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overconfidence vs. market timing

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Abstract

We examine the exercising behavior for executive stock options by S&P 500 CEOs from 1994 to 2003. We analyze whether the postponement decisions of CEOs are explained by the competing hypotheses of optimism (overconfidence) or market timing. For CEOs with high levels of options, overconfidence appears to play an important part in the postponement of exercise. CEOs having lower levels of options, however, are influenced by market timing concerns in their exercise decision, with overconfidence playing a role in the postponement decision.

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I. Introduction

There is a recent spate of literature examining the consequences of managerial *optimism* or *overconfidence* - terms that we employ interchangeably. Managerial optimism can manifest itself in a variety of corporate decisions and lead to outcomes which are different from the first-best. Managerial optimism is presumably based on an attitude wherein the manager tends to systematically inflate the probability of beneficial outcomes and deflate the probability of undesirable outcomes. An early example of such managerial attitudes in the finance literature underlies Roll's (1986) hubris hypothesis of corporate takeovers. More recent literature provides explicit models of managerial optimism and examines its empirical consequences.

The purpose of this paper is to examine the pervasiveness of overconfidence in a specific personal decision made by the CEO – that associated with the exercise decision of vested executive options. Specifically, we examine the degree to which CEOs' option exercise decision is influenced by overconfidence or is motivated by market timing concerns.

Our approach contrasts with the literature that typically examines the role of overconfidence in the context of public (corporate) decision making at the firm level. In the recent literature the focus has been to identify overconfident CEOs (Malmendier and Tate 2005a) or overconfident investors (Barber and Odean 2001) according to some stated rule and then compare the decisions made by the overconfident CEO (or, investors) against those made by CEOs (or, investors) who do not display such high degrees of optimism.

We focus on whether CEO optimism has consequences for the CEO's private decision making. We also examine whether overconfidence is a persistent trait in this context.

Our sample is based on CEOs of S&P500 firms from 1994 to 2003. We examine their exercise behavior for vested options and relate this to proxies for overconfidence and market timing, in addition to a number of control variables. CEOs having high levels of vested options are most likely to exercise their options, however not all of them do so. A manager imbued with optimism may postpone option exercise from the current year with the hope of better stock price in the following year. CEOs may also postpone exercising due to rational timing considerations and not due to overconfident attitudes.

We examine the role of the size (amount) of vested options on the exercising behavior of CEOs. CEOs endowed with large amounts of vested options should have a greater propensity to exercise due to risk aversion and diversification concerns. However, many CEOs do postpone their exercise decision presumably on account of overconfidence. Also CEOs with relatively low amounts of vested options should have a lower propensity to exercise in view of the small size of option holding. In this sub-set, exercising decision is possibly more idiosyncratic. However, we do find support to the market timing hypothesis in addition to lower levels of exercise influenced by overconfidence.

The rest of the paper is organized as follows. The next section summarizes literature on overconfidence and the literature on options exercising. In section three, we provide a short discussion of our measure for overconfidence and its consequences for the exercising decision. In the fourth section, we describe the role of market timing as an alternative explanation for exercise postponement and describe the other control variables that influence the option exercise decision. In the fifth section, the hypotheses and the results are presented. In the last section, we present some concluding comments.

II. Optimism and its consequences for options exercise

Overconfidence at the individual level is analyzed in the social psychology literature. Individuals tend to consider themselves better than average (Larwood and Whittaker 1977). Executives are likely to exhibit overconfidence which is brought about by the illusion of control, a high degree of commitment to good outcomes, and the difficulty in comparing performance across individuals (Alicke et al 1995).[1] Overconfidence is also likely to be observed for activities involving high degrees of uncertainty and low predictability such as in stock trading (Barber and Odean 2001), options exercise, and numerous corporate decisions.

Heaton (2002) presents a model in which optimistic managers believe that the capital market undervalues their equity and, as a consequence, these managers may forego positive NPV projects when external financing is needed to undertake such projects. Conversely, optimistic managers may overvalue projects and undertake negative NPV projects when these projects can be internally financed. Such outcomes, which are different from the first-best, are not brought about by agency concerns including disutility of effort, opportunistic behavior, or those based on the divergence of personal interests of managers from those of the shareholders. Gervais et al (2003) argue that managerial overconfidence provides an alternative solution to the agency problem. Hackbarth (2004) models the capital structure decisions made by overconfident managers. Overconfident managers elect higher levels of debt but, as he argues, small degree of overconfidence ameliorates the agency conflict between manager and shareholders.

Malmendier and Tate (2005a) present an empirical test of Heaton's hypothesis. They identify overconfident CEOs *ex ante* and then examine their corporate decisions. They analyze the investment cash flow sensitivity of firms while controlling for the possibility

[1] Klayman et al (1999) argue that inferences of overconfidence are confounded when judgments are imperfect.

that some managers are infused with *overconfidence*. They report that the corporate investment decisions made by overconfident CEOs are more responsive to cash flow.

Numerous aspects of CEO's exercise decisions have been investigated in the literature. Hall and Murphy (2000) provide a framework which measures the value of non-tradable executive stock option (ESO). In view of the restrictions on marketability of options and on short selling, and due to the need to hedge corporate risk exposures, the value of ESO is substantially lower to a CEO than the conventional Black-Scholes model value. Further, the ESO value is sensitive to executives' risk preferences and to the proportion of their wealth in the option. Increases in attitude to risk or increases in the percentage of stock option can dramatically decrease the value of the option to the executive.

These arguments suggest that the executive would have an incentive to exercise the in-the-money option when vested. The incentive to exercise is likely to be higher the larger the proportion of wealth invested in options, i.e., the larger the level of option holdings. Non-exercise would be suggestive of overconfident attitudes regarding the future. Postponement of exercise would be also be indicative of bullish outlook for the future whether such outlook is warranted (as in rational market timing) or not (as in display of overconfidence).

Carpenter and Remmes (2001) examine the information basis of executives' option exercise. They report that the post-exercise abnormal stock price performance is not significant from zero, and argue that insiders' exercise of stock option is mainly motivated by diversification concerns and is therefore non-informative about corporate prospects. Huddart and Lang (2003) present evidence based on seven firms that option exercising is negatively related to post-exercising stock performance suggestive of market timing abilities. Employees hold their options when they expect price to go up while they will cash out of options if the price is anticipated to drop. High exercising rate is associated with negative post-exercising return while low levels of exercise are associated with large post-exercising

return. Such information or timing based trading is observed in choices made by high level executives and by junior level employees.

Bartov and Mohanram (2004) argue that only abnormally large exercises have information content. They present evidence that executives manipulate earnings measures that are perceived to influence stock price by increasing discretionary accruals before exercising and by decreasing these items in the post exercise period. Wei (2004) also examines the role of private information in the exercise decisions of CEOs. He reports that managers aggressively manage earnings prior to the exercise period and faced with the foreknowledge of weak financial and stock price performance exercise their options. Both these studies suggest that exercise behavior is consistent with optimal timing whatever the underlying basis of that timing decision.

We examine the role of overconfidence in the CEO's private decision to exercise options. We want to test if in the aggregate CEOs (or a subset) appear to be driven by overconfidence. We dichotomize the set of CEOs according to the size of their option holding. Absent overconfidence, we expect that the managers who are endowed with larger exercisable option positions would do so. Managers with lower holdings may postpone. If the highly vested CEOs do not exercise in a given year, it may be due to their expectations about the future stock prices or it may be motivated by the false optimism that the stock is going to do even better in the future.

The market timing hypothesis of option exercise suggests that a CEO may anticipate future returns. If the future returns are expected to be higher, then postponement would be an appropriate choice. Conversely, if the future returns are expected to be lower then option exercise in the current period would be desirable. A CEO imbued with overconfidence, however, may irrationally believe that the stock performance will be better in the following year and hence postpone his exercise decision.

III. Overconfidence and exercising behavior

A: Data Collection and Summary Statistics

Our analysis is based on the stock option exercising behavior of the sample of S&P500 companies CEOs for the time period from 1994 to 2003. Firms in the S&P 500 index by the year-end are included in our sample for that year. We obtain the S&P500 index components lists for each year starting with the lists from 2000 to 2003 from the Standard and Poor's website. We construct the lists prior to 2000 by searching for announcements of S&P500 index changes in the *Wall Street Journal* and in *LexisNexis*. We incorporate the announcements regarding addition or deletion to index for 2000 to recover the year-ending list for 1999, and repeat the process backwards to 1994. There are a total of 3,865 firm-years of data consisting of 747 firms. This set is subsequently culled to generate the sample. We obtain the financial and executive compensation data from the Execucomp database, and the stock price, stock return and market return data for the three years surrounding each firm-year from CRSP.

B: Exercising Behavior

A summary of option exercising behavior of CEOs is presented in Table 1. For each CEO, we calculate the value of his option holding as the sum of the vested and unvested in-the-money options' value. If the value of vested options for the executive is greater than 66.7% of his total option holding, a dummy variable *HiVest* is set to 1, otherwise, it take on a value of zero. The dummy variable *HiVest* thus differentiates the option holding status.

A great part of the personal wealth of most CEOs is tied to their company in the form of stocks, restricted stocks, options etc. Restrictions on short selling of company stock and non-tradability of executive stock options provides a stronger incentive for the CEO to exercise stock options and diversify personal portfolios. Hall and Murphy (2002) report that

the CEO's exercising decision is sensitive to his risk-preference, wealth level, and the relative weight of stock options as a percent of total personal assets. We do not have access to the individual CEOs wealth level or total portfolio data. However, it is reasonable to expect that for CEOs with high degree of vesting, the probability of exercise will be high.

Our use of the threshold of option-exercising at 66.7% assumes that the CEO should exercise some part of his in-the-money options to diversify the idiosyncratic corporate risk. The summary results presented in Table 1 suggest that when the CEO's option holding exceeds the 66.7% threshold, approximately 51% do exercise compared to approximately 41% of CEOs exercising with smaller option holding. Since CEOs holding higher levels of options are more likely to exercise, the non-exercise behavior may be suggestive of the presence of a degree of overconfidence in the sub-set of CEOs with lower levels of option holding. A question of interest is whether overconfidence plays a significant role in option non-exercise after controlling for other variables.

[Insert Table I]

C: Measuring Overconfidence

There is no agreed upon measure of overconfidence in the literature. Malmendier and Tate (2005a) employ three different measures for overconfidence. *Holder67* and *Longholder* are based upon CEO's option exercising practice. *Holder67* defines an overconfident CEO who does not exercise his option when his option package is fully vested and is more than 67% in the money. *Longholder* recognizes an overconfident CEO who does not exercise his option until the last year of its duration. Finally, *NetBuyer* pertains to the CEO's stock trading behavior, and an overconfident CEO is recognized if he purchases additional company stock in spite of high exposure to company risk via the option holding. Barber and Odean (2001) implicitly posit that male gender of the investor is indicative of overconfidence compared to female investors.

We split our sample according to the proportion of vested options, *HiVest*. The *HiVest* variable loosely corresponds to the *Hold67* variable in Malmendier and Tate (2005a) who use a different data base and use data items not available in the *Execucomp* database. We recognize that it may be difficult to draw a behavioral implication solely from a static measure of option ownership. Consequently, we attempt to infer the presence or absence of overconfidence from observable past actions.

Overconfidence may be present when a CEO decides to forego exercising options with the expectation that stock prices will be higher the next year. If the stock price is actually higher in the next year, such postponement decision would be also consistent with market timing. If the stock price in the following year is lower then the postponement decision may be deemed to be an overconfident decision. In the absence of perfect foresight, a timing decision may appear to be overconfident *ex post* if the stock price outcome is unfavorable.

We examine the CEO's option exercise history for a period of three years. For year *t*, we examine the choices and outcomes corresponding to years *t-3*, *t-2*, and *t-1*. Exercise decisions and subsequent stock returns are examined and lead to the following classification scheme.

Figure I: Classification of past managerial decisions

time t-3 decisions	time t-2 outcomes	Classification	Score
Exercise	$ret_{t-2} > ret_{t-3}$	*bad timer*	0
	$ret_{t-2} =< ret_{t-3}$	*good timer*	+1
Postpone	$ret_{t-2} > ret_{t-3}$	*good timer*	+1
	$ret_{t-2} =< ret_{t-3}$	*overcon*	-1

We assign numeric scores corresponding to the classifications of *good timer* (+1), *bad timer* (0), and *overcon* (-1) in year *t-3*. We repeat the classifications for *t-2* and *t-3.* The aggregate numeric score for the past 3 years, therefore, ranges from -3, to +3. We classify the CEO as *overconfident* in year *t* if his total score based on previous three years is non-positive. A good timer can not be falsely classified as overconfident or conversely. The dummy variable *overconfident* is based on past, out-of-sample data and it is employed as an instrument for the overconfidence variable in the regressions using current year data.

There are 1,840 firm-years of data after discarding the classification data pertaining to years *t-3*, *t-2*, and *t-1*. The sample data is sued to analyze the exercise behavior from 1997 to 2003. Out of the 1,840 cases, 949 involved exercise (51.6%). However, CEOs classified as *overconfident* exhibit a lower frequency of exercise (42.3%). We test the null-hypothesis that exercise is equally likely for overconfident managers vs. good timers. The computed binomial z-statistic of -6.60 for the overconfident CEOs permits rejection of the null that the propensity to exercise options is similar across the two groups. Without controlling for other variables, it appears that managers classified as overconfident tend to exercise less frequently. Frequency of the 1,840 cases with total scores ranging from -3 to +3 are; 20, 49, 277, 271, 612, 401, 210. Corresponding to the positive totals +1 to +3, there are 1,223 cases that are classified as good timers (66.5%), and the remaining 617 case are classified as *overconfident* managers.[2]

[2] In the subsequently reported probit analysis, we employ a dummy variable for overconfidence which takes on a value of 1 (presence of overconfidence) or 0 (absence of overconfidence). We have also replicated the analysis by using the integer scores -3 to +3, and the results are similar.

IV. Market timing and other control variables

A: Market Timing Issues

In addition to the examining the role of overconfidence in the exercising behavior, we also control for other variables that are known to influence the propensity to exercise. For market-timing CEOs, the likelihood of exercise is high if the stock price is high in the current period and is expected to decline in the future period. Conversely, the likelihood of postponement is high if current stock price is low compared to anticipated future price.

The date on which the CEO exercises the option is not known. In order to examine the market timing hypothesis, we assume that the option is exercised in the 2nd Quarter (Q2) or the 3rd Quarter (Q3) of a year. We compute the quarterly returns for Q2 and Q3 for year *t* and for Q1 through Q4 of year *t+1*, and rank the six computed returns. We obtain the average rank for the returns of Q2 and Q3 for year *t*. If the average rank is high (current prices are high) relative to ranks for year *t+1*, then the CEO relying on market timing is more likely to exercise in the current year. Conversely, if the average rank is low, then the CEO may postpone the exercise with the expectation of getting a better stock price next year. Huddart and Lang (2003) provide empirical evidence that the size of option exercise is larger when the future returns are smaller. [3]

The average rank statistic for Q2 and Q3 for year *t* ranges from 1.5 to 5.5 in steps of 0.5 with the highest average rank being 5.5. We split the entire sample in three groups; average rank ranging from 1.5 to 2.5 (28% of observations), ranging from 3 to 4.0 (44% of observations), and ranging from 4.5 to 5.5 (28% of observations). The proportions of exercising associated with the three groups are 46.5%, 51.6%, and 56.6% respectively from the lowest ranked group to the highest ranked groups. CEOs exercise their options with

[3] The executive may act to influence the next year's return to be high by engaging in managerial actions or by accounting manipulations (Huddart and Lang 2003, Bartov and Mohanram, 2004). This "timing option" underlies the capital budgeting real-option decisions made by the CEO in Gervais et al (2003).

greater frequency when the average rank of current year returns is higher than those for the next year, suggestive of market timing behavior.

B: Firm Characteristics, Compensation

We compare the set of CEOs who exercise to those that do not exercise with respect to compensation, firm characteristics, and stock performance. The difference of corporate size characteristics might influence the exercising behavior of executives. The firm summary statistics are presented in Table 2 corresponding to the 1,832 firm-years with 8 firm-years being dropped on account of incomplete data.

Table 2 summarizes the firm level characteristics of the exercise vs. non-exercise sub-samples. CEOs of larger firms measured by sales appear to exercise with greater frequency of 53.2% compared to 46.8% for smaller than median firms. For the exercising CEOs, the average firm size by sales, assets, and market capitalization variables are $13.9, 38.7 and 26.1 billion respectively while they are $12.8, 35.9 and 22.1 billion respectively for the non-exercising group. The mean and median of these variables, excluding sales, are significantly different. The exercising firms exhibit higher levels of ROA and ROE.

[Insert Table 2]

Table 3 presents the salient statistics regarding CEO compensation. Panel A reports the compensation data. Based on the difference of means test, there is no statistical difference between the mean salary, bonus and total compensation (including option grant or not) of the exercising CEOs and non-exercising CEOs. However, median test and the rank-sum test suggest statistically significant non-parametric differences between the two sub-samples. Exercising group has a median annual bonus, in thousands, of $892 compared to $751 for the non-exercising group. The total annual compensation (including option grant) of exercising group has a median of $1.74 million (6.05 million) while the

median for the non-exercising group is $1.60 million (4.95 million), both being statistically significantly different employing non-parametric tests.

Panel B summarizes the difference of option grant variables between two groups. The level of annual option grant measured in terms of either shares or value exhibits similar means but different medians. The median value of annual stock option grant for exercising CEOs is $3.61 million and $2.38 million for non-exercising CEOs.

The two samples differ in the dollar value of option holding. Exercising group has higher levels of vested options, unvested options, and total option. The mean (median) of yearly vested option holding is $27.26 million ($6.96 million) for exercising sample but only $16.5 million (3.26 million) for the non-exercising group. Statistical tests indicate significant differences for both mean and median at conventional levels. Non-exercising CEOs have, on average, 66.4% of their total options vested, versus 67.6% for exercising CEOs. Non-exercising CEOs' option grant is about 8.03% of their firms' total annual stock option grants while it is 6.01% for exercising CEO. The results in Table 3 indicate that, besides risk-preference or diversification considerations, compensation and option grant variables might influence the exercising behavior of CEOs.

[Insert Table 3]

C: Stock and Market Return and Volatility

The fluctuation of stock price may influence the exercising decision for CEOs. While traded options are not likely to be exercised early in response to price movements, the impact of price movement on options characterized by extreme illiquidity is to induce early exercise. Option holders may exercise if underlying stock price jumps to a high level. Table 4 summarizes difference of stock performance between two samples.

We compare previous year, current year, and the next year stock return and market-adjusted return, as well as each year's average stock daily return volatility. Adjusted return

is defined as the difference between stock return and market return. We assume that if the executive exercises his/her stock option, the proceeds will be invested in a market portfolio. The difference between the stock return and market return is the realized gain/loss due to the delay in option-exercising. We compute the annual stock return of each firm and the market by aggregating the continuous daily return (annualized). Volatility for both market and individual stock is computed based on daily return (not annualized).

Panel A summarizes the stock and market return. The major difference between two samples is the current year return, for both stock and adjusted return. Stock annual return for exercising sample is 19.86% and for non-exercising sample it is 14.35%. The difference is statistically significant. The difference between of median is also large and statistically different at 13.95% for the exercising sample and 7.43% for the non-exercising sample. Because the market performance is about the same, the adjusted return, which is the difference of market return and stock return, is also significantly different between two sample groups, 9.79% for the exercise group compared to 5.62% for the non-exercise group. We assume that the current year stock performance is another major driving force for option exercising. Panel B reports the average daily volatility for stock return and market return. The stock return volatility in the previous period and in the current period are higher for the non-exercise group compared to the exercise group.

Stock return volatility is likely to have an impact on the exercising behavior. Higher stock volatility does increase the value of call options in the Black-Scholes framework. It is also likely that higher stock volatility increases the value of the executive stock options. In that case, the likelihood of exercise should be negatively related to the volatility.

[Insert Table 4]

V. Specifications and Results

A: Hypotheses and Specification

Our primary interest is in examining the relative importance of the overconfidence hypothesis contrasted against the timing hypothesis for executive option exercise, or more pertinently, in the postponement of option exercise. Do executives postpone option exercise on account of overconfidence or on account of market timing?

Overconfidence is more likely to be present in CEOs who own a high number of options (*HiVest* = 1). However, based on the CEO's past exercising behavior, we have constructed a dummy variable which instruments for overconfidence in the current period. Such a measure is likely to provide a more reliable proxy for overconfidence. As described earlier, *overconfidence* is a dummy variable that takes on a value of 1 for presumed overconfident CEOs otherwise it takes on a value of 0. There are two questions: first, do overconfident managers postpone their exercise decisions, and second, is overconfidence more prevalent among the CEOs who own a larger amount of vested options.

A CEO postpones the exercising decision at time 0, and the revealed R_1 is greater than R_0. Such postponement will be consistent with the executive exercising a timing option if the executive has ability to predict next year's return. Instead of using a dummy variable, we obtain a rank measure. *Return Rank* is the average of the rank of Q2 and Q3 returns of year *t* compared to the returns of Q1 through Q4 for year *t+1*. If the returns in the exercise period exceed the returns in the subsequent period, then *return rank* is high. Thus, with market timing behavior, we expect the CEO to be more likely to exercise if the current period *return rank* is high. Also of interest is the question whether timing is more prevalent for the *HiVest* = 1 sample or for the lower ownership sample.

We employ a number of control variables similar to the ones employed in earlier studies (Malmendier and Tate 2005a) and consistent with the univariate differences reported

in Tables 2 to 4. Higher level of *Stock Volatility* of the previous year is expected to induce postponement and reduce the probability of exercise. *Asset*, defined as the log of total assets, is a proxy for the size of compensation and option packages since larger firms are likely to provide higher packages. However, the direct relationship between assets and exercise is unclear. *In-the-money option* is the dollar value of the CEO's option holding in current year. A higher level is indicative of a potential for lack of diversification and is likely to induce exercise. *Total Compensation* is the sum of salary, bonus and other non-option related payments for the current year. A higher level of compensation may act as a substitute for income from the exercise of options, thus delaying option exercise. *Options Granted* is the current year stock option grant, and a higher level would induce exercise. We expect the following signs with regard to exercise probability in the control variables; *volatility* (-), *in-the-money* options (+), *total compensation* (-), *options granted* (+), *assets* (?).

The dependent variable is *Exercise* which takes on a value of 1 if the CEO exercises options during the year (946 cases) otherwise it takes on value of 0 (886 cases). The probability of exercise is estimated by a probit model on two sub-samples; the CEO has high levels of vested options (*HiVest* = 1, consisting of 1,012 cases) or low levels of vested options (*HiVest* = 0, consisting of 716 cases). We restate our hypotheses below:

H_1: overconfidence as measured leads to postponement of options exercise.

H_2: overconfidence has dissimilar consequences for the two groups of managers, *HiVest* = 1, and *HiVest* = 0.

H_3: Managers exhibit market timing, and hence postpone option exercise.

H_4: The two groups of managers exhibit dissimilar abilities for market timing.

Robust estimation and firm-level clustering is employed. Equation 1 is estimated without the *overconfidence* variable, and equations 2 to 4 include the *overconfidence* variable along with industry fixed effects (2 digit SIC code), and year fixed effects.

B: Results

The results are presented in Table 5. *Overconfidence* has significant coefficients in both samples, in all specifications. The negative coefficient supports H_1 that the presence of *overconfidence* leads to reduced exercise probability in both the samples. The size of the coefficients are dissimilar across samples with the stronger effect in *HiVest* = 1sample. The coefficients are not directly comparable across the samples, we estimate the probability of exercise for each sample. The impact of *overconfidence* on probability of exercise is -0.17 for the highly vested mangers and -0.11 for less vested CEOs in equations. 2. Thus, there is support for dissimilar response of H_2. Counter to intuition, the postponement of option exercise by highly vested managers is largely due to *overconfidence*.

Next, we examine the role of market timing in the exercise decision. The coefficient attached to *Return Rank* is positive in both the samples, but statistically significant only in the low vested sample. The positive coefficient indicates that the probability of exercise increases in current stock price. Conversely, the probability of postponement increases in lower levels of current stock price. The marginal impact on probability of exercise is 0.014 for the high vested managers and 0.058 for the lower vested managers. Thus, for low vested managers, low current stock price also delays exercise.

Stock volatility has a negative and statistically significant coefficient in both the samples and in all equations. The impact of volatility is not dissimilar across the samples. *Asset* size is weakly significant only in equations 1 and 2 for the highly vested samples. Larger firms have associated higher probability of exercise (0.031). It is possible that asset proxies for compensation and other variables. Larger dollar value of *In-the-money* options leads to higher probability of exercise in the high vested sample. The response for low vested sample is small and not significant. The *total compensation* variable is not significant in either sample. *Options Granted* is significant in the low vested sample but not in the high

vested sample. This is an intuitive relationship in that the manager exercises if he is awarded a large option grant in the current year and his holding is relatively small.

[Insert Table 5I]

VI. Conclusions

There are numerous studies that tie in the notion of insiders trading based on their insider information. The idea that overconfidence may play a role in a CEO's actions or on trading behavior is a relatively recent concept in finance. Recent literature assumes that managers with high levels of option holdings are driven by overconfidence if they postpone the exercise of their executive stock options.

We estimate the presence of managerial overconfidence based on the past behavior of a sample of S&P 500 CEOs. Employing proxies, we estimate whether overconfidence or rational timing decisions explain exercise of executive stock options. We find that CEOs with high levels of vested options do postpone their exercise decisions, but the frequency of such postponements is no greater than that observed for CEOs with low levels of options.

Controlling for a number of variables in a probit model, we note that overconfidence lead to postponement of option exercise, but the competing hypothesis of market timing also has an impact on the exercise decision for a set of CEOs endowed with low levels of options. We note that higher stock volatility leads to delay in exercise, and the role of the size of option holding and size of option grants are dependent on the sample.

The consequences of managerial overconfidence are on a number of corporate choices. Controlling for managerial attitudes may lead to a clear understanding of the factors that are important in managerial decision making.

References

Alicke, Mark D., Klotz, M. L., Breitenbecher, D. L. et al, 1995, "Personal contact, individuation, and the better-than-average effect," *Journal of Personality and Social Psychology*, 68, 804-825.

Barber, Brad M. and Terrance Odean, 2001, "Boys will be boys: gender, overconfidence, and common stock investment", *Quarterly Journal of Economics*, 111 # 1, 261-292.

Bartov, Eli, and Partha Mohanram, 2004, "Private information, earnings manipulations, and executive stock-option exercises", *Accounting Review*, 79 # 4, 889-920.

Carpenter, Jennifer N. and Barbara Remmers, 2001, "Executive stock option exercises and inside information", *Journal of Business*, 74 # 4, 513-534.

Gervais, Simon, J. B. Heaton, and Terrance Odean, 2003, "Overconfidence, investment policy, and executive stock options", working paper.

Hackbarth, Dirk, 2004, "Managerial traits and capital structure decisions", working paper, Indiana University.

Hall, Brian J. and Kevin J. Murphy, 2000 "Optimal exercise prices for executive stock options", *American Economic Review,* 90 # 2, 209-214.

Heaton, J. B., 2002, "Managerial optimism and corporate finance", *Financial Management*, 31 # 2, 33-45.

Heath, Chip, Steven Huddart, and Mark Lang, 1999 "Psychological factors and stock options exercise", *Quarterly Journal of Economics*, 114 # 2, 601- 627.

Huddart, Steven and Mark Lang, 2003 "Information distribution within firms: evidence from stock option exercises", *Journal of Accounting and Economics* 31, 3-31.

Jin, Li and S. P. Kothari, 2005, "Determinants of management ownership of unrestricted equity: overconfidence versus tax explanation", working paper.

Klayman, Joshua, Jack B. Soll,.C. Gonzalez-Vallejo, and S. Barlas, 1999, "Overconfidence: It depends on how, what, and whom you ask," *Organizational Behavior and Human Decision Processes*, 79 # 3, 216- 247.

Larwood, Laurie and William Whittaker, 1977, "Managerial myopia: self-serving biases in organizational planning," *Journal of Applied Psychology*, 62, 194-198.

Malmendier, Ulrike and Geoffrey Tate, 2003 "Who makes acquisitions? CEO overconfidence and the market's reaction", *NBER* working paper No.10813.

Malmendier, Ulrike and Geoffrey Tate, 2005a, "CEO overconfidence and corporate investment", *Journal of Finance*, 60 #6, 2661-2700.

Malmendier, Ulrike and Geoffrey Tate, 2005b, “Does overconfidence affect corporate investment? CEO overconfidence measures reexamined”, *European Financial Management*, 11 # 5, 649 - 659.

Roll, Richard, 1986, “The hubris hypothesis of corporate takeovers,” *Journal of Business*, 59 #2, 197-217.

Wie, Yu, 2004, “Executive stock option exercises, insider information and earnings management”, working paper, University of Utah.

Table 1: Frequency of CEOs Exercising Options

This table summarizes the exercising behavior of CEOs of S&P500 companies from 1994 to 2003.

Panel A: CEOs with more than 66.7% options vested (*HiVest* = 1)

	Number of CEOs exercising option during the year	percentage	Number of CEOs not exercising option during the year	percentage	Total
1994	51	41.1%	73	58.9%	124
1995	48	40.7%	70	59.3%	118
1996	69	50.7%	67	49.3%	136
1997	86	56.6%	66	43.4%	152
1998	99	56.3%	77	43.8%	176
1999	100	52.9%	89	47.1%	189
2000	95	54.9%	78	45.1%	173
2001	104	50.2%	103	49.8%	207
2002	122	50.4%	120	49.6%	242
2003	121	52.2%	111	47.8%	232
Total	895	51.2%	854	48.8%	1,749

Panel B: CEOs with less than 66.7% options vested (*HiVest* = 0)

	Number of CEOs exercising option during the year	percentage	Number of CEOs not exercising option during the year	percentage	Total
1994	72	46.8%	82	53.3%	154
1995	80	43.2%	105	56.8%	185
1996	92	47.9%	100	52.1%	192
1997	97	47.6%	107	52.5%	204
1998	93	44.3%	117	55.7%	210
1999	102	47.4%	113	52.6%	215
2000	91	37.6%	151	62.4%	242
2001	100	41.3%	142	58.7%	242
2002	71	31.6%	154	68.4%	225
2003	83	33.6%	164	66.4%	247
Total	881	41.6%	1235	58.4%	2,116

Note:
Value of vested options is measured by *inmonex*. Total option holding is measured by the total value of options (the sum of *inmonex* and *inmonun* variable in the Execucomp database).

Table2: Firm Summary Statistics

	Exercising CEOs		Non-Exercising CEOs		Difference of Means Test	Non-parametric Test	
	Mean	Median	Mean	Median	t-statistics	Ranksum Test z-statistics	Median Test z-statistics
Sales	13,864	6,622	12,872	13,864	0.93	1.16	0.28
Total Assets	38,702	10,676	35,929	38,702	0.61	2.71**	1.31
Common Equity	6,428	3,291	6,189	6,428	0.49	2.84***	2.52**
Market Cap	26,085	10,853	22,077	26,085	1.87**	6.46***	6.52***
Shares Outstanding	579	251	528	579	1.07	2.35**	1.75*
Q Ratio	3.85	3.09	3.88	3.85	0.06	6.54***	5.03***
Return on Assets (%)	5.76	5.12	4.80	5.76	2.99***	3.12***	2.34**
Return on Equity (%)	19.25	17.23	14.93	19.25	2.43**	5.11***	4.77***

Note:
1) All the variables, except ratios, are in millions
2) Q is the ratio of market value divided by the book value of the firm.
3) Variables are collected from the Execucomp Database. The variables are named in the Execucomp: *sales*, *assets*, *commeq*, *mktval*, *shrsout*, *roa*, and *roeavg*.
4)*, **, *** refer respectively to significance levels at better than 10%, 5%, and 1% level.

Table 3: Summary Statistics of CEO Compensation and Option Holding
This table provides a summary of CEO compensation and option-holding for a sample of 1,832 cases over the period 1997-2003. Panel A compares the sub-sample compensation results for exercising vs. non-exercising CEOs. Panel B provides a summary of CEO option holding.

Panel A: Compensation (in $ thousands)

	Exercising CEOs		Non-Exercising CEOs		Difference of Means	Non-parametric Tests	
	Mean	Median	Mean	Median	t-Statistics	Ranksum Test z-statistics	Median Test z-statistics
Salary	853	834	861	850	-0.40	-0.70	-1.12
Bonus	1,381	892	1,292	751	0.93	3.20***	2.52**
Total Current Compensation	2,234	1,735	2,153	1,600	0.78	2.34**	1.78*
Total Compensation Incl Option Grants	9,865	6,045	8,671	4,951	1.29	4.66***	3.56***
Observation	946		886		-	-	-

Panel B: CEO Option Holding (in thousands)

	Exercising CEOs		Non-Exercising CEOs		Difference of Means	Non-parametric Tests	
	Mean	Median	Mean	Median	t-Statistics	Ranksum Test z-statistics	Median Test z-statistics
Option Granted (#)	382	200	351	175	0.78	3.89***	2.24**
Option Granted ($)	6,728	3,612	6,926	2,379	0.14	6.52***	5.37***
CEO's Options as % of Employee Option	6.0%	4.3%	8.0%	5.1%	-5.06***	-4.72***	-3.53***
Vested Option (#)	1,453	563	1,476	530	-0.12	0.88	0.73
Unvested Option (#)	998	450	920	445	0.80	0.90	0.07
Total Option Holding	2,451	1,080	2,396	1,075	0.22	0.48	0.16
Vested Option ($)	27,258	6,959	16,516	3,262	3.24***	8.31***	6.25***
Unvested Option ($)	11,154	2,631	6,637	1,041	1.90*	7.94***	7.00***
Total Option Holding	38,412	11,273	23,153	5,206	2.89***	8.75***	6.72***
CEOs Vested Option as % of Total Holding	67.6%	74.3%	66.4%	74.1%	0.91	-0.10	0.29

Note:
1) Salary, Bonus, Total Current Compensation and Total Compensation Including Option Grants correspond to following variables in Execucomp Database; *salary*, *bonus tcc*, and *tdc1*.
2) Stock Option Granted, Percentage of Total Employee Option, Vested Options and Unvested Options are collected from the Execucomp Database. They are *soptgrnt*, *soptval*, *pcttotop*, *uexnumex*, *uexnumun*, *inmonex* and *inmonun*. Total Options holding is the sum of *uexnumex and uexnumun* in terms of number (*inmonex* and *inmonun* in terms of value)
3)*, **, *** refer respectively to significance levels at better than 10%, 5%, and 1% level.

Table 4: Summary of Stock and Market Performance

Panel A: Stock and Market Return (in percentages)

	Exercising CEOs		Non-Exercising CEOs		Difference of Means Test	Non-parametric Test	
	Mean	Median	Mean	Median	t-statistics	Ranksum Test z-statistics	Median Test z-statistics
Return							
Stock Return							
Previous Year	15.99	10.97	6.59	1.24	4.83***	5.59***	4.95***
Current Year	19.86	13.95	14.35	7.43	2.76***	3.66***	3.74***
Next Year	8.41	4.29	11.91	5.33	-2.00**	-1.85*	-0.84
Market Return							
Previous Year	5.76	21.24	3.61	-11.06	2.24**	1.58	2.26**
Current Year	10.07	22.36	8.73	22.36	1.31	0.79	1.26
Next Year	4.81	0.29	4.37	0.29	0.49	-0.21	0.63
Adjusted Return							
Previous Year	10.23	6.43	2.98	0.10	3.87***	-1.58	-2.26**
Current Year	9.79	3.57	5.62	1.92	2.21**	-0.79	-1.26
Next Year	3.60	0.48	7.55	3.55	-2.40**	0.21	-0.63

Panel B: Stock and Market Return Standard Deviation (based on daily return)

	Exercising CEOs		Non-Exercising CEOs		Difference of Means Test	Non-parametric Test	
	Mean	Median	Mean	Median	t-statistics	Ranksum Test z-statistics	Median Test z-statistics
Stock σ							
Previous Year	2.42	2.18	2.60	2.35	-3.68***	-4.15***	-3.27***
Current Year	2.37	2.15	2.48	2.30	-2.31**	-2.86***	-3.18***
Next Year	2.31	2.11	2.31	2.12	-0.12	-0.64	-0.37
Market σ							
Previous Year	1.24	1.23	1.28	1.39	-2.83***	-2.25**	-2.26**
Current Year	1.25	1.23	1.26	1.23	-1.45	-1.74*	-1.26
Next Year	1.20	1.23	1.18	1.10	1.57	1.86*	1.55

*, **, *** refer respectively to significance levels at better than 10%, 5%, and 1% level.

Table 5: Probit Analysis of Option Exercising Behavior

The probit regression results for two sub-samples, CEOs with high levels of vested options, and for CEOs with lower levels of vested options, clustered by firm are shown. The dependent variable is whether the CEO exercises options in a given year (coded as one). The independent variables include; a dummy variable for Overconfidence, Return Rank, Stock Volatility, Assets, Percent of Options in the money, Size of Total Compensation package, and Options Granted during the year. *t*-statistics are shown in parentheses below the coefficient estimates.

	CEOs with high levels of vested options (*HiVest* = 1)				CEOs with low levels of vested options (*HiVest* = 0)			
	#1.	#2.	#3.	#4.	#1.	#2.	#3.	#4.
Overconfidence		-0.433	-0.428	-0.432		-0.272	-0.249	-0.252
		(-4.62) ***	(-4.48) ***	(-4.48) ***		(-2.43) **	(-2.14) **	(-2.15) **
Return Rank	0.037	0.036	0.032	0.033	0.140	0.144	0.138	0.146
	(1.07)	(1.05)	(0.92)	(0.92)	(3.87) ***	(3.98) ***	(3.71) ***	(3.87) ***
Stock Volatility	-9.942	-11.348	-15.287	-11.987	-10.561	-11.081	-13.955	-13.092
	(-2.04) **	(-2.29) **	(-2.66) ***	(-1.74) *	(-2.06) **	(-2.20) **	(-2.38) **	(-1.96) *
Assets	0.076	0.076	0.032	0.037	-0.001	-0.001	-0.022	-0.020
	(1.91) *	(1.95) *	(0.67)	(0.78)	(-0.00)	(-0.21)	(-0.41)	(-0.37)
In-the-money options	0.002	0.002	0.002	0.002	-0.000	-0.000	-0.000	-0.000
	(2.89) ***	(2.75) ***	(2.57) ***	(2.48) **	(-0.66)	(-0.67)	(-0.74)	(-0.74)
Total Compensation	-0.031	-0.034	-0.029	-0.026	-0.006	0.000	0.000	0.015
	(-1.36)	(-1.41)	(-1.27)	(-1.17)	(-0.15)	(0.01)	(0.01)	(0.38)
Options Granted	-0.002	-0.002	-0.002	-0.002	0.018	0.017	0.016	0.015
	(-1.56)	(-1.33)	(-1.59)	(-1.63)	(2.56) ***	(2.50) **	(2.31) **	(2.12) **
Intercept	-0.473	-0.289	-0.021	0.052	-0.358	-0.190	0.023	0.080
	(-1.11)	(-0.70)	(0.04)	(0..09)	(-0.82)	(0.43)	(0.04)	(0.14)
industry fixed effects	no	no	yes	yes	no	no	yes	yes
year fixed effects	no	no	no	yes	no	no	no	yes
Observations	1022	1022	1022	1022	794	794	794	794
Wald's χ^2	20.08 ***	38.91 ***	52.11 ***	56.31 ***	22.36 ***	28.23 ***	41.09 ***	50.25 ***
Pseudo R^2	1.82%	3.67%	4.61%	4.83%	2.83%	3.56%	4.79%	5.84%

*, **, *** refer respectively to significance levels at better than 10%, 5%, and 1% level.