following hypothesis:

H5: Early exercises in which the number of options exercised relative to the number of vested options not exercised is large contain more private information than exercises in which the number of options exercised relative to the number of vested options not exercised is small.

The ExecuComp data set enables us to obtain a proxy for liquidity using the proportion of options exercised to those vested but not exercised.[5]

We also consider that when options are exercised and the stock is not sold, the executive is unlikely to possess negative information. Therefore, we propose this hypothesis:

H6: Early exercises in which the executive retains a large proportion of the stock acquired upon exercise contain less private information and therefore exhibit smaller negative abnormal returns than those in which the executive sells a large proportion of stock acquired.

Following the methodology of Ofek and Yermack (2000), we use the ExecuComp database to approximate the amount of stock acquired upon option exercise that is sold. As noted previously, the majority of shares acquired upon exercise are sold, but we shall divide our sample into two groups based on percentage of stock sold and determine if this measure has discriminatory power.

An important cost in exercising early is the loss of time value of the option. Of course, only in-the-money options are exercised, and options that are barely in-the-money have the most time value to lose. Deep in-the-money options have the least time value to lose. Therefore, options only slightly in-the-money are the most costly and those deep in-the-money are the least costly. By considering this cost, we can make a prediction about which options should have the most private information.

H7: Early exercises of deep in-the-money options are the least costly to exercise and should be associated with the least private information. Early exercises of slightly in-the-money options are the most costly to exercise and should be associated with the most private information.

Each hypothesis is tested by examining abnormal performance following exercise with one-tailed t-tests. A one-tailed test is appropriate because our priors are that any private information that leads to exercise is likely to be only negative in nature. Positive information should not trigger exercise because exercise would result in loss of time value and the benefits of the positive information would be captured

[5]Interestingly, *The Wall Street Journal* (Tam, 2006) stated almost precisely the point of this hypothesis in an article on the large increase in recent option exercises in the technology industry, noting that "Tech executives are also cashing in a bigger proportion of their vested options, suggesting many want to take profits while they can." This statement suggests that exercises are often motivated by a view that recent increases in the stock price are unlikely to continue.

by the option as well as the stock. As noted above, managers are far more inclined to sell stock acquired upon exercise, which is inconsistent with the expectation of positive abnormal performance. We also conduct one-tailed tests comparing groups of exercises, such as exercises at expiration and exercises prior to expiration. One-tailed tests are appropriate for these tests as well, because we expect the effect to be to one-directional.

3.3. Methodology

Most studies of abnormal returns employ one of several commonly used techniques for identifying expected returns. They would then subtract the expected returns from the actual returns to obtain the abnormal returns and apply appropriate statistical tests to determine if the abnormal returns and cumulative abnormal returns are significant in the expected direction. Exercises of stock options, however, pose a special difficulty that can induce a subtle bias. The parameters required for estimating expected returns are typically estimated over a period prior to the event. This pre-event period is assumed to be a term of normal (vis-a-vis "abnormal") stock price behavior. But stock option exercises usually occur following a potentially long period of strong positive performance of the stock. Thus, the alphas would be estimated over a period of primarily rising stock prices. These alphas would then be biased upward, which would bias expected returns upward and would increase the likelihood of finding negative abnormal returns after exercise. Thus, even if there are truly negative abnormal returns afterwards, we could overstate their magnitude. Alternatively, there could be no true abnormal performance that is turned into apparent negative abnormal performance. Thus, estimation period bias is particularly acute in studies of executive stock option exercises. In addition, this pattern of an event occurring after a period of rising prices can potentially induce a form of pseudo-timing bias, which we discuss later.

As an alternative, we follow Barber and Lyon (1997) in adopting an event-time matching-firm portfolio as a benchmark for calculating buy-and-hold abnormal returns for our sample firms. Because there is no parameter estimation, this method eliminates the bias discussed above. Our sample firm is, therefore, benchmarked against comparable firms over the same time period that did not experience exercises.[6]

The specific procedure is as follows. For each event date, we identify five firms matched according to industry, size, and book-to-market.[7] Consider a single exercise event that is a component of

[6]We also conducted most of our tests using market-adjusted and raw returns. Our results were only slightly different and our conclusions are still supported.

[7]The choice of number of firms is arbitrary. Barber and Lyon (1977) make no recommendation on the number of firms. Jegadeesh (2000) uses ten firms. We attempted to use 10 firms but were unable to obtain a sufficiently high quality match on size and book-to-market for firms without the corresponding type of exercise, probably due to the fact that executive stock option exercises are such a common event. Choosing a small number of firms makes the benchmark relatively undiversified, which will make it more difficult to find consistent results. To this extent, our results are biased against finding abnormal returns.

a sub-sample. All exercises in that sub-sample have a common characteristic. Let us assume they are all vest date exercises and the firm is called XYZ. We identify the industry of the firm and select all firms in that industry as potential benchmark firms. We first eliminate XYZ from the benchmark set and then eliminate all other firms from the benchmark set that also have a vest date exercise within one year of the event date. We then eliminate all firms with a market capitalization at the end of the previous year that differs by more than 30% from that of XYZ. We then select the five firms in the benchmark set that are closest to XYZ with respect to the book-to-market value ratio at the end of the previous year. We now have a benchmark portfolio for each unique exercise and can compare the returns following exercise of the options to those of a comparable group.

The tests are conducted using daily returns. We observe performance over three post-event periods: 365 days, 182 days, and 90 calendar days. For a given day, the arithmetic mean daily return of these five matching firms is calculated to obtain the matching portfolio return. Performance is then measured by the difference between the buy-and-hold returns of firms that had options exercised and the corresponding buy-and-hold matching portfolio returns in the following manner:

$$BHR_{EX}(T) = \prod_{t=1}^{T}(1+R_t) - 1$$

$$BHM_{MP}(T) = \prod_{t=1}^{T}[1+(r_{1t}+r_{2t}+r_{3t}+r_{4t}+r_{5t})/5] - 1$$

$$BHAR(T) = BHR_{EX}(T) - BHM_{MP}(T)$$

where the subscript *EX* refers to the firm with the option exercise and *MP* refers to the matching portfolio, and

t = 1 is the first day following exercise

T is the selected day (365, 182, or 90) after exercise or the delisting day, whichever comes first

R_t = return on day t of the firm with the exercised option

r_{it} = return of matching firm i on day t

Barber and Lyon (1997) provide strong evidence that long-run abnormal performance is not well-captured by standard market models that benchmark off of a market index. They advocate the buy-and-hold abnormal return methodology with firm selected on the basis of size and book-to-market for dealing with problems related to new listings, rebalancing, and skewness. We believe it is highly appropriate for the case at hand, which would be otherwise biased by the fact that the event occurs over a period following strong positive performance.

3.4. How Much Private Information is Required

An executive with negative private information would not automatically exercise an option. Exercise involves loss of time value and interest on the exercise price. The information must be of sufficient quality to justify the cost. The tests based on moneyness (H7) somewhat capture this element, but we conduct one additional measure.

One indication of the required information quality is the stock price change that would justify exercise. For example, consider a five-year option struck at $50 with volatility of 30%, discrete risk-free rate of 5%, and no dividends. Suppose the stock is at $140, which is approximately the median moneyness of our sample of exercised options. The Black-Scholes-Merton value of the option is $101.35 and the exercise value is $90. Suppose the executive has private information that indicates the stock is likely to fall over the next year. If the option is exercised now and the proceeds invested in risk-free bonds, the executive would have $90(1.05) = $94.50 in one year. A stock price forecast of $135.25, a decline of 3.39%, would bring the option value down to $94.50 in one year. Thus, if the executive exercises we might say that the information predicts a decline of at least 3.39%.

This analysis provides a measure of the information required to justify exercise but is only an approximation. In spite of its widespread use in executive option valuation, the Black-Scholes-Merton model does not provide precise values of the option to the executive because it ignores the illiquidity of these options. Unfortunately, models that capture executive option valuation typically require knowledge of personal information about the executive, such as the degree of risk aversion, the amount of the executive's non-option wealth, the executive's life expectancy, and how that wealth is invested. The number of possible permutations that would have to be tested with a sample as large as ours is astronomical. In addition, when there are dividends on the stock, the option value under any pricing regime can lie below the exercise value.[8] In that case, the required stock price to justify exercise could be above the current stock price. Thus, this approach will not provide an exact estimate of the required stock price change to justify exercise based on private information, but it could be useful in identifying patterns across groups that we would expect to see when the exercises are motivated by private information.

To measure the quality of the required information, we estimate the percentage of times that the ex post stock price decline was greater than the required stock price decline to justify exercise ex ante. We call this figure the "hit ratio." Of course, an executive could be in possession of high quality private information about the company, but market or industry factors exert effects that could offset the value of any firm-specific private information. Moreover, even private information does not provide a perfect

[8]This result is unrelated to the Black-Scholes-Merton model and applies to all options whether they are traded or executive stock options. It is simply a boundary condition based on the payoff and requires only basic arbitrage arguments.

forecast. Thus, we should not expect a 100% hit ratio. To determine if the hit ratios have any economic content, it will be helpful to have a benchmark for comparison.

Consider a required stock price decline of x% to justify exercise. Now suppose an executive has no private information. A reasonable benchmark for the quality of the private information is the probability that the stock would decline at least x% in the absence of private information. Under lognormality, the $N(d_2)$ parameter of the Black-Scholes-Merton model obtained using an estimate of the expected return and volatility will provide an estimate of the probability that the stock would decline by a sufficient amount to justify exercise in the absence of private information. Because the return on the matched portfolio is otherwise a benchmark for measuring the abnormal return, we take its expected return as an estimate of the expected return of the stock in the absence of private information.

Consider the above example in which the Black-Scholes-Merton model indicates that the stock must fall 3.39% in one year such that the value of the option in one year equals the future value of the exercise proceeds. If the stock has an expected return of 10% and volatility of 30%, in the absence of private information the probability of a decrease of at least 3.39% is about 38%. Thus, in a large sample of identical options, we would expect that if the executive is in possession of private information and exercises, the stock would fall by the required amount more than 38% of the time.

We can test the significance of the hit ratio for each group relative to its benchmark with a binomial test, which is equivalent to a z-test in our large samples. We can also test the difference in the hit ratios of two groups with a two-sample binomial z-test. We should note, however, that being based on the Black-Scholes-Merton model, these hit ratio tests are not completely indicative of how the options would be valued. Therefore, we expect them to be somewhat weaker than the abnormal return tests.

4. Results

This section is divided into seven sub-sections, according to the hypotheses presented above. Table 1 reports summary statistics for the full and merged samples and the various stratifications described above. These statistics are frequently referenced throughout this section.

We impose one other constraint on the sample. In many cases, there are multiple exercises of the same or different executives of the same firm in a short period of time. Carpenter and Remmers (2001) recognize this problem and its potential for overstating the significance of the results. They constrain their sample to the first exercise of an executive of a firm in a month. We also impose a similar constraint. Our returns are measured on a daily basis, so we eliminate multiple exercises on the same day by an executive of the same firm. Because each exercise event does not necessarily have the same relationship to the exercise or vest date, however, we make these eliminations separately on each sub-sample. For example, assume there are five exercises for various executives for a firm in a month. Suppose in constructing our overall sample, we select the first and delete the other four. It is possible that

the deleted exercises could be liquidity-motivated or departure-motivated. If we deleted them, we would lose these observations from subsequent tests in which they would be most needed. Hence, we construct each sub-sample separately and then apply the rule of choosing only the first exercise per company per day.

As noted previously, we do not formally develop any hypotheses for the full or merged samples. These samples are not stratified, and therefore do not tell us whether abnormal returns following exercises that should be motivated by private information are different from those following exercises that should not be motivated by private information. We do, however, examine the overall and merged samples. Figs. 1 and 2 illustrate the mean buy-and-hold abnormal returns (BHARs) from day -365 to day +365 and Table 2 shows the statistical results, including calendar time t-tests. As expected, the stock exhibits strong firm-specific performance prior to exercise. For the full sample the results are significantly negative for 182 and 365 days following exercise, suggesting that private information could be a dominating factor. For the merged sample, however, BHARs are positive and significant for 365 and 182 days after exercise so the results do not appear to be dominated by users of private information. One reason for this finding could be that the merged sample, which requires ExecuComp data, will tend to consist of larger firms. Consistent with Carpenter and Remmers, the use of private information could be more prevalent in smaller firms.

The benchmark hit ratios vary directly with the holding period and range from 34 to 45%, and the actual hit ratios are much higher at more than 47% in all cases. In fact, for all groups and sub-groups in this study, the hit ratios are significantly higher than the benchmark hit ratios. To save space we do not report these significance tests. We will, however, report the group comparison tests of the hit ratios.

Of course, these full and merged sample results are not stratified and merely indicate that exercises motivated by private information could dominate those not motivated by private information for the full sample, and exercises not motivated by private information could dominate those motivated by private information for the merged sample. The more critical tests are those that examine whether exercises that are hypothesized to be motivated by private information are followed by significantly lower abnormal performance than those that are not.

Note in Figs. 1 and 2 that we do indeed see the pattern previously noted: prices rise prior to exercise. For the full sample, prices began falling thereafter. For the merged sample, the rate of increase drops off around the exercise date, but the BHAR series continues to increase. Both graphs, however, suggest a pattern of near-perfect timing. This result is likely to be nothing more than *pseudo timing* as discussed by Schultz (2003) in relation to the performance of IPOs. Pseudo timing arises when an event follows and is often triggered by a period of rising stock prices. Of course, IPOs and stock option exercises would have this characteristic. Pseudo timing can mean that abnormal returns will tend to be

negative following the event. Hence, the existence of negative abnormal returns is not by itself proof of the use of private information. Pseudo timing, however, is an absolute but not relative concept. That is, pseudo timing can appear to explain the near perfect timing of a group of common exercises, but it cannot explain the post-exercise differences across groups distinguished by a factor such as early versus maturity, vest date versus not vest date, and so forth. Thus, separation into groups is critical and is the principal basis for our conclusions.

4.1. Results According to Early Exercise versus Exercise at Expiration

In this sub-section we conduct tests to determine whether there is any difference in abnormal performance according to whether the options are exercised early or at expiration. Relevant summary statistics are presented in Panel A of Table 1. About 93% of usable exercises in the full sample occur prior to expiration, an average of 2.87 years after vesting and five years before expiration. Statistics for the merged sample are similar to those of the full sample, but the merged sample exercises occur slightly later.

Fig. 3 shows the BHARs from day -365 to day +365 for both the early and expiration exercises in the full sample and Panel A of Table 3 provides statistical details. As expected, the BHARs for maturity exercises do not show much of a pattern prior to exercise. These options would, of course, be in-the-money, but their exercise is principally motivated by the expiration itself. Following exercise, their BHARs rise slightly for a brief period but then fall slowly over a longer period of time. For 90 days, the BHAR is positive but not significant. For 182 and 365 days, the BHARs are negative and significant with t's of -2.95 and -1.92. Of course, we know that pseudo timing could explain this apparent use of private information when it is unlikely to exist. For options exercised prior to expiration, the BHARs are sharply lower following exercise with t's of -4.01, -2.70, and -1.49 for 365, 182, and 90 days respectively. The differences between the BHARs for all three horizons are significant in the expected direction. Thus, options exercised early have negative BHARs that are significantly lower than those of options exercised at expiration. The hit ratios are significantly higher for options exercised early in comparison to options exercised at expiration for the 365- and 182-day holding periods, but the difference is not significant for the 90-day holding period.

Thus, the evidence supports hypothesis H1, which state that options exercised early appear to be associated with the use of private information. Those exercised at expiration indicate some evidence of private information but are followed by significantly weaker performance than options exercised early.

4.2. Results According to Vest Date Exercise

We now partition all early exercises according to whether the exercise occurred on the vest date. As noted earlier, we define a vest date exercise as one in which exercise occurs within 30 days after the

vest date.[9] Of 350,922 early exercises, we find that almost 93% occur after the vest date. Summary statistics are presented in Panel A of Table 1. Fig. 4 shows the BHARs from day -365 to +365 for early exercises on the vest date and those after the vest date. As expected, both series rise sharply prior to expiration and appear to peak around the exercise date. Of course this result is likely to be a sampling phenomenon as previously discussed. But BHARs following vest date exercises are mostly flat, while BHARs follow exercises not on the vest date continue to fall for 365 days. Table 3, Panel B reports summary statistics. Exercises on the vest date have BHARs that are slightly negative for all three holding periods but not significantly different from zero for any of the three periods. Exercises after the vest date, however, have BHARs that are significantly negative for all three periods. A t-test for the differences between the BHARs for these groups is significant for 365 and 90 days though not for 182 days (t = -1.13). The hit ratios are not significantly different for the 365- and 182-day holding periods, but are significant in the expected direction for the 90-day holding period.

Thus, evidence from the analysis based on whether the options are exercised on the vest date is consistent with hypothesis H2. Vest date exercises appear to contain less private information than exercises that occur after the vest date but before expiration.

4.3. Results According to Dividend-Motivated Exercise

As noted previously, standard option theory demonstrates that one reason executives (or any call option holders) could choose to exercise early is to capture an upcoming dividend payment. Exercises that are motivated by the capture of dividends should not contain private information. To gauge the extent to which exercises could be motivated by dividends, we identify the exercises that occur close but prior to the ex-dividend date. We first capture the ex-dividend dates from CRSP and then merge them with our full sample of exercises. Using only early exercises, each exercise event is assigned a date in weeks relative to the upcoming dividend, in which a week is defined as five business days. We then examined the number of exercises per week. We observe a distinct increase in the number of exercises as the ex-dividend date approaches. The large number of exercises that occur close to the ex-dividend date, in comparison to those that occur much earlier (and after the previous ex-dividend date) suggests that some exercises are likely to be motivated by the capture of the dividend.[10]

Hypothesis H3 states that exercises motivated by the capture of dividends should be less informative than those that are not. Standard option theory suggests that the capture of dividends supports rational exercise of options only an instant before ex-dividend. The pattern of exercises prior to

[9]Although these exercises occur after the vest date (no more than 30 days), we refer to them as occurring on the vest date. This terminology is used only for expositional ease.

[10]This is an interesting finding in itself. Even though it is well known that dividends motivate early exercise of tradeable stock options, the literature on pricing executive stock options gives little attention to dividends as a factor that can motivate early exercise. Although a more formal and supportable conclusion would require further study, we believe these results suggest that many executives do exercise early to capture dividends.

an ex-dividend date, however, suggests that dividend-motivated early exercise could start occurring much earlier than the day before the ex-dividend date. We define a dividend-motivated exercise as one occurring within 15 business days before the ex-dividend date, which we refer to as weeks -1, -2, and -3. Exercises not motivated by dividends are defined as those occurring in weeks -7, -8, -9, and -10 as well as exercises of options on stocks that do not pay dividends. Exercises occurring -4, -5, and -6 weeks relative to the ex-dividend date could contain both dividend-motivated and non-dividend-motivated exercises. Because these exercises cannot be clearly classified either way, we drop this group from consideration in this test. After removing observations with insufficient data, there are 44,951 dividend-motivated exercises and 263,005 not-dividend motivated exercises. Summary statistics are presented in Table 1.

Fig. 5 shows the BHARs from day -365 to +365 for dividend-motivated and non-dividend-motivated early exercises. As expected, both sets of BHARs rise prior to exercise and peak at the exercise date, but there are clear distinctions between the two groups following exercise. Table 4 reports the statistics. BHARs for exercises not motivated by dividends are negative and significant with t's of -4.68, -3.37, and -2.24 for 365, 182, and 90 days. BHARs for exercises motivated by dividends, however, are positive and significant for 365 days at t's of 1.65, and 2.18, and negative and not significant for 90 days. Tests for the differences are highly significant in the expected direction with t's larger than -6.5 for each period. The differences in the hit ratios are in the expected direction and are significant for all three holding periods.

Dividend announcements are often linked to earnings announcements, and the latter are often associated with blackout periods, which limit the ability to exercise options and sell shares. Bettis, Coles, and Lemmon (2000) find that blackout periods are used by about 92% of companies though 78% permit exceptions that allow trading during the blackout period. Since dividend announcements often occur with earnings announcements and a few weeks before ex-dividend dates, blackout periods could mean that some apparently dividend-motivated exercises occur as option holders come out of blackout periods. Hence, the timing could be suboptimal for some dividend-motivated exercises, imposing a conservative bias. In addition, we noted earlier that some apparently dividend-motivated exercises could occur prior to periods of poor abnormal performance because the dividend was decreased and provided a negative signal. Because we find no negative abnormal performance in the period following exercises classified as dividend-motivated, it seems likely that any such possibilities are relatively minor and dominated by pure dividend-motivated exercises. Hypothesis H3 seems strongly supported.

4.4. Results According to Executive Departure

In this sub-section we conduct tests to determine whether options exercised when an executive leaves the firm are based on private information. We define a departure exercise as one that occurs within plus or minus 270 days of the executive departure date. For this test, we require the departure date, so we

must use the merged sample. This data set contains 82,146 useable early exercises. We find that 5,364 were induced by executive departure.[11] Summary statistics are presented in Panel B of Table 1.

Fig. 6 shows the BHARs from day -365 to +365 for exercises that are induced by departure and those that are not. It seems intuitive that an executive would consider the decision to leave the company to be independent of the existence of vested in-the-money options. If the decision to depart were made, the executive would then exercise all in-the-money options. Such exercises would not likely be motivated by private information. But the pattern in Fig. 6 suggests that executives might well be motivated to leave the firm and exercise their options based on private information. The differences are striking. As expected, BHARs for both groups rise sharply until exercise. Following exercise, BHARs for exercises not motivated by departure continue to rise while those motivated by departure fall sharply. Table 5, Panel A reports the statistical details. Exercises not motivated by departure are followed by significant positive BHARs for all three holding periods with t's of 1.98, 3.36, and 2.38, while those not motivated by departure are followed by large and significant negative BHARs for all three holding periods with t's of -3.76, -3.29, and -3.22. The differences between the BHARs for these two groups are highly significant for all three holding periods. The difference in the hit ratio for the two groups is not significant for the 365-day period but is significant for the 182- and 90-day periods, with the hit ratio for the departure group being the larger.

Thus, our results are not consistent with H4. Exercises motivated by departure appear to be associated with the use of private information, indeed more so than exercises not motivated by departure. Given this finding, it is worthwhile to investigate further by identifying the reasons for departure. The two reasons identified on ExecuComp for departure are resignation and retirement. Of course, we do not know whether a resignation is a forced resignation, a voluntary resignation, or a voluntary resignation that is de facto forced. Of the 5,364 exercises associated with departure, 824 do not contain a reason on ExecuComp. Of the remaining 4,540 transactions, 2,018 report the reason for departure as resignation, and 2,522 report the reason as retirement. After using the Carpenter-Remmers criterion, these samples are reduced to 950 and 977 exercises associated with resignations and retirements, respectively.

Fig. 7 plots the BHARs for these two groups from day -365 to +365, and Table 5, Panel B provides the statistics. While resignations follow a period of stronger positive stock price performance, BHARs for both groups after exercise behave similarly. Consistent with the results for the departure group as a whole, both of these groups show mostly significant negative performance following exercise.

[11]Executives are likely to begin liquidating their option portfolios well in advance of their actual departure. They also typically have 90 days after departure to exercise before they must forfeit the options. For these reasons we separate exercises within plus or minus 270 days of the reported departure date. For robustness we also separated exercises within plus or minus 90, 180, 300, 330, and 365 days of departure. Results are consistent with those reported.

The differences are not significant for the 365- and 182-day horizons. For the 90-day horizon, however, BHARs for the resignation group are significantly lower than for the retirement group. The hit ratios are higher for the resignation group for the 365- and 182-day holding periods, and the differences are significant. The difference is not significant for the 90-day holding period.

Thus, overall we find that H4 is not supported. Departing executives exercising options do appear to be motivated by private information, with a very slight edge to departures motivated by resignation. Several possible explanations exist. The executive could have foreseen poor firm-specific performance and chose to "cash out" and leave. Alternatively, the board could have anticipated difficult times ahead and felt no confidence in the executive's ability to lead the firm through this period. If that is the case, then the executive's replacement did no better. A third possible explanation is that the firm performed poorly *because* the executive left. We are unable to distinguish whether there are any differences in the stock's performance according to whether the exercise follows a retirement or a resignation, as neither group can be clearly distinguished from the other after exercise. These findings suggest a need for further research on why firms appear to perform poorly following the departure of an executive who also exercises options.

We should add that it is common for departing executives to receive large severance packages. Yermack (2006b) estimates that, for CEO's of Fortune 500 companies in virtually the same period studied here, the average package amounts to $5.4 million. The avoidance of future losses by exercising options on private information could be viewed as another element of these "golden handshakes."

4.5. Results According to Proportion of Vested Stock Exercised

As noted earlier, we are interested in separating exercises that are motivated by private information from those that are motivated by the executive's need for liquidity. If an executive is in possession of private information that suggests poor upcoming firm-specific performance, there is probably no reason to exercise only a small number of options. In fact, the executive would probably exercise a large proportion of exercisable options, if not all of them.

The ExecuComp database contains items that enable us to estimate the proportion of options exercised to those vested that remained unexercised. ExecuComp provides the number of unexercised exercisable options (UEO), which is the number of vested but unexercised options outstanding at fiscal year-end. This figure includes both in-and out-of-the-money options, however, so it overstates the number of options that could be exercised but are not. To address this problem, we estimate the proportion of exercised options to vested unexercised options using the *exercise value* of UEO reported by ExecuComp, which is the exercise value of in-the-money exercisable options. This figure represents

the realized value if the executive had exercised all vested options at year-end.[12] Since the exercise value of out-of-the-money options is zero, only the exercise value of in-the-money options is reported. Thus, our ratio is the value of options exercised to the exercise value of unexercised vested options at year-end and proxies for the number of options exercised relative to the number of vested options not exercised.[13]

The merged sample of 82,146 early exercises includes 1,472 that do not report UEO and therefore are eliminated. The remaining 80,674 transactions are ranked by the proportion of options exercised relative to those vested but unexercised and placed into two groups. One group contains exercises in which the value of options exercised exceeds the value of vested options not exercised. Thus, the ratio of these exercised to unexercised options is more than 100%. The other group contains the complement, in which the ratio is less than 100%. The groups are almost equally sized with 23,815 in the first group and 23,173 in the second, the small difference occurring because we divide the sample before applying the Carpenter-Remmers criterion and building the benchmark portfolio. Summary statistics for this sample partition are presented in Panel B of Table 1. For ease of discussion, we will refer to these two groups as "large exercises" and "small exercises."

Fig. 8 shows the BHARs from day -365 to + 365 for both groups, and Table 6, Panel A shows the statistics. As expected, both groups show sharply rising performance prior to expiration and peak at the exercise date. The large exercises group shows falling performance following exercise, while the small exercises group shows performance that continues to rise. For the large exercises group, BHARs are negative for all three periods, but only the 365-day BHAR is significant. For the small exercise group, BHARs are positive and highly significant for each time period. The differences between the groups, however, are highly significant for all periods. The hit ratios are significantly higher for the large exercises group for all three holding periods.

Thus, this evidence is consistent with Hypothesis H5 in that exercises in which the number of options exercised is large relative to those not exercised contain private information. While significant negative BHARs manifest for the large exercises group only over the longest holding period, the differences between the large exercises group and the small exercises group are highly significant in the expected direction for all three periods.

4.6. Results According to the Proportion of Stock Sold

[12]One potential problem is the fact that the options are exercised during the year and must be matched up with figures for holdings at fiscal year-end. Our concern, however, is with relative performance across groups. There does not appear to be any reason why this factor would make one group perform differently from another.

[13]One could make a compelling case that it is indeed the exercise value of the options, not the number of options, that is important. An executive in possession of private information who holds deep in-the-money options would be more inclined to exercise most of those options than if he holds an equivalent number of only slightly in-the-money options, the exercise of which would also discard more time value.

In this sub-section we conduct tests based on the proportion of stock sold that is acquired upon exercise. Due to data limitations, however, one cannot directly observe whether acquired stock is sold. We can, however, use a procedure similar to that of Ofek and Yermack (2000) to estimate this variable. They propose that if executives retain shares acquired from option exercise and restricted stock grants, then stock ownership should rise one-for-one during years in which executives receive restricted stock or exercise options. Thus, by comparing the change in ownership with the amount of options exercised and restricted stock granted, we obtain a proxy for the stock acquired that was sold.

As noted earlier, the merged sample has a median percentage of stock sold of about 98%, but the distribution is highly skewed with a mean of about 78%. We partition the sample of early exercises into two sub-samples: those that involve the sale of greater than 50% of the stock acquired and those that involve sale of less than 50% of the stock acquired. Summary statistics are presented in Panel B of Table 1. The group selling more than 50% consists of 64,608 exercises and has a mean percentage sold of 92.9% and a median of 99.9%. The group selling less than 50% consists of 13,071 exercises with a mean percentage sold of 13.1% and a median of 0.00%. For ease of exposition we will refer to these two groups as "large stock sales" and "small stock sales."

Fig. 9 shows the BHARs from day -365 to day +365 for the large stock sales and small stock sales groups. As expected, BHARs of both groups peak at the exercise day, but the small stock sales group continues to rise, while the large stock sales group is mostly flat thereafter. Table 6, Panel B reports the statistics. The large stock sales mean BHARs are positive for 365 and 182 days and marginally significant for 182 days but negative and not significant for 90 days. For the small stock sales group, BHARs are positive and highly significant for all three horizons. Because the small stock sales group does indeed hold on to more stock than it sells, it should not be surprising that we find better stock performance somewhat indicative of private information.[14] T-tests for differences between the three groups are highly significant in the expected direction. The hit ratios, however, are surprisingly higher for the small stock sales group for all three holding periods and the differences are significant.

These findings are somewhat but not completely supportive of Hypothesis H6. Exercises that involve the sale of a large percentage of acquired stock do not show negative performance after exercise but do appear to be followed by significantly weaker performance than exercises that involve the sale of a small percentage of acquired stock. Exercises that involve the sale of a small percentage of acquired

[14]Our results are also not surprising in light of the results of Cicero (2007). He finds that 29 (16) percent of executive stock option exercises are not associated with same day disposal of shares before (after) SOX. He interprets this result as evidence of executives exercising and holding acquired shares for more than one year to qualify for long-term capital gains tax treatment. He further shows that disposed exercises are associated with a short-run abnormal return peak around option exercise. For the options that were exercised and held, he finds a trough in short-run returns around exercise, consistent with our large stock sales group. He argues that transactions in which the executive holds the shares are probably backdated.

stock are followed by strong positive performance, so they are probably for purposes other than private information.[15] Hit ratio tests are inconclusive. Overall, we find that percentage of stock sold is not a strong variable in discriminating exercises based on private information from those not based on private information. This result could be due to the use of the Ofek-Yermack estimator, which is only an approximation of a very difficult variable to measure.

4.7. Moneyness Tests

We now examine whether exercises of options contain more private information based on the option's moneyness. Recall that for in-the-money options, time value is inversely related to moneyness. Hence, options with low moneyness are more costly to exercise than options with high moneyness and would require more private information to justify exercise. We divide the sample of 145,252 early exercises into five moneyness quintiles. Q1 is the group closest to at-the-money, and Q5 is the group deepest in-the-money. Each group contains approximately 29,000 exercises. Mean and median moneyness (stock price to exercise price) figures are 1.41 and 1.42 for Q1, 1.75 and 2.15 for Q2, 2.61 and 3.31 for Q3, 5.83 and 5.64 for Q4, and 238.17 and 15.89 for Q5.

Other descriptive statistics for the moneyness quintiles are contained in Table 1. Fig. 10 shows the BHARs for the five moneyness quintiles. Note the consistency of the results, as no lines intersect. Options that are deepest in-the-money (Q5) naturally exhibit the strongest pre-exercise performance, and pre-exercise performance is monotonically lower with each group that is less in-the-money. The closest to at-the-money group (Q1) shows the poorest performance after exercise and each group with more moneyness shows successively better performance. Q5, the deepest in-the-money, shows strong positive performance after exercise. Table 7 provides the statistics. We see that Q1-Q3 show significant negative performance following exercise for all holding periods. Q4 shows significant negative performance for the 365-day holding period and negative but insignificant performance for the 182-and 90-day holding periods. Q5, the deepest in-the-money, shows positive and significant performance for all holding periods. A t-test for the difference between BHARs for Q1 and Q5 is highly significant for all three holding periods.

A comparison of Q1 to Q5 reveals that their hit ratios are significantly different. Ignoring abnormal returns and focusing only on the hit ratios, one would arrive at a different conclusion when comparing sub-samples. For example, we hypothesize and confirm in the abnormal returns that Q1 exercises would likely have the most private information and Q5 the least. But the hit ratios show that Q5

[15]These results are quite comparable to the literature on insider stock purchases and sales in which purchases appear to be informative and sales are not. Sales are probably a mixture of transactions based on private information and other reasons. Purchases are likely to be motivated only by private information. Comparably, our results also show that exercises in which a small percentage of stock is sold are followed by strong positive performance, while exercises in which a large percentage of stock is sold are followed by mostly normal performance.

exercises were followed by price decreases that exceeded the minimum more than 65% of the time over 365 days while Q1 exercises were followed by price decreases that exceeded the minimum only about 36% of the time. The explanation for this result lies in the fact that moneyness and time value are inversely related. The Q1 group has the most time value, and the Q5 group has the least. So, ranking by moneyness results in an inverse ranking by time value. Thus, both a moneyness sub-grouping and the hit ratio tests are attempting to capture the same effect and doing it in a somewhat opposite manner. The deepest in-the-money group has the least time value to overcome and, therefore, is far more successful in overcoming its time value lost. The least in-the-money group has the most time value to overcome and, therefore, is far less successful in overcoming its time value lost.

In conclusion, the moneyness tests support H7 and provide a perspective on the amount of private information used when exercising early. Options only slightly in-the-money are the most costly to exercise, while options deep in-the-money are the least costly. Hence, we should observe considerably poorer firm-specific performance following exercise when the cost of exercising in terms of time value lost is higher. That is indeed what occurs. Moreover, the results seem to clearly and consistently discriminate across moneyness classes.

5. Further Tests

In this section we report the results of some additional tests. Although we did not formally present hypotheses for these tests earlier in the paper, they are suggested by some of the results reported in the previous section and provide diagnostic checks, further scrutiny, and possible explanations for some of the results. These tests are conducted for the 365-day periods.

5.1. The Impact of SOX

The Sarbanes-Oxley Act went into effect in August 2002. To determine if the act had any effect on the patterns of early exercise based on private information, we repeat the tests for the period prior to August 2002 and the period after August 2002. We examine the sample of 73,645 early exercises prior to SOX and 75,682 after SOX. The results are largely the same. Significant negative post-exercise performance is observed for both time periods. The 365-day BHAR is -2.44% (t = -1.02) before SOX and -2.92% (t = -6.87) after SOX. The differences between the BHARs are not significant. Thus, SOX apparently had no effect on exercise based on private information.

As noted earlier, SOX also accelerated the filing deadline. This rule, however, permits a number of exceptions such that late filings are quite possible. We examined late filings in the post-SOX period to determine if executives achieved even greater gains when filing late. In the post-SOX period, we obtain a sample of 6,105 late filings and 70,220 filed on time. The twelve-month BHAR for late filings is -2.99 (t = -2.61) and for on-time filings is -2.97 (t = -6.98), both of which are significant. The differences, however, are not significant. Thus, late filings do not appear to be more informative.

5.2. Trends Across Time

To determine the consistency of these results across time, we repeat our full sample tests for each year over the 1996-2005 period. Naturally the results vary somewhat from year to year. The 365-day BHAR is negative in eight of 10 years and significant in five of those eight years. The 365-day BHAR is positive in two years and significant in one year. The patterns, however, suggest no trend over time.

5.3. Reloads

Reload options are those in which the employee exercises the option by tendering stock and upon exercise receives options to replace shares tendered. Because exercise of reload options still leaves the employee holding options, there is the possibility that reload options could be primarily exercised without any private information. Indeed Dybvig and Loewenstein (2003) show that an optimal strategy is to exercise a reload option any time it is in-the-money. We isolate the reload options in the merged sample and find only 448, or 1.2%, out the sample of 36,936 are reloads. Both groups show positive returns after exercise and the no-reload group is slightly significant, but the differences are not significant.

5.4. Executive Rank

An interesting question is whether the evidence of exploitation of private information is stronger the higher the executive rank. TFI provides four codes that identify the executive's rank.[16] We examine the full sample to determine if there are any differences in the use of private information across these ranks. The number of exercises in each group is 42,388 for Rank 1, 109,301 for Rank 2, 6,715 for Rank 3, and 2,821 for Rank 4. The BHARs are negative and significant for Ranks 1 and 2 with t's of -2.31 and -5.55. For Rank 3 the BHAR is positive but not significant, while for Rank 4 the BHAR is negative and not significant. The differences between Ranks 1 and 2 combined versus 3 and 4 combined is significant, confirming that the higher ranked executives do appear to make greater use of private information. Interestingly, however, the best performance is achieved by Rank 2 and not Rank 1, and the difference between Rank 2 and Rank 1 is significant. Thus, Rank 2 executives appear to make greater use of private information. This result could be due to the fact that top level executives are more scrutinized and might be more careful in using private information. In addition, we previously mentioned blackout periods that could prevent top level executives from taking full advantage of private information.

5.5 Most Informed and Least Informed

To now we have examined the data only by one dimension at a time, such as exercise date, vest date exercise, dividend motivated exercise, moneyness, etc. We now combine events that should represent the most informed exercises into a single group, leave all other exercises in a separate group,

[16]Thomson classifies the Chairman, CEO, COO, General Counsel, and President as Rank 1. Ranks 2 through 4 contain numerous classifications, such as CFO and Director. Rank 3 includes Vice President and Controller, and Rank 4 includes Beneficial Owner of more than 10% and Retired. More detailed rank descriptions are available from the authors or Thomson.

and compare the groups. The most informed group consists of 40,791 exercises not at expiration, not at the vest date, not motivated by dividends, and in moneyness quintiles 1 and 2. The complementary group has 147, 321 exercises. The BHAR is -7.78 for the most informed group and -1.66 for the least informed, both of which are significant. As expected, the difference is highly significant with a t-statistics of -17.32.

6. Conclusion

Our results show that significantly lower buy-and-hold abnormal returns are observed following exercise for options exercised early compared to options exercised at maturity, options exercised not on the vest date compared to those exercised on the vest date, options not exercised to capture a dividend compared to those exercised to capture a dividend, options the least in-the-money compared to those deepest in-the-money, exercises in which more options are exercised compared to those in which fewer options are exercised, and exercises in which more than half of the stock is sold in comparison to those in which less than half of the options are sold. Exercises in which the executive leaves the firm show greater use of private information in comparison to those in which the executive does not leave the firm. We find slightly better performance for exercises in which the executive resigns instead of retires. We also find that the highest ranked executives, Ranks 1 and 2, show greater use of private information compared to Ranks 3 and 4, though somewhat surprisingly, executives at the lower senior rank, Rank 2, show greater use of private information than do top level executives, Rank 1.

We also observe one more interesting result. For each group comparison that was not constructed by dividing the sample in half or into quintiles, we had notably different sample sizes for the two groups. For every expiration exercise, there are 13 early exercises. For every vest date exercise, there are about 13 exercises not on the vest date. For every dividend-motivated exercise, we have six non dividend-motivated exercises. For every exercise in which less than 50% of stock is sold, we have five exercises in which more than 50% of stock is sold. In each case, we find significantly lower abnormal returns for the larger sample. The only exception was the retired-resigned sample in which the differences were not significant. The combination of lower abnormal returns and considerably larger sample sizes in almost every case suggests that the use of private information may well be extremely common.

Of course, these findings do not prove that executives are engaged in behavior that would meet the legal definition of insider trading. All executives form opinions about the future performance of the stock and their ability to manage the firm successfully. Illegal inside information is but one of many forms of private and potentially quite accurate information about future company performance. These exercises and the subsequent stock sales are filed with the SEC, so executives and the SEC must generally believe the transactions pass the test of legality. But they raise questions about the link between pay and performance that options are intended to establish.

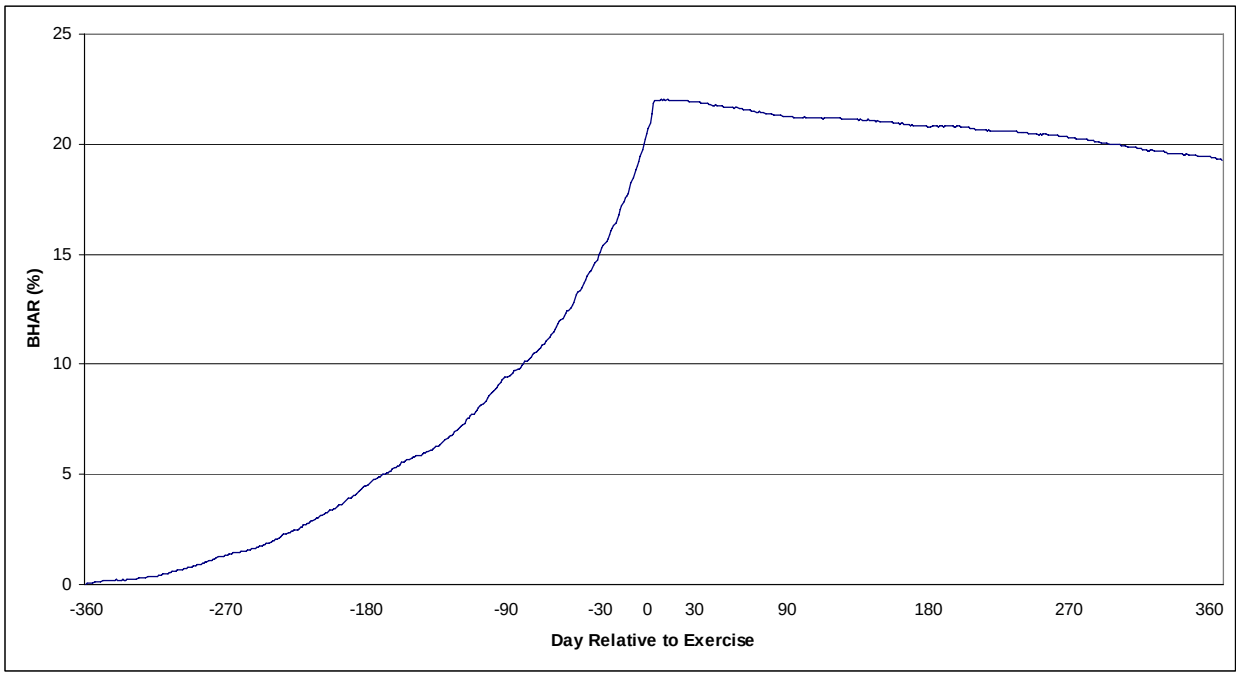

Fig. 1. Buy-and-hold abnormal returns for the full sample around option exercises. Buy-and-hold abnormal returns for each firm are estimated using a benchmark portfolio constructed by matching on industry, size, book-to-market and with no corresponding exercise event during the relevant time period. The sample of exercises is taken from those reported by corporate insiders to the SEC between 1996 and 2005 and compiled by Thomson Financial Insider filings.

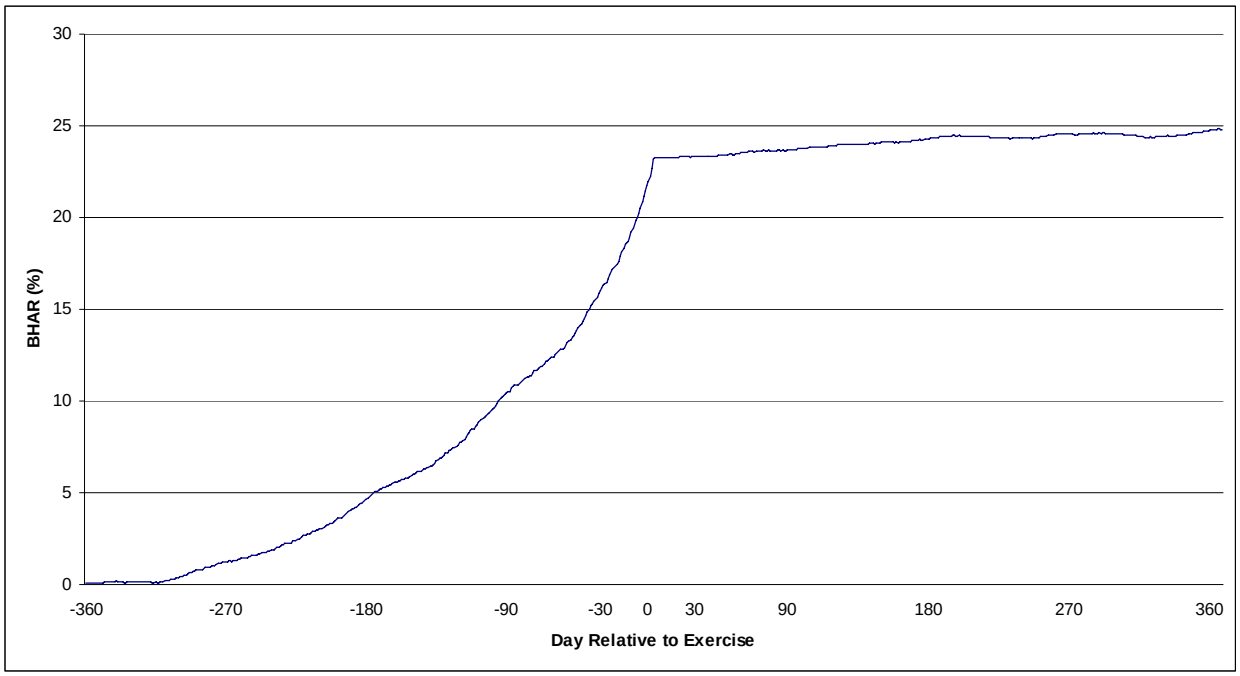

Fig. 2. Buy-and-hold abnormal returns for the merged sample around option exercises. Buy-and-hold abnormal returns for each firm are estimated using a benchmark portfolio constructed by matching on industry, size, book-to-market and with no corresponding exercise event during the relevant time period.The sample of exercises is taken from those reported by corporate insiders to the SEC between 1996 and 2005 and compiled by Thomson Financial Insider filings. The merged sample is a subset of the full sample in which insider data can be obtained from Standard and Poor's ExecuComp.

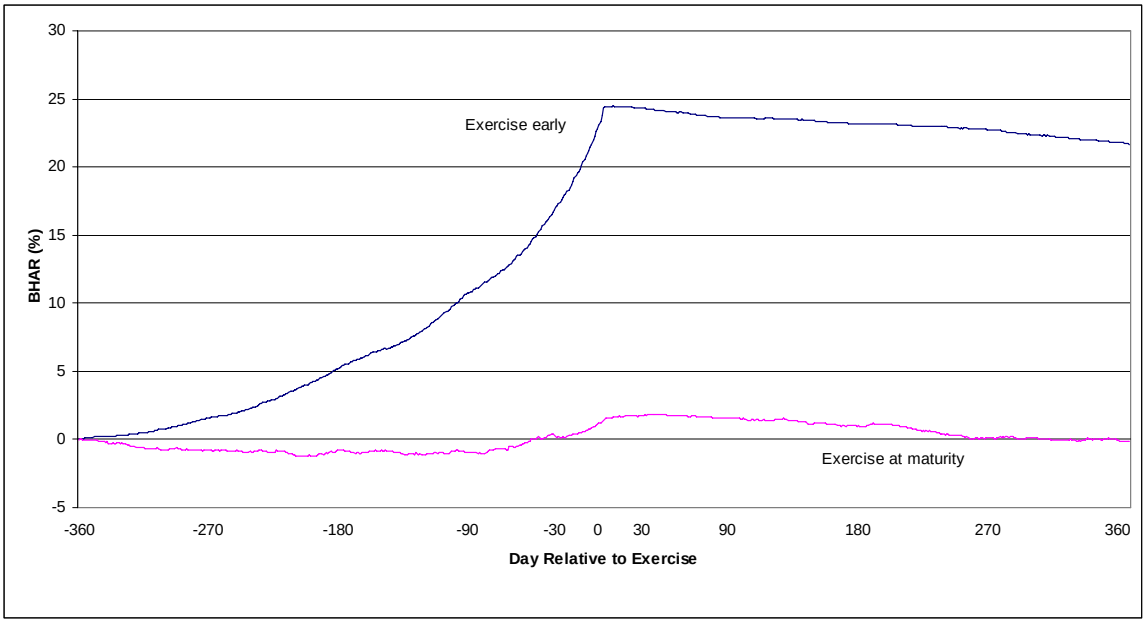

Fig. 3. Buy-and-hold abnormal returns for the full sample of options exercised early and options exercised at expiration. Buy-and-hold abnormal returns for each firm are estimated using a benchmark portfolio constructed by matching on industry, size, book-to-market and with no corresponding exercise event during the relevant time period. Early exercise is defined as options exercised with more than 30 days remaining to expiration. These results apply to the full sample, which is comprised of all option exercises reported by corporate insiders to the SEC between 1996 and 2005 and compiled by Thomson Financial Insider filings.

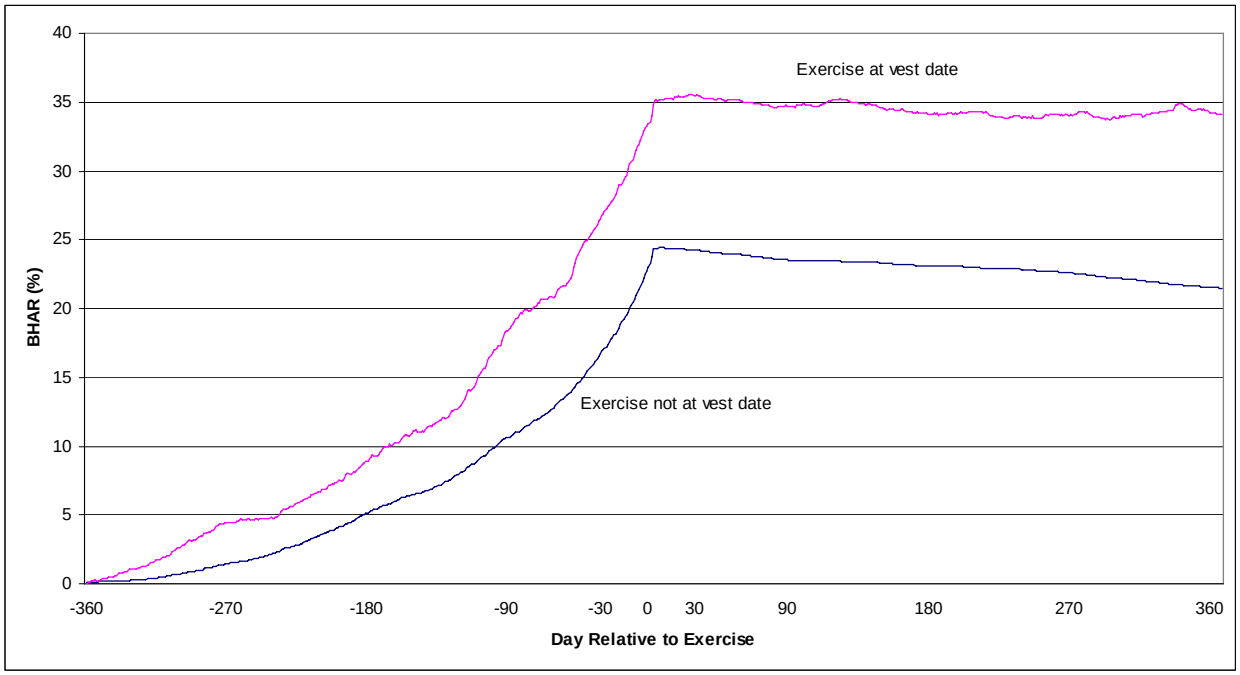

Fig. 4. Buy-and-hold abnormal returns for the full sample of options exercised on the vest date and options exercised after the vest date. Buy-and-hold abnormal returns for each firm are estimated using a benchmark portfolio constructed by matching on industry, size, book-to-market and with no corresponding exercise event during the relevant time period. Exercises on the vest date are defined as options exercised no more than 30 days after the vest date, with all other options exercised at least 30 days before expiration identified as not exercised on the vest date. These results apply to the full sample, which is comprised of option exercises reported by corporate insiders to the SEC between 1996 and 2005 and compiled by Thomson Financial Insider filings.

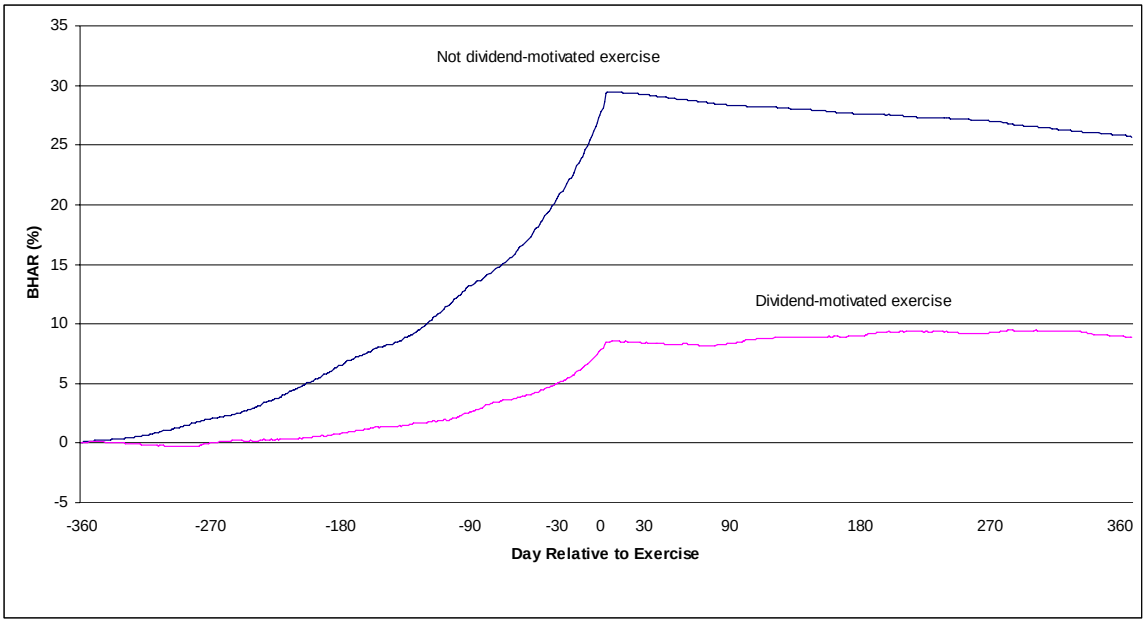

Fig. 5. Buy-and-hold abnormal returns for exercises motivated by dividends and exercises not motivated by dividends. Buy-and-hold abnormal returns for each firm are estimated using a benchmark portfolio constructed by matching on industry, size, book-to-market and with no corresponding exercise event during the relevant time period. This sample includes only options exercised more than 30 days before expiration. A dividend-motivated exercise is defined as an option exercised early in which the reported exercise date occurs within 15 trading days prior to the ex-dividend date reported in CRSP. Not-dividend-motivated exercises include exercises that occur from seven to ten weeks prior to an ex-dividend dates and exercises of non-dividend paying firms. These results apply to the full sample, which is comprised of option exercises reported by corporate insiders to the SEC between 1996 and 2005 and compiled by Thomson Financial Insider filings.

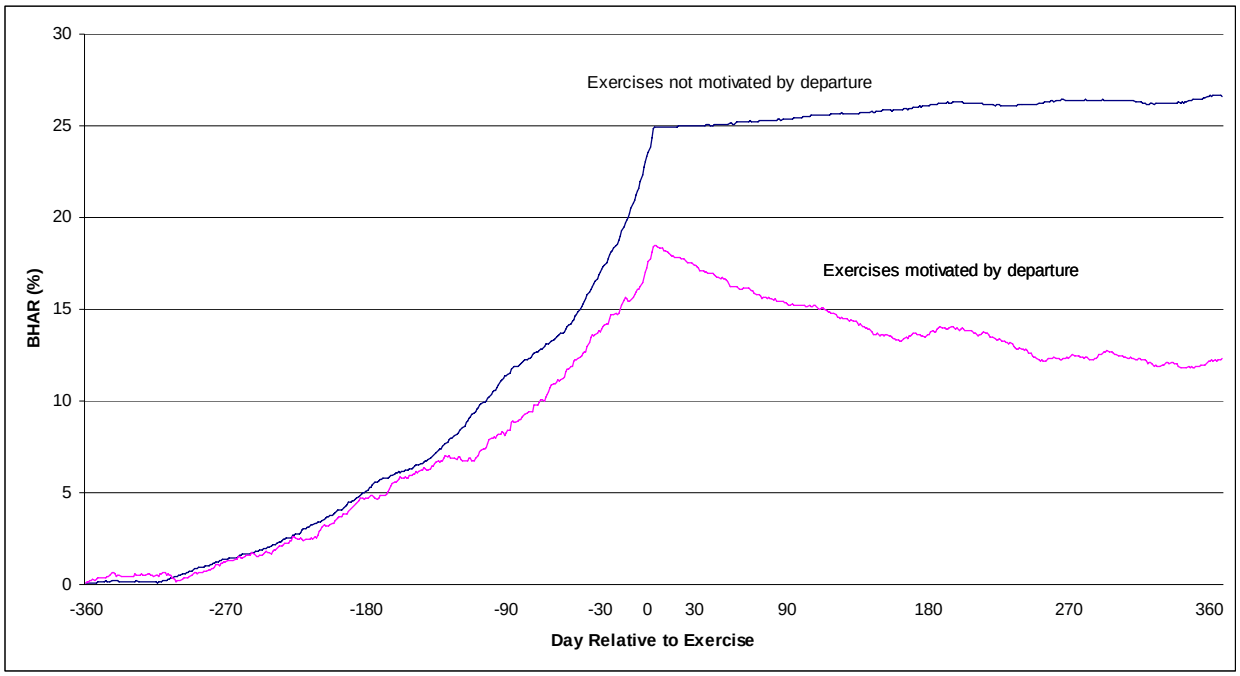

Fig. 6. Buy-and-hold abnormal returns for exercises motivated by executive departure and those not motivated by executive departure. Buy-and-hold abnormal returns for each firm are estimated using a benchmark portfolio constructed by matching on industry, size, book-to-market and with no corresponding exercise event during the relevant time period. This sample includes only options exercised more than 30 days before expiration. Exercises motivated by executive departure are defined as those that occurred within plus or minus 270 days of the executive leaving the company. Exercises not motivated by executive departure include all other exercises that occur at least 30 days before expiration. These results apply to the merged sample, which is comprised of insider trades reported in the Table II File of Thomson Financial Insider filings for the period 1996 through 2005 in which the transactions can be matched with the insider's data reported in Standard and Poor's ExecuComp.

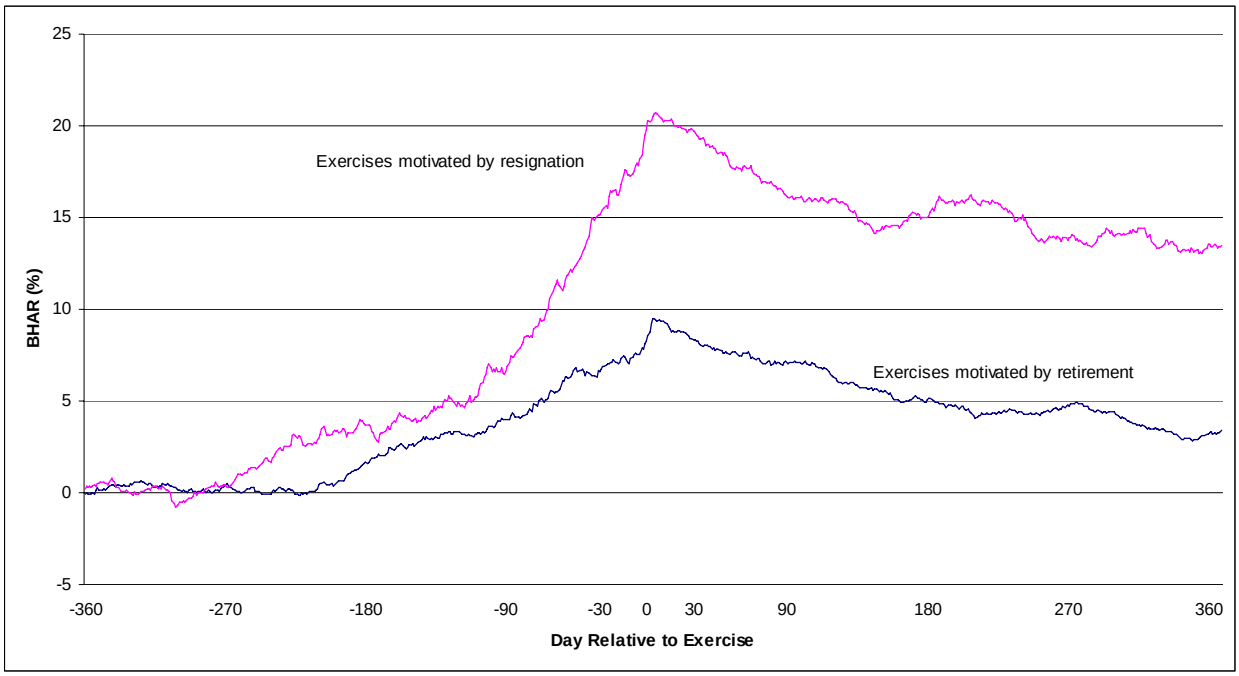

Fig. 7. Buy-and-hold abnormal returns for exercises in which the executive resigned and exercises in which the executive retired. Buy-and-hold abnormal returns for each firm are estimated using a benchmark portfolio constructed by matching on industry, size, book-to-market and with no corresponding exercise event during the relevant time period. This sample includes only options exercised more than 30 days before expiration. These results apply to the merged sample, which is comprised of insider trades reported in the Table II File of Thomson Financial Insider filings for the period 1996 through 2005 in which the transactions can be matched with the insider's data reported in Standard and Poor's ExecuComp.

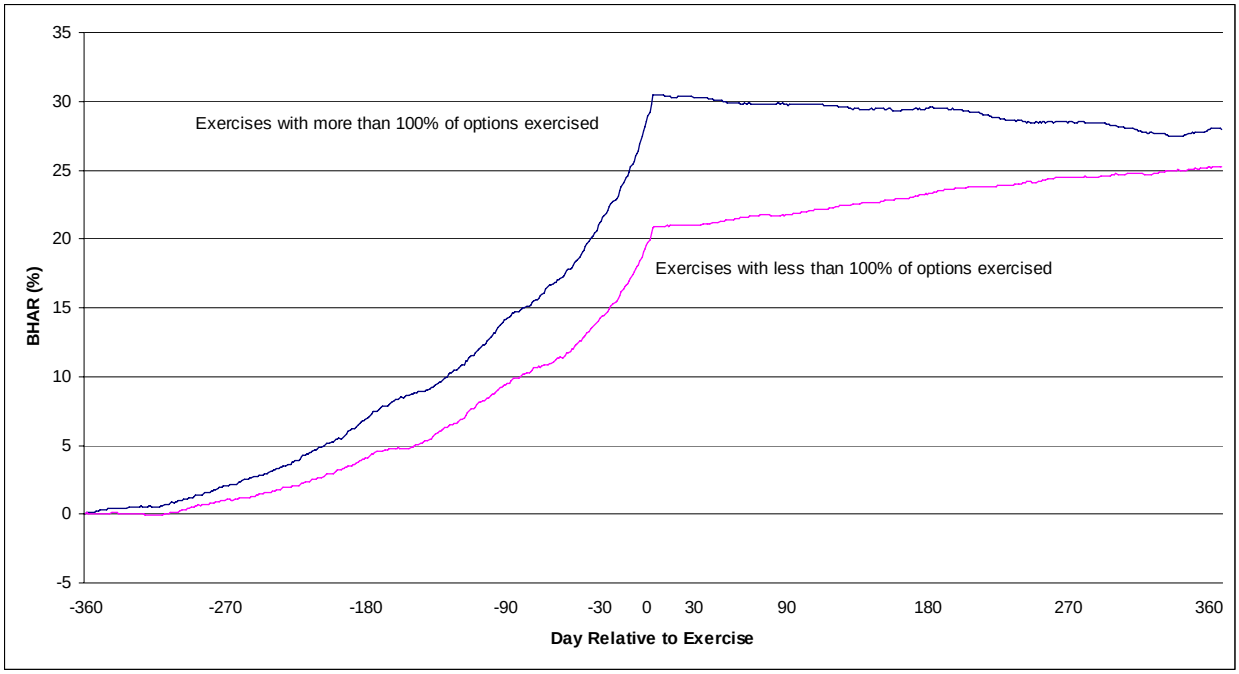

Fig. 8. Buy-and-hold abnormal returns for options grouped according to the ratio of exercised options to vested but unexercised options. Buy-and-hold abnormal returns for each firm are estimated using a benchmark portfolio constructed by matching on industry, size, book-to-market and with no corresponding exercise event during the relevant time period. This sample includes only options exercised more than 30 days before expiration. A proxy is used to estimate the ratio of exercised to unexercised vested options, which is based on the exercise value of exercised options to the exercise value of unexercised vested options. As described in Table 1, the group labeled > 100% is the group in which the ratio of the value of exercised options to vested but unexercised options is more than 100%, and the group labeled < 100% is the complementary group. These results apply to the merged sample, which is comprised of insider trades reported in the Table II File of Thomson Financial Insider filings for the period 1996 through 2005 in which the transactions can be matched with the insider's data reported in Standard and Poor's ExecuComp.

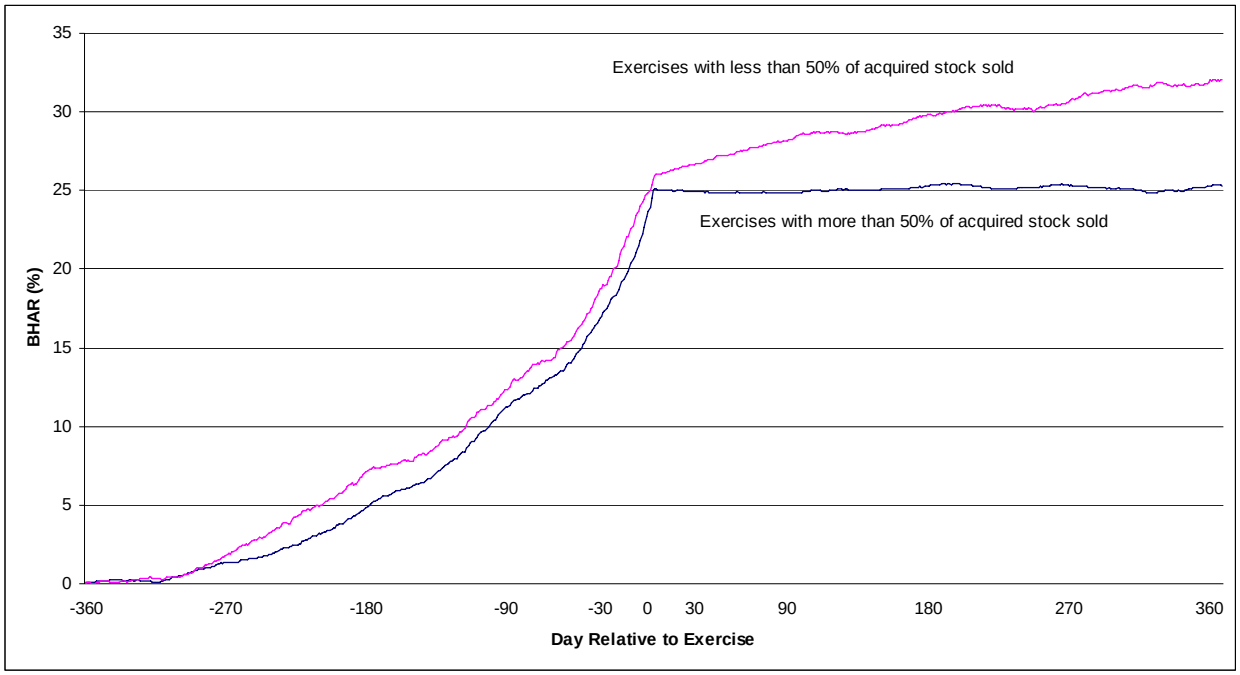

Fig. 9. Buy-and-hold abnormal returns for exercises in which more than 50% of the stock acquired upon exercise is sold and exercises in which less than 50% of the stock acquired up on exercise is sold. Buy-and-hold abnormal returns for each firm are estimated using a benchmark portfolio constructed by matching on industry, size, book-to-market and with no corresponding exercise event during the relevant time period. This sample includes only options exercised more than 30 days before expiration. These results apply to the merged sample, which is comprised of insider trades reported in the Table II File of Thomson Financial Insider filings for the period 1996 through 2005 in which the transactions can be matched with the insider's data reported in Standard and Poor's ExecuComp.

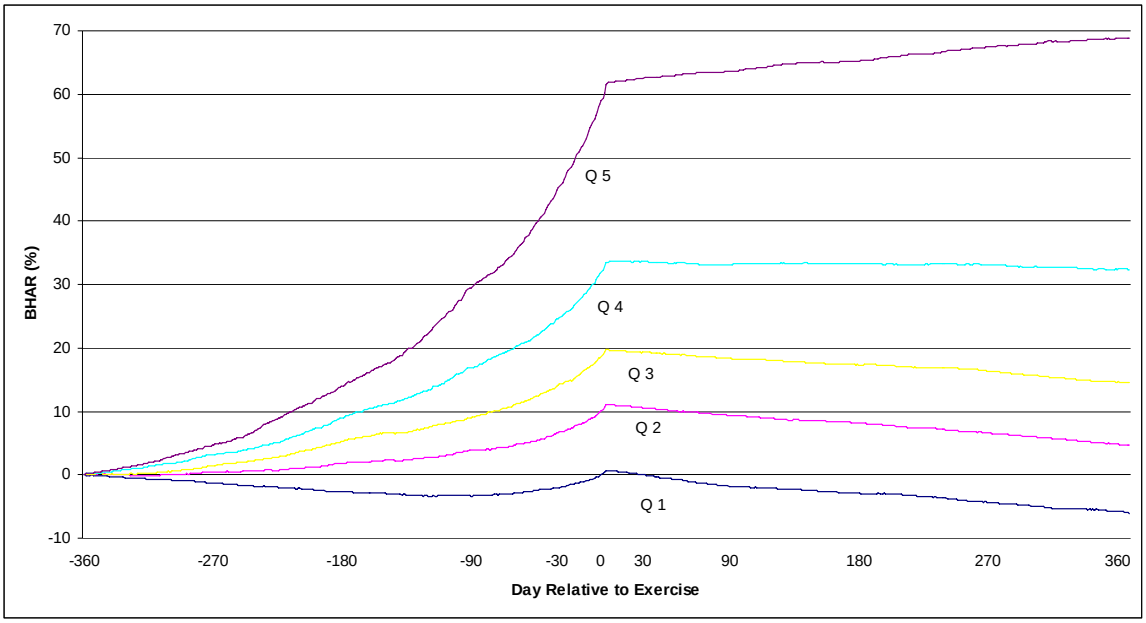

Fig. 10. Buy-and-hold abnormal return quintiles based on moneyness. Moneyness is defined as the ratio of the stock price to the exercise price. Q1 is the quintile containing options that are closest to at-the-money, and Q5 is the quintile containing options deepest in-the-money. Buy-and-hold abnormal returns for each firm are estimated using a benchmark portfolio constructed by matching on industry, size, book-to-market and with no corresponding exercise event during the relevant time period. This sample includes only options exercised more than 30 days before expiration. These results apply to the merged sample, which is comprised of insider trades reported in the Table II File of Thomson Financial Insider filings for the period 1996 through 2005 in which the transactions can be matched with the insider's data reported in Standard and Poor's ExecuComp.

Table 1

Descriptive statistics of the exercise events. Panel A reports statistics for the full sample, which includes option exercises by corporate insiders reported to the SEC between 1996 and 2005 available on Thomson Financial Insider filings. The full sample is partitioned according to whether the exercise occurred early or at expiration, whether the exercise occurred on the vest date, and whether the exercise was motivation by capture of a dividend. Early exercise is defined as exercise with more than 30 days to expiration. Of the 411,366 exercises in the full sample, 33,945 do not report an exercise date. Exercise on the vest date is defined as an exercise between zero and 30 days after the vest date. "Not on vest date" exercise includes all other early exercises. "Dividend-motivated" exercise includes all options exercised within 15 business days prior to the ex-dividend date. "Not dividend-motivated" exercise represents exercises seven to ten weeks before the dividend or all exercises of firms that do not pay dividends. Panel B reports all statistics for the merged sample, which is comprised of insider trades reported in the Table II File of TFI for the period 1996 through 2005 in which the transactions can be matched with the insider's data in Standard and Poor's ExecuComp. The merged sample is partitioned similarly to the full sample, and also according to whether the exercise was induced by executive departure from the firm, the proportion of options exercised to those vested that were not exercised, and the proportion of stock sold at exercise. Of the 92,960 exercises in the merged sample 6,043 do not report an exercise date. Exercises associated with executive departure are those early exercises in which the executive left the company within 270 days of the exercise. Resigned exercises are those in which the reason for departure was resignation, and retired exercises are those in which the reason was retirement. Of the 5,364 departure exercises, 824 do not indicate a reason for departure. Early exercises in the merged sample are ranked by the proportion of options exercised relative to those vested but unexercised and placed into two groups. "> 100%" contains exercises in which the value of options exercised to the value of vested but unexercised options is more than 100% and "< 100%" is the complement. Of the 82,146 early exercises in the merged sample, 1,472 do not report an unexercised exercisable variable. The group labeled "> 50%" are those in which the executive sold more than 50% of the shares acquired from exercise, and the "< 50%" group are the remaining exercises. Of the 82,146 early exercises in the merged sample, 4,467 do not report shares held at fiscal year end. Q1-Q5 moneyness refers to quintiles based on the moneyness of the options at exercise with Q1 being closest to a-the-money and Q5 being deepest in-the-money.

Panel A: Summary Statistics for Full Sample Option Exercises

	Number of exercises	Number of executives	Number of firms	Mean years prior to expiration (median)		Mean years after vesting (median)	
Full Sample	411,366	59,733	7,569	4.55	(4.89)	2.95	(2.30)
Exercised early	350,922	51,159	6,967	5.00	(5.29)	2.87	(2.24)
Exercised at expiration	26,499	12,427	3,658		-		-
Exercise not on vest date	325,700	49,395	6,837		-		-
Exercised on vest date	25,222	8,741	3,025		-		-
Not-dividend motivated	263,005	42,915	6,700		-		-
Dividend-motivated	44,951	12,367	2,254		-		-
Q1 moneyness	66,469	18,304	4,440				
Q2 moneyness	66,469	21,275	4,677				
Q3 moneyness	66,469	20,184	4,459				
Q4 moneyness	66,469	17,718	3,769				
Q5 moneyness	66,470	12,825	2,847				

Panel B: Summary Statistics for Merged Sample

Merged Sample	92,960	9,703	2,105	4.36	(4.65)	3.19	(2.71)
Exercised early	82,146	8,699	2,014	4.60	(4.96)	3.14	(2.68)
Exercised at expiration	4,771	2,045	1,001		-		-
No executive departure	76,782	8,293	1,989		-		-
Executive departure	5,364	925	663		-		-
Executive resigned	2,018	368	307		-		-
Executive retired	2,522	403	329		-		-
> 100% exercised	39,972	4,535	1,646		-		-
< 100% exercised	40,702	6,132	1,828		-		-
> 50% of stock sold	64,608	7,009	1,866		-		-
< 50% of stock sold	13,071	3,055	1,315		-		-

Table 2

Mean buy-and-hold abnormal returns and hit ratios for periods spanning 365, 182, and 90 days after exercise. The sample is drawn from the full sample described in Table 1 by selecting only the first exercise for a firm in a given day. The benchmark is the portfolio of five firms matched on industry, size, and book-to-market with no corresponding exercise event in the test period. Calendar-time t-statistics are presented. The hit ratios are the percentage of times the stock price fell more than implied by the Black-Scholes-Merton model to justify exercise. The percentage in parenthesis beside the hit ratio is the mean probability of a stock price decrease of at least the required amount to justify exercise under the assumption of no private information. The sample sizes for the 365-day period are 178,017 for the abnormal returns and 145,347 for the hit ratios. The sample sizes for the 182- and 90-day periods are identical to or extremely close to the numbers reported here.

	Mean Buy-and-Hold Abnormal Returns			
Period relative to exercise (day 0)	Mean (%)	t-statistic	Mean (%)	t-statistic
	Full Sample		Merged Sample	
(0, 365)	-2.61	-5.26	1.61	2.58
(0, 182)	-1.06	-3.20	1.19	3.93
(0, 90)	-0.65	-1.59	0.52	2.69
	Hit Ratios			
(0,365)	51.48% (44.73%)		51.50% (44.69%)	
(0,182)	48.39% (38.71%)		47.26% (38.69%)	
(0,90)	47.44% (34.43%)		47.06% (34.58%)	

Table 3

Mean buy-and-hold abnormal returns and hit ratios for periods spanning 365, 182, and 90 days after exercise for the samples divided into options exercised early compared to those exercised at expiration (Panel A) and options not exercised on the vest date compared to those exercised on the vest date (Panel B). The sample is drawn from the full sample of exercises described in Table 1 by selecting only the first exercise for a firm in a given day. The benchmark is the portfolio of five firms matched on industry, size, and book-to-market with no corresponding exercise event in the test period. Calendar-time t-statistics are presented. The hit ratios are the percentage of times the stock price fell more than implied by the Black-Scholes-Merton model to justify exercise. The percentage in parenthesis beside the hit ratio is the mean probability of a stock price decrease of at least the required amount to justify exercise under the assumption of no private information. An early exercise is defined as an exercise with more than 30 days remaining to expiration. A vest date exercise is an exercise defined as occurring between 0 and 30 days after the vest date. The sample sizes for the 365-day period are 149,286 early exercises, 15,400 maturity exercises, 10,339 vest date exercises, and 143,212 not vest date exercises for the abnormal returns and 126,396 early exercises, 9,022 maturity exercises, 7,752 vest date exercises, and 118,644 not vest date exercises for the hit ratios. The sample sizes for the 182- and 90-day periods are identical to or extremely close to the numbers reported here.

Panel A: Early exercise vs. exercise at expiration

	Options exercised early		Options exercised at expiration		
	Mean Buy-and-Hold Abnormal Returns				
Period relative to exercise (day 0)	Mean (%)	t-statistic	Mean (%)	t-statistic	t- or z-statistic for difference
(0,365)	-2.69	-4.01	-1.51	-2.95	-2.23
(0,182)	-1.18	-2.70	-0.42	-1.92	-2.13
(0,90)	-0.77	-1.49	0.15	0.83	-4.16
	Hit Ratios				
(0,365)	51.74% (44.68%)		44.74% (42.36%)		13.37
(0,182)	48.40% (38.48%)		45.17% (37.06%)		6.17
(0,90)	47.12% (34.43%)		46.61% (33.22%)		0.97

Panel B. Vest date exercise vs. not-vest date exercise

	Options not exercised on vest date		Options exercised on vest date		
	Mean Buy-and-Hold Abnormal Returns				
Period relative to exercise (day 0)	Mean (%)	t-statistic	Mean (%)	t-statistic	t- or z-statistic for difference
(0,365)	-2.89	-4.90	-0.69	-0.66	-2.48
(0,182)	-1.22	-3.24	-0.64	-0.13	-1.13
(0,90)	-0.81	-2.15	-0.15	0.46	-1.84
	Hit Ratios				
(0,365)	51.69% (44.87%)		52.71% (45.04%)		-1.46
(0,182)	48.45% (38.48%)		47.43% (38.54%)		1.45
(0,90)	47.31% (34.07%)		43.36% (33.94%)		5.62

Table 4

Mean buy-and-hold abnormal returns and hit ratios for periods spanning 365, 182, and 90 days after exercise for the full sample of all early exercises divided into exercises motivated by dividends and those not motivated by dividends. The sample is drawn from the full sample described in Table 1 by selecting only the first exercise for a firm in a given day. A dividend-motivated exercise is defined as an early exercise in which the reported exercise date occurs within 15 trading days prior to the ex-dividend date. Non-dividend motivated exercises also include exercises of firms that do not pay dividends. The benchmark is the portfolio of five firms matched on industry, size, and book-to-market with no corresponding exercise event in the test period. Calendar-time t-statistics are presented. The hit ratios are the percentage of times the stock price fell more than implied by the Black-Scholes-Merton model to justify exercise. The percentage in parenthesis beside the hit ratio is the mean probability of a stock price decrease of at least the required amount to justify exercise under the assumption of no private information. The sample sizes for the 365-day period are 114,224 not dividend-motivated exercises and 17,622 dividend-motivated exercises for the abnormal returns and 97,555 not dividend-motivated and 12,492 dividend-motivated exercises for the hit ratios. The sample sizes for the 182- and 90-day periods are identical to or extremely close to the numbers reported here.

	Not dividend-motivated exercise		Dividend-motivated exercise		
	Mean Buy-and-Hold Abnormal Returns				
Period relative to exercise (day 0)	Mean (%)	t-statistic	Mean (%)	t-statistic	t- or z-statistic for difference
(0,365)	-3.62	-4.68	0.43	1.65	-11.25
(0,182)	-1.72	-3.37	0.69	2.18	-10.89
(0,90)	-1.02	-2.24	-0.05	0.56	-6.51
	Hit Ratios				
(0,365)	53.26% (46.21%)		47.27% (40.10%)		12.80
(0,182)	49.12% (40.00%)		45.63% (33.94%)		7.48
(0,90)	46.81% (35.60%)		45.13% (33.94%)		3.60

Table 5

Mean buy-and-hold abnormal returns and hit ratios for periods spanning 365, 182, and 90 days after exercise for the samples divided into options exercised around the executive's departure compared to those exercised not around the executive's departure (Panel A) and options exercised around the executive's retirement compared to those exercised not around the executive's retirement (Panel B). The sample is drawn from the merged sample described in Table 1 by selecting only the first exercise for a firm in a given day. The benchmark is the portfolio of five firms matched on industry, size, and book-to-market with no corresponding exercise event in the test period. Calendar-time t-statistics are presented. The hit ratios are the percentage of times the stock price fell more than implied by the Black-Scholes-Merton model to justify exercise. The percentage in parenthesis beside the hit ratio is the mean probability of a stock price decrease of at least the required amount to justify exercise under the assumption of no private information. Exercises associated with executive departure are those that occur within plus or minus 270 days of the executive leaving the company. The sample sizes for the 365-day period are 34,885 not departure exercises, 2,394 departure exercises, 977 retirement exercises, and 950 resignation exercises for the abnormal returns and 30,285 not departure, 2,142 departure exercises, 1,074 retirement exercises, and 788 resignation exercises for the hit ratios. The sample sizes for the 182- and 90-day periods are identical to or extremely close to the numbers reported here.

Panel A: Departure and Not Departure

	Exercises not associated with executive departure		Exercises associated with executed departure		
	Mean Buy-and-Hold Abnormal Returns				
Period relative to exercise (day 0)	Mean (%)	t-statistic	Mean (%)	t-statistic	t- or z-statistic for difference
(0,365)	1.72	1.98	-6.06	-3.76	7.62
(0,182)	1.31	3.36	-4.45	-3.29	8.34
(0,90)	0.52	2.38	-3.16	-3.22	7.30
	Hit Ratios				
(0,365)	51.83% (44.82%)		51.89% (41.73%)		-0.05
(0,182)	47.57% (38.69%)		43.97% (34.95%)		2.86
(0,90)	47.12% (34.58%)		44.90% (30.14%)		1.76

Panel B. Retirement and Resignation

	Exercises in which the executive retired		Exercises in which the executive resigned		
	Mean Buy-and-Hold Abnormal Returns				
Period relative to exercise (day 0)	Mean (%)	t-statistic	Mean (%)	t-statistic	t- or z-statistic for difference
(0,365)	-6.10	-2.70	-7.03	-3.15	0.42
(0,182)	-4.57	-3.08	-4.62	-2.26	0.03
(0,90)	-2.37	-1.39	-4.51	-2.59	1.89
	Hit Ratios				
(0,365)	51.30% (37.78%)		56.98% (45.59%)		2.08
(0,182)	38.42% (30.94%)		48.06% (38.52%)		3.57
(0,90)	44.01% (25.91%)		42.26% (33.61%)		-0.65

Table 6

Mean buy-and-hold abnormal returns and hit ratios for periods spanning 365, 182, and 90 days after exercise for the samples divided into exercises in which more than 100% of the options are exercised compared to exercises in which less than 100% of the options are exercised (Panel A) and exercises in which more than 50% of the stock is sold compared to exercises in which less than 50% of the stock is sold (Panel B). The sample is drawn from the merged sample described in Table 1 by selecting only the first exercise for a firm in a given day. The benchmark is the portfolio of five firms matched on industry, size, and book-to-market with no corresponding exercise event in the test period. Calendar-time t-statistics are presented. The hit ratios are the percentage of times the stock price fell more than implied by the Black-Scholes-Merton model to justify exercise. The percentage in parenthesis beside the hit ratio is the mean probability of a stock price decrease of at least the required amount to justify exercise under the assumption of no private information. These results apply to the merged sample, which is comprised of insider trades reported in the Table II File of Thomson Financial Insider filings for the period 1996 through 2005 in which the transactions can be matched with the insider's data reported in Standard and Poor's ExecuComp. Early exercises are ranked by the proportion of options exercised relative to those vested but unexercised and placed into two samples. A proxy based on the value, rather than the quantity, of exercised and unexercised vested options is used. The first group contains exercises in which the ratio of exercised to unexercised but vested options is more than 100%, and the second group is the complement. For exercises classified by percentage of stock sold, we use the technique of Ofek and Yermack (2000) who estimate the percentage of stock sold by comparing the change in the executive's stock ownership with the amount of options exercised and restricted stock granted. The sample sizes for the 365-day period are 16,589 greater than 100% exercises, 21,242 less than 100% exercises, 28,871greater than 50% sold exercises, and 6,678 less than 50% sold exercises for the abnormal returns. For the hit ratios, we have 15,496 greater than 100% exercises, 16,359 less than 100% exercises, 25,676 greater than 50% sold exercises, and 16,359 less than 50% sold exercises for the hit ratios. The sample sizes for the 182- and 90-day periods are identical to or extremely close to the numbers reported here.

Panel A: More than 100% of options exercised to not exercised versus. less than 100% of options exercised to not exercised

	> 100% exercised		< 100% exercised		
	Mean Buy-and-Hold Abnormal Returns				
Period relative to exercise (day 0)	Mean (%)	t-statistic	Mean (%)	t-statistic	t- or z-statistic for difference
(0,365)	-2.53	-1.70	4.41	4.84	-10.79
(0,180)	-0.96	-0.37	2.62	6.03	-9.52
(0,90)	-0.67	-1.34	1.00	3.91	-6.77
	Hit Ratios				
(0,365)	56.37% (46.79%)		48.22% (42.93%)		13.29
(0,182)	50.78% (40.60%)		44.62% (36.77%)		10.04
(0,90)	47.90% (36.02%)		46.21% (32.36%)		2.75

Panel B. More than 50% of stock sold versus less than 50% of stock sold

	> 50% of stock sold		< 50% of stock sold		
	Mean Buy-and-Hold Abnormal Returns				
Period relative to exercise (day 0)	Mean (%)	t-statistic	Mean (%)	t-statistic	t- or z-statistic for difference
(0,365)	0.21	0.59	6.35	3.97	-6.35
(0,182)	0.30	1.66	4.16	5.30	-7.54
(0,90)	-0.19	0.42	2.64	5.95	-8.59
	Hit Ratios				
(0,365)	51.00% (44.42%)		55.00% (44.88%)		-4.96
(0,182)	46.34% (38.19%)		50.92% (38.96%)		-5.70
(0,90)	46.39% (33.87%)		49.21% (35.22%)		-3.51

Table 7

Mean buy-and-hold abnormal returns and hit ratios for periods spanning 365, 182, and 90 days after exercise for the samples divided into quintiles based on moneyness where Quintile 1 is the 20% of exercises that are closest to at-the-money. The sample is drawn from the full sample described in Table 1 by selecting only the first exercise for a firm in a given day. The benchmark is the portfolio of five firms matched on industry, size, and book-to-market with no corresponding exercise event in the test period. Calendar-time t-statistics are presented. The hit ratios are the percentage of times the stock price fell more than implied by the Black-Scholes-Merton model to justify exercise. The percentage in parenthesis beside the hit ratio is the mean probability of a stock price decrease of at least the required amount to justify exercise under the assumption of no private information. The sample sizes for the 365-day period are 29,032 for Q1, 29,174 for Q2, 29,177 for Q3, 28,984 for Q4, and 28,885 for Q5 for the abnormal returns and 25,222 for Q1, 25,221 for Q2, 25,221 for Q3, 25,222 for Q4, and 25,221 for Q5 for the hit ratios. The sample sizes for the 182- and 90-day periods are identical to or extremely close to the numbers reported here.

	Q1		Q2	
	Mean Buy-and-Hold Abnormal Returns			
Period relative to exercise (day 0)	Mean (%)	t-statistic	Mean (%)	t-statistic
(0,365)	-6.60	-11.62	-6.44	-11.66
(0,182)	-3.51	-10.14	-3.01	-8.47
(0,90)	-2.40	-8.48	-1.72	-6.24
	Hit Ratios			
(0,365)	36.22% (35.01%)		46.23% (41.83%)	
(0,182)	34.16% (27.32%)		46.14% (35.23%)	
(0,90)	33.66% (22.08%)		45.93% (30.48%)	

	Q3		Q4	
	Mean Buy-and-Hold Abnormal Returns			
Period relative to exercise (day 0)	Mean (%)	t-statistic	Mean (%)	t-statistic
(0,365)	-5.07	-7.11	-1.16	-2.11
(0,182)	-2.29	-4.88	-0.22	-0.59
(0,90)	-1.41	-3.63	-0.30	-0.57
	Hit Ratios			
(0,365)	52.45% (44.52%)		58.42% (47.81%)	
(0,182)	49.04% (38.54%)		53.28% (42.28%)	
(0,90)	48.70% (34.15%)		51.73% (38.17%)	

	Q5		
Period relative to exercise (day 0)	Mean (%)	t-statistic	Q1 vs. Q5 t
(0,365)	7.31	6.25	-22.75
(0,182)	3.84	6.09	-20.77
(0,90)	2.14	5.39	-19.63
		Hit Ratios	
			Q1 vs. Q5 z:
(0,365)	65.67% (54.48%)		-62.39
(0,182)	59.70% (49.27%)		-54.16
(0,90)	55.82% (45.64%)		-47.14

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