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Do Stock Prices Incorporate the Potential Dilution of Employee Stock Options?[+]

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Abstract

Employee stock options represent a significant potential source of dilution for many shareholders. It is well known that reported earnings tend to understate the associated costs, but an efficient stock market will show no such bias. If by contrast stock prices underestimate the future costs implied by stock option grants, option *exercises* will produce negative abnormal returns. We design and implement a stock-picking rule based on predictions of stock-option exercise using widely available data. The rule identifies stocks that subsequently suffer significant negative abnormal returns using either a CAPM or the three factor Fama-French benchmarks. According to our point estimates, if the cost of employee stock options as a fraction of market capitalization is 10%, the stock will subsequently exhibit a negative abnormal return of between 3% and 5%. There is some evidence of market learning in that the abnormal returns tend to fall over time. We use a restricted sample of actual stock exercises and find that the reduced power of our trading rule does not reflect a reduced ability to predict stock option exercise. It also does not seem to reflect improved accounting disclosure since the portion of option costs recognized in diluted earnings per share appears to be priced by the market in all our sample years.

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[+] Thanks to Gene Fama for the Fama-French factors and to Stuart Gillan for data on option exercises. Thanks also to Sheridan Titman for useful suggestions and to Xifeng Diao for expert research assistance and computational support.

There has been a wide and heated debate about how exactly to value and report the costs of employee stock options. A key issue that has not been directly addressed is whether the stock market already takes account of such costs. Stock option grants do not result in any direct charge to earnings, but the economic costs often exceed earnings for high-tech firms.[1] To take an "old economy" example, in 1996 Pepsi granted stock options to its employees with a Black-Scholes value of over $500 million, equal to almost one-third of its earnings for the year. If this value were subtracted from earnings, Pepsi's price-earnings ratio for 1996 would increase from just under 34 to over 50.

Of course, this does not establish that Pepsi was overvalued. Sufficient growth prospects would warrant the higher multiple, and the motivational properties of the options could contribute to such growth. Moreover, employees usually exercise their options before their maturity date, thereby forfeiting some of the Black-Scholes value and reducing the cost to shareholders (eg., Huddart and Lang, 1996). Core, Guay and Kothari (2000) and Huson, Scott and Wier (1998) find evidence consistent with efficient pricing of stock option costs in that that market value is lower for firms with more potential stock option costs. These studies are reassuring but are only able to use current earnings and book value to control for all the relevant underlying determinants of firm value.

We use a trading rule to test whether the market appropriately values stock option liabilities, using publicly available data. If the market efficiently prices option obligations, we will not be able to earn abnormal returns based on this information. Our trading rule first makes the obvious assumption that investors effectively disregard at least a portion of the costs of stock option grants. In order to implement the rule, we make the additional assumption that prices do not reflect option costs until they materialize upon exercise by employees.[2] Our test does not rule out a "temporary" inefficiency in which the market adjusts with a lag but before the options vest and are exercised. Without a theory of such lags, searching for such an effect would inevitably

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[1] The Economist (2000) reports that the Black-Scholes value of such grants in 1999 was just over 6% of the earnings of an average S&P 500 firm, and for high-tech firms, the values often exceed earnings. Core and Guay (2000) document that the Black-Scholes value of employee stock options average almost 4% of the market capitalization of the average large corporation and the value can be as high as 24%. The Investor Responsibility Research Center (2001) reports similar figures.

[2] Not surprisingly, this idea has been expressed by others. One of the authors spoke in June 2000 to a reporter for the Surrey Times in British Columbia, Canada who complained that a high-tech stock he had invested in never went above $100. His view was that whenever the stock went near that level, employees of the company would exercise a set of options and drive the price back down. As far as we are aware, he has not exploited this predictable market movement.

result in data-snooping; in hindsight there will always be some period in which option-granting firms have lower than expected returns.

A benefit of the trading rule approach is that it forces the researcher to recognize many of the constraints that an active investor would bear in order to exploit potential mispricing. Most importantly, we *cannot* use data on actual employee exercises, as in Carpenter and Remmers (2000) and Vargus (1998). This research can ascertain whether executives made well-timed trades based on their own information, but is mute on the question of market efficiency unless the market is sluggish in its reaction to the revelation of an insider sale (see Seyhun, 1998). By contrast, we use public information to forecast future exercises and form our portfolios in anticipation of such exercises. Finally, we predict only the year in which an exercise will take place and use data at the beginning of the year to estimate the costs of such exercises. While this exposes our strategy to significant risk, it keeps transaction costs to a minimum.

Despite the above hurdles, our trading rule seems to produce abnormal performance. We use ExecuComp data on approximately 1000 stocks starting in the earliest available year (1992) to form a trading rule for each of the years 1996-99. The reason we have such a restricted time-series is that most employee options are not fully exercisable for four years. Despite this limitation, we estimate a reliable and negative relationship between abnormal returns and our measure of the unrecognized cost of employee stock options. In a regression that includes all four years of data, the relationship is significant at the 1% level for raw returns and for abnormal returns based on either a CAPM or a three-factor Fama-French (1993) benchmark. Moreover, when we adopt the Fama and MacBeth (1973) approach we continue to find that the results are significant at the 1% level for both CAPM and Fama-French abnormal returns despite having only four individual-year coefficients.

The case of Michaels Stores, a retailer of art and related supplies, illustrates how our trading rule works. Michaels Stores had approximately 15 million outstanding shares in 1994, and in that year granted over 5 million options to its employees with an exercise price equal to the current stock price of $12.3. By the end of 1997 the stock price had increased significantly. As the 1994 options would be fully vested in the next year, our trading rule predicted a large amount of option exercise and significant negative stock performance for Michaels Stores in 1998. The annual report for 1998 reports an increase in shares outstanding from 16.5 million to 21.5 million, reflecting the exercise of just over 5 million employee options. More important, Michaels had a raw stock return of just under -30% and a CAPM and Fama-French abnormal return of almost –50%. These returns are even less than our estimate of option costs for the year, which is just under 20% of market capitalization.

The above example also reminds us why a large-sample test is required. As we confirm with a restricted sample of actual exercise data, our rule is based on a reasonable but noisy estimate of future option exercises. More obviously, stock returns are affected by factors other than such exercises. For example, Michaels' annual report ascribed their negative performance to the market's unfairly dim assessment of their acquisition of Aaron's stores. The Michaels case also overstates our results. According to our point estimates of between 3 and 5% abnormal negative performance for every 10% of option costs, Michaels should have experienced abnormal returns of between 6 and 10%. Finally, Michaels Stores is one of the smaller firms in our sample and while large firms such as Pepsi also exhibit significant option cost, our rule identifies a disproportionate number of small firms. While large firms tended to outperform small firms over our sample period, all our results hold with either an explicit size control or after removing the effects of the Fama-French size factor.

There is also some indication that our trading rule becomes less effective over time. This could be because the market eventually learned how to value option obligations and indeed, there was a change in option reporting rules (SFAS 128) effective after December 1997. However, as stressed by Core, Guay and Kothari (2000), the option reporting rules do not account for the Black-Scholes values that we use. Moreover, our abnormal performance is based only on the difference between the Black-Scholes value and the intrinsic value used by SFAS 128, even in the years before the rule was effective. Put more directly, the evidence suggests that the market priced-in the portion of option costs reflected in diluted earnings as early as 1996. It is only the Black-Scholes value that appears to have been underestimated. We also check our rule against actual option exercises for a subset of our sample and find no evidence that our trading rule is less successful in predicting such exercises in later years.

While our tests control for market, size, and book-market factors it is still possible that we are picking up some version of some other anomaly. However, the most obvious and important such anomaly, the price momentum effect documented by Jegadeesh and Titman (1993), would tend to strengthen our results. All else equal, the cost of outstanding employee stock options is higher for firms that have had price increases in previous years, and our measure of option cost has a significant correlation of over 16% with stock returns in the preceding year.

I. The Data and the Trading Rule

A. Estimating the cost of option exercises

Our trading rule is based on stock option information from Standard and Poors' ExecuComp combined with market data from CRSP. ExecuComp reports key information about option grants to executives for the S&P 1500 firms starting in 1992. The database covers at most five executives, but also reports the percentage of total option grants in a given year represented by a given executive option grant.[3] We assume that other employees have options with the same exercise price as the executives, which amounts to assuming that they receive their grants at the same time. For most firms in our sample this is sufficient. But just under 35% of the firms in our sample made multiple grants to the CEO and/or to other executives. We assume that employees receive grants in the same proportion as the CEO, i.e., the CEO's grant is a scale replica of the total option grant at his/her firm. Finally, we sometimes obtain conflicting values for the total number of options granted. The reason is that firms sometimes use options granted for a subsidiary as the denominator in reporting the percentage of options granted to the total.[4] We use the maximum implied number of options since we are forming our trading rule at the level of the entire firm, but our stock selections are quite similar if we use alternative rules.

Our trading rule also requires information about when employees exercise their options, and the associated costs to shareholders. It is well-known that employees exercise grants soon after vesting if the option is "sufficiently" in the money. Huddart and Lang (1996) and Heath, Huddart and Lang (1999) both document spikes in exercise at the fourth year of an option when it is at least 10-20% in the money. Our trading rule forms portfolios at the beginning of each year and can only use information at that time. The simplest plausible approach would be to assume that options become fully vested during the fourth year of maturity and will be exercised if they *begin* the year sufficiently in the money. However, this cost is essentially the same as the one reflected in diluted earnings under SFAS 128, and effectively assumes that options not currently at the money have zero cost. We instead use the Black-Scholes value of options (adapted for continuous dividends) in their fourth year in order to exploit our current information about the volatility of the stock as well as the current price level. However, we are assuming that

[3] Thanks to Wayne Guay for alerting us to the presence of this data item along with some of its shortcomings.

[4] Thanks to Andy Halula of Standard and Poors for clarifying this issue.

exercise will take place in the year after we form our portfolios. We therefore use a maturity of only one year in our Black-Scholes values. Clearly, this is not an internally consistent way to characterize the value of the options to the employees since the Black-Scholes model would generally tell the employees to wait more than one year (unless dividend yields were sufficiently high). But it is a reasonable characterization of the costs borne by shareholders under the assumption that the employees do not have any private information about the stock's future price path.

Our precise formula for computing option cost is as follows. In 1992, we take the number, n_{1992} and weighted average exercise price of options granted, X_{1992}, for each firm and then look forward to the end of calendar 1995. At this point we estimate volatility for each firm using the previous five years of monthly data. We compute a crude "intrinsic value" version of dollar option cost as the maximum of zero and the difference between the stock price at the end of 1995 and the exercise price. This number, scaled by market capitalization, is effectively 1992's contribution to diluted earnings per share computed according to SFAS 128 (see Core, Guay, and Kothari, 2000). Our forecast of dollar option costs that will be realized in 1996 computes the Black-Scholes value of options granted in 1992 valued at the end of 1995 and assumes a one-year maturity. Finally, to isolate that portion of option cost that is not recorded in any earnings statement, we subtract the intrinsic value from our Black-Scholes value and scale by market capitalization.

More formally, for each firm we compute:

$$OpCost_{1996} = n_{1992}\left(C(P_{1995}, X_{1992}, d, \sigma, T=1) - Max(0, P_{1995} - X_{1992})\right) / MCap_{1995} \qquad (1)$$

where C() is the Black-Scholes-Merton formula adopted for the payment of continuous dividends, P_{1995} is the stock price at the end of 1995, d is the dividend yield averaged over the previous five years, σ is the estimated volatility, and T=1 is the assumed time to maturity. The next term is the intrinsic option cost at the end of 1995 and $MCap_{1995}$ is market capitalization at the end of 1995.

Our procedure is similar for subsequent years; we use options granted in 1993 to form our portfolios for 1997 and so forth. The difference is that we also track whether options granted in 1992 did in fact come into the money in 1996. If the maximum stock price in 1996 did not exceed the exercise price of options granted in 1992, we use these options as well as those granted in 1993 to compute our option cost at the end of 1996 for our portfolio choices for the year 1997. Formally, at the end of 1996 we save the maximum stock price during the year, $P^{Max}{}_{1996}$ and the associated indicator variable:

$$I_{1992} = \begin{cases} 1 \; if \;\; P_{1996}^{Max} < X_{1992} \\ 0 \; otherwise \end{cases} \tag{2}$$

We then compute the 1997 stock option cost as:

$$\begin{aligned} OpCost_{1997} &= [n_{1993}\big(C(P_{1996}, X_{1993}, d, \sigma, T=1) - Max(0, P_{1996} - X_{1993})\big) + \\ &I_{1992} n_{1992} C(P_{1996}, X_{1993}, d, \sigma, T=1)] / MCap_{1995} \end{aligned} \tag{3}$$

If again the 1992 options do not fall in the money, we retain them for the following year. We do not exogenously drop any options unless their maturity is exceeded, which is a rare event in our sample given the 9-year window and the fact that most options have a 10-year maturity.

The above procedure embodies an assumption that options vest in four years and that employees exercise such options in the first year they are vested and in the money. Both assumptions are only a rough approximation of reality. Some options are vested in 3 years and many vest 25% per year in each of the first four years. Our portfolio choices are not overly sensitive to the precise assumptions we make about vesting and exercise; if for example we use a three rather than a four-year vesting period, the rank correlation between the resulting measures of option costs is over 70%. Similarly, the rank correlation between the crude "intrinsic value" measure of option cost and our more refined measure is approximately 63%. However, it is only the difference between the Black-Scholes and the intrinsic value estimate that results in abnormal performance

B. Computing Abnormal Returns

The standard approach for estimating the abnormal performance of a trading rule uses market and other benchmarks along with the trading rule in a single regression. In our case, this strategy unduly reduces the amount of usable information. Due to the relative novelty of the ExecuComp data and the relatively long vesting period for employee stock options, we can only implement our trading rule for four years. Obviously, however, we have much richer data on market and other relevant benchmarks. In order to make use of this data, we estimate each of our firms' beta and exposure to the Fama-French factors using the previous five calendar years of monthly data. Thus, for CAPM abnormal returns in 1996 we estimate a beta for each firm using monthly returns from January 1991 to December 1995 and then define abnormal returns as raw return over 1996 minus the CRSP 1-year T-bill return plus the estimated beta times the difference between the realized return on the value-weighted S&P 500 and the T-bill return. The three factor Fama-French benchmark is implemented in the same fashion.

As an indication of the importance of using the additional data in this fashion, if we restrict ourselves to the use of contemporary annual benchmark data, our estimated betas are based on only four observations per firm and are actually negatively correlated with the contemporaneous betas supplied by CRSP. Our five-year betas by contrast are correlated with the CRSP betas at over 90%.

C. Descriptive statistics and evaluation of our rule for predicting option exercise

Table 1a summarizes the raw data. The first thing to note is that our sample size is significantly smaller than might be expected with four years of returns and the 1500 firms covered by ExecuComp. The main reason is that we must match firms' option grants with their stock return data four and more years later. To give some idea of the selection process, Table 1b summarizes key data for the overall ExecuComp sample. Not surprisingly, we tend to oversample large firms, and to undersample those firms for whom employee options are large relative to the total amount of equity capital. It is thus possible that we understate the extent to which the market misvalued employee option costs. However, all our results remain after including direct size controls in addition to the Fama-French size factor.

The option cost values in Table 1a are approximately one-third those reported in Core and Guay's (2000) study of employee stock options for a similar sample. The reason is that Core and Guay (2000) characterize the entire portfolio of options held by employees, and thus adds non-vested options. We focus attention on options that are at least four years old and that have not yet come into the money.

Table 1c uses Proxy statement data kindly provided to us by Stuart Gillan on employee option exercises for a subset of our firms for the years 1997-99. This allows us to gauge how closely our trading rule predicts the actual realized costs of such options. We reproduce some of our own numbers for this restricted sample because as the first row of the table shows, the requirement for our sample to match Gillan's tends to emphasize larger firms. Our estimates of the number of options that are at least four years old and thus fully exercisable tends to overstate the actual amount of exercise, although the difference is not statistically significant. The difference becomes somewhat narrower if we use our Black-Scholes approach and deflate the number of exercisable options by the hedge ratio.[5] More importantly, the Pearson correlation between the expected and the actual number of exercises is over 50% and this correlation is understated by the importance of some outliers; the Spearman rank correlation is 76%. The last two rows of Table 1c indicate that our Black-Scholes method tends to underestimate the actual costs of employee exercise. An obvious reason is that the market performed abnormally well in the time period we study. A less obvious reason is that Proxy Statements report the weighted average exercise price of employee options but do not report the price received by the employee. Our estimates in Table 1c use the maximum stock price for the year, which assumes that employees have perfect timing abilities in the year that they exercise. The values fall by about 15% if we use the average price for the year. Whatever price we use, the rank correlation between the realized cost and our predicted cost is 73% in 1997, 77% in 1998, and 80% in 1999. While the increase in predictive ability is not significant, it could reflect the fact that our information about outstanding employee options improves over time. The reason is that our grant data begins in 1992, so our 1997 trading rule can only use options granted in 1993 and those granted in 1992 that did not come into the money in 1996. Actual option exercises in 1997 doubtless included some options granted before 1992 which we are unable to observe. As time goes forward, such unobserved options must become less important relative to the ones we can observe.

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[5] Deflating by the hedge ratio reduces the average size of estimated option exercises by less than 10%. The large increase in stock prices over our sample period placed most options well in the money so many hedge ratios are near one.

II. Performance of the Trading Rule

A. Descriptive statistics

Table 2 provides some preliminary information on our trading rule's performance. We report summary statistics for the firms with the highest expected option cost (decile 1), for a middle decile 5, and for the firms with the least expected option cost (decile 10). The data are not inconsistent with our trading rule identifying underperformers. We can focus on the performance of decile one relative to the others because option cost is small once we leave the highest decile. The firm at the top of the second decile had an expected option cost less than 2.7% of its market capitalization and the cost is less than 0.75% by the time we enter the fifth decile. Both measures of abnormal returns (CAPM and Fama-French) are lower for the highest option cost decile and there is also a tendency for the raw returns to be somewhat lower. This conclusion holds more strongly when we look at medians rather than means, implying that the lower performance is not driven by outliers. The standard errors within deciles preclude any immediate conclusions about statistical significance and we take up this question in detail in the next subsection.

The remaining data in Table 2 indicate how important it is to control for market and the Fama-French factors. The high option-cost firms tend to have high volatility, high betas, and tend to show positive exposure to the Fama-French small-firm factor. These features are to be expected given the construction of the option cost variable. First, high volatility will tend to increase the Black-Scholes value relative to intrinsic value. Second, stock options tend to reflect a larger portion of the equity of smaller firms. Finally, option exercise prices are fixed rather than indexed to a CAPM benchmark. A firm with a high beta can significantly underperform its CAPM benchmark but still experience positive raw returns which in turn makes their employees' options relatively valuable. This is another case of the criticism that stock options allow employees to gain even when their firm is underperforming (e.g., Rappaport, 1999).

B. Tests of statistical and economic significance

Table 3 presents some straightforward regressions to assess the performance of our trading rule. We pool together the data from our 4 years and include year dummies and estimate robust standard errors allowing for both heteroskedasticity and the possibility that errors are correlated across time for each firm. The results tend to support the performance of our trading rule in that the option cost variable is associated with negative abnormal returns at the 1% level. Moreover, the effect is of appreciable magnitude. A firm with 10% of its value reflected in exercisable options tends to underperform in subsequent years by between 3 and 5%. If the market truly ignored option costs as we assume they do, and we had a perfect ex ante measure of these costs, the effect would be one-to-one. A smaller effect is to be expected given the inevitable errors in forecasting option exercises (evaluated earlier) and in identifying the portion of the cost that is not anticipated by the market.

While the results are strong, their statistical significance is in doubt. All variables in the regressions are highly significant yet the explanatory power is low. While this is a standard finding in explaining stock returns, it raises the prospect that the standard errors are understated. However, our reported standard errors allow for heteroskedasticity and correlated errors. The last two columns of Table 3 estimate median regressions to reduce the effect of outliers. The CAPM results are stronger while the Fama-French results are weaker but still significant at the 5% level.

To more directly address the possibility that we have overstated our degrees of freedom or underestimated the standard errors, Table 4 presents tests following Fama and McBeth (1973) using OLS estimated coefficients from each of our years. Despite having only four observations and three degrees of freedom, we are able to strongly reject the hypothesis that option cost has no effect on either the CAPM or Fama-French abnormal returns. The coefficients on raw returns are more variable and we are unable to reject the hypothesis that their mean is zero. The standard errors used in Table 4 are computed directly by taking the square root of summed squared deviations from the mean. We obtain smaller estimates and greater statistical significance if we augment the data by using the mean of 1000 individual bootstrapped standard error estimates with 50 replications apiece.

C. Additional results

The coefficients in Table 4 show some tendency to decline in successive years, although the effect is by no means statistically significant or consistent across all measures of abnormal returns. It is nonetheless worth further investigation as it is suggestive of the market learning how to price option liabilities, albeit slowly. Two alternative explanations are (a) that the change in option reporting rules alerted the market to the cost of such options, and (b) that firms continued to underperform when options were exercised but our rule became less successful at predicting option exercises over time. Explanation (a) is undercut by the fact that our rule always subtracts out “intrinsic” option values based on the difference between the prevailing price and the exercise price at the end of the year before we form our portfolios. This is essentially the same information reflected in diluted earnings per share under SFAS 128 and these costs never predict underperformance even in the years 1996-7 before the rule was in effect. Explanation (b) is invalidated by the fact that our option data begins in 1992 and we effectively have a fuller picture of outstanding options as time progresses. Moreover, based on the actual exercise data provided to us by Stuart Gillan, we are if anything slightly more successful at identifying exercises in later years. Specifically, the rank correlation between actual and predicted option exercises is 65% in 1996, 74% in 1997, 77% in 1998 and 82% in 1999.

While our results do not seem to be driven by outliers, there is useful information to be gleaned by inspecting the most influential observations. Only six of the 100 most influential observations for either the CAPM or the Fama-French OLS coefficients are from the same firm in adjacent years. [6] This means that our results are not driven by the systematic underperformance of some heavy option-using firms. As mentioned above, this outcome is possible because some firms face significant option costs in multiple adjacent years. There are many reasons for this pattern. First, some firms are heavy option granters in each of the years 1992-95. Second, heavy option granters tend to have high betas and thus expected returns while granting options with exercise prices that are fixed in dollar terms.[7] A useful way to summarize this effect is that our trading rule performs even better if we impose the additional requirement that no firm can have more than the mean level of unexpected option cost in adjacent years. A common-sense argument would be that the market becomes aware of option costs after it is "bitten" once by a large amount of employee option exercises. While it is doubtless possible to locate a result in the experimental psychology literature that would justify such a procedure, the fact is that we only conceived the idea after a thorough analysis of our data.

III. Conclusions and Extensions

A more sophisticated and detailed inspection of employee options could potentially yield better results. For example, our technique successfully identified Regeneron Pharamceuticals as a "loser" stock in 1997. Their outstanding shares grew from who 15.3 to almost 19 million during that year in 1996-97 along with a large negative

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[6] Influential observations are identified using the DFBETAS statistic which computes the effect of a given on the t-statistic of a chosen variable. No one observation is sufficiently important to drive the significance below 1% if it were deleted.

[7] Not surprisingly, decile firms also have a lower dividend yield than the rest of the sample. This implies that price increases will also tend to be larger, again boosting option values although the effect is not significant.

abnormal return. Our method significantly underestimated the costs of their option exercises because we used an exercise price of $13. In fact, nearly two million options issued in 1993 had been repriced in 1994 with the exercise price lowered to $4. Accounting for repricing and reload features of options would result in a more accurate assessment of realized option costs. Whether it would also idenfity abnormal returns is an open question.

Distress factors may also play a role. Our method of isolating firms with large unexpected option cost also identifies at least two firms that subsequently suffer financial distress; Gibson Greeting cards in 1998 and Finova in 1999. While the theoretical rationale for including financial leverage beyond its effect on beta is tenuous, it could at least increase our understanding of why and how our trading rule actually works.

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Table 1a: Summary Statistics for the Full Sample of 3094 Observations, 1996-99

Variable	Mean	Median	SD	Min	Max
Shares Outstanding (mill)	138	52.9	271	3.59	3272
Number of 4-year old options/Shares Outstanding (%)	3.42	1.07	15.9	0	322
Market Capitalization ($ billion)	7.19	1.61	19.8	0.0640	343
"Intrinsic" value of 4-year old options/Market Capitalization (%)	0.581	0.045	5.26	0	90.5
Unreported Option Cost/Market Capitalization (%)	1.81	0.434	4.54	0	80.9
Raw Annual Return (%)	18.3	10.5	70.1	-93.0	457
Volatility (% Standard Deviation of returns)	32.9	29.3	14.5	8.33	177
Beta[+]	1.06	0.987	0.533	-1.32	4.05
Abnormal Return (%)	-0.813	-1.33	66.2	-109	258

[+] Regression coefficient of previous 60 months raw return on the value-weighted S&P 500 index return.

Table 1b: Summary Statistics for Execu-Comp Firms with at least two years of coverage, 1992-97. Observations=8532

Variable	Mean	Median	SD	Min	Max
Number of options/Shares Outstanding (%)	5.75	0.476	83.3	0	568
Market Capitalization ($ billion)	4.51	1.19	14.2	0.020	343
Raw Annual Return (%)	19.7	13.2	100.4	-97.2	715
Beta[+]	1.10	1.057	0.577	-1.96	5.50

Table 1c: Summary Statistics for 927 firms with complete option and return data plus data on actual exercises, 1997-99. Observations=927

Variable	Mean	Median	SD	Min	Max
Market capitalization	11.3	4.88	21.1	0.640	230
Number of options exercised/shares outstanding	1.62	1.01	2.71	0	87.5
Number of four-year old options/shares outstanding	2.04	0.813	4.78	0	91.3
Realized option cost/Market Capitalization[++]	1.81	0.860	5.24	0	65.6
Predicted option cost/market capitalization	1.11	0.292	3.47	0	36.6

[+] Regression coefficient of previous 60 months raw return on the value-weighted S&P 500 index return.

[++] Estimated as maximum price during the year minus weighted average exercise price times number of options exercised.

Table 2: Summary Statistics by Decile of Option Cost/Market Capitalization

Variable	Mean	Median	SD	Min	Max
Decile 1					
% Option Cost/Mcap	12.1	8.14	10.2	2.71	80.9
Beta	1.35	1.29	0.699	-0.362	3.90
Market Cap	2.24	0.504	6.63	0.0505	66.3
Volatility	48.9	47.2	20.0	16.0	177
Raw Return	16.3	2.54	72.9	-90.3	373
CAPM Ab. Ret.	-16.7	-28.4	69.4	-165	335
SMB loading	1.12	0.961	1.32	-1.09	12.0
HML loading	-0.236	-0.144	0.452	-4.02	9.69
FF Ab. Ret.	-12.6	-16.0	45.2	-97.4	156
Decile 5					
% Option Cost/Mcap	0.523	0.525	0.122	0.270	0.748
Beta	1.04	0.967	0.500	-0.164	2.92
Market Cap	4.96	1.78	11.2	0.060	133
Volatility	29.7	27.3	9.63	14.6	69.1
Raw Return	17.2	10.9	40.9	-78.5	232
CAPM Ab. Ret.	-5.89	-4.53	40.1	-95.3	230
SMB loading	0.365	0.395	0.649	-1.50	2.93
HML loading	0.181	0.192	0.704	-1.98	2.83
FF Ab. Ret.	-7.87	-4.32	30.4	-74.4	124
Decile 10					
% Option Cost/Mcap	0.0141	0.0111	0.013	0	0.0435
Beta	0.882	0.850	0.436	-0.340	1.98
Market Cap	9.68	2.99	21.2	0.0248	178
Volatility	26.3	23.9	12.7	8.33	83.8
Raw Return	22.1	9.62	65.9	-86.8	387
CAPM Ab. Ret.	0.489	-1.43	64.1	-115	368
SMB loading	0.319	0.108	0.793	-1.41	3.10
HML loading	0.227	0.266	0.663	-2.29	1.79
FF Ab. Ret.	-4.28	-0.332	35.8	-92.1	162

Table 3: Estimates of returns for pooled sample. 3094 observations, 1996-99

Absolute t-statistics in parentheses. Standard errors for the OLS regressions are Huber-White sandwich errors allowing for correlation within firms using the Stata cluster option. Standard errors for median regressions are bootstrapped with 20 replications

Variable	Raw Returns, OLS	CAPM Abnormal Returns, OLS	FF Abnormal Returns, OLS	CAPM Ab. Returns, Median	FF Ab. Returns, Median
Intercept	0.139* (0.0217)	-0.111* (0.207)	-0.125* (0.143)	-0.263* (0.149)	-0.187* (0.0126)
Option Cost/Market Cap	-0.254** (0.103)	-0.506* (0.128)	-0.305* (0.0966)	-0.622* (0.161)	-0.213** (0.104)
Year=1996	0.0656** (0.0258)	0.0793* (0.0255)	0.109* (0.185)	0.201* (0.0176)	0.151* (0.0157)
Year=1997	0.113* (0.0256)	0.0353* (0.0259)	0.0869* (0.185)	0.174* (0.0206)	0.129* (0.0219)
Year=1998	-0.0.0778* (0.0267)	-0.0458*** (0.0260)	0.0940* (0.143)	0.0300 (0.0214)	0.0877* (0.0196)
Adj. R^2 (pseudo R^2 for median regressions)	0.083	0.051	0.058	0.042	0.047
F	26.1	13.5	11.9		

* (**) [***] indicates different from zero at 1% (5%), and [10%], respectively

Table 4: Estimates of the effect of Option Cost/Market Capitalization for each year, 1996-99

Standard errors in parentheses are Huber-White sandwich errors for annual coefficient estimates.

Year	Raw Returns	CAPM Abnormal Returns	FF Abnormal Returns
1996	-0.387*** (0.279)	-0.654* (0.242)	-0.359** (0.149)
1997	-0.354 (0.217)	-0.738* (0.249)	-0.529* (0.204)
1998	-0.357*** (0.198)	-0.492** (0.202)	-0.0904 (0.143)
1999	0.173 (0.392)	-0.129 (0.375)	-0.399*** (0.248)
Mean of Coefficients	-0.280	-0.498	-0.345
Standard deviation of Coefficients	0.157	0.133	0.0920
t-value	-1.781	-3.746	-3.742
p-value for mean of coefficients=0	0.173	0.0333	0.0332

* (**) [***] indicates that individual estimated coefficient is different from zero at 1% (5%), and [10%], respectively