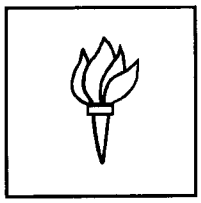

NEW YORK UNIVERSITY
STERN SCHOOL OF BUSINESS
FINANCE DEPARTMENT

Working Paper Series, 1994

Earnings Surprises and the Options Market

Donald H. Fehrs, Richard R. Mendenhall, and William D. Nichols

FD-94-31

Earnings Surprises and the Options Market

Donald H. Fehrs*
Richard R. Mendenhall**
and
William D. Nichols*

October, 1994

*University of Notre Dame
**New York University and University of Notre Dame

Numerous articles over the past few decades have documented a consistent relationship between earnings surprises and subsequent stock price performance. [See,for example, Ball and Brown (1968), Rendleman, Jones, and Latané (1982), Foster, Olsen, and Shevlin (1984), and Bernard and Thomas (1989).] Specifically, when firms announce quarterly earnings figures that are higher (lower) than market expectations, as proxied by either mechanical time-series models or commercially available analysts' forecasts, the stock price performance following the announcement tends to be abnormally good (bad). This phenomenon is referred to as post-earnings-announcement drift or the standardized unexpected earnings effect, SUE for short.

While the SUE effect has been extensively documented for equities, the effect of earnings surprise on subsequent options prices has been ignored. A potential explanation for why researchers have neglected this issue is that firms on which options are traded tend to be quite large and the SUE effect is most pronounced for small firms [see, e.g., Rendleman, Jones, and Latané (1987)]. Indeed one recent study suggests that the SUE effect is greatly diminished or may even disappear among stocks for which listed options trading is initiated [see Botosan and Skinner(1993)]. In addition, the availability of machine-readable equity-return data is much more common than machine-readable option-return data.

In this paper, we investigate whether the SUE effect exists for optioned firms and whether it exists for the options themselves. In each case the answer is that a statistically significant SUE effect does exist.

Recent Evidence on SUE

An ongoing debate is whether the SUE effect represents true abnormal performance, compensation for unobservable risk factors, or methodological errors. Recent research, however, strongly suggests that the SUE effect is caused by a failure of market participants to fully appreciate the implications of quarterly earnings announcements for future earnings levels. For example, Bernard and Thomas (1989) and Freeman and Tse (1989) show that an inordinately large fraction of the post-earnings-announcement drift occurs around the *next* quarter's earnings announcement. This result is difficult to reconcile with either the risk-compensation or methodological-error explanation of the SUE effect. It suggests that the SUE effect represents a delayed response to the information in quarterly earnings announcements that, on average, continues at least through the next announcement.

In a subsequent paper, Bernard and Thomas (1990) demonstrate a close relation between the autocorrelation structure of seasonally differenced earnings (i.e., this quarter's earnings minus earnings for the same fiscal quarter of the previous year) and the returns around consecutive quarterly earnings announcements. Specifically, they show that the returns around consecutive earnings announcements exhibit positive and declining first-, second-, and third-order serial correlation and *negative* fourth-order serial correlation. This is the same autocorrelation structure previously documented for seasonally differenced earnings [see Foster (1977)]. Bernard and Thomas (1990) show that this is the autocorrelation that would exist if investors overweighted year-to-year changes in quarterly earnings instead of using more accurate methods to forecast earnings (e.g. analysts' forecasts). An example may clarify this point. Say that a firm announces first quarter earnings above market expectations.

It then becomes somewhat more likely that it will also announce second, third, and fourth quarter earnings that also exceed market expectations (as indicated by contemporaneous positive abnormal returns), suggesting that these later expectations were not sufficiently revised after the first quarter's good news earnings surprise. In the first quarter of the following year, it is more likely that earnings will be below market expectations, and the announcement will be associated with a negative abnormal stock return, giving back some of the abnormal returns earned after the three earlier quarters' "surprises". According to the Bernard and Thomas (1990) theory, the reason the return in the first quarter of the second year is negative is that market participants compare it to the original first-quarter earnings. Recall that that announcement was above expectations, which according to Bernard and Thomas (1990) means that it was high by historical standards. Now, on average, the first-quarter announcement of the second year will tend to fall short of this historically-high previous first-quarter level and the return will be negative.

Over-reliance on year-to-year earnings changes at the expense of more accurate estimates of earnings would cause investors to underestimate the effect that a current earnings surprise has for future earnings levels. That is, it would cause investors generally to underweight the information in earnings announcements. Mendenhall (1991) shows that at least one set of market participants, professional security analysts, fails to sufficiently adjust forecasts of future earnings levels in light of current earnings surprises. In addition, he shows that market prices react to the information in analysts' forecast revisions, but not as much as

they should. That is, he documents a positive correlation between analysts' forecast revisions and the abnormal return around the ensuing earnings announcement.[1]

These studies portray a market that consists of investors with varying levels of sophistication in judging the appropriate price response to earnings surprises. More important, in this portrayal relatively unsophisticated investors play a role in setting prices. Currently, this is the most plausible explanation for the SUE effect.

Why (or Why Not) Options?

The idea that the SUE effect is caused by unsophisticated investors who affect prices is consistent with the finding that the effect is smaller for large firms. Presumably, greater numbers of better trained analysts scrutinize large firms than small firms. For example, for the large sample from which the sample used in this paper was derived, the Spearman rank order correlation between firm size and number of analysts reporting quarterly earnings forecasts to I/B/E/S was 0.76. As stated above, this means that abnormal performance associated with the effect may be difficult to detect for firms with exchange-listed options. In addition, there are other reasons to believe that the effect may be diminished for these firms.

Cox and Rubinstein (1985) argue that due to the availability of greater leverage, lower transactions costs, a lack of short sales restrictions, and other special factors, informed investors may prefer the option market to the stock market. If this is true, then option prices

---

[1] Mendenhall (1991) and Abarbanell and Bernard (1992) document a positive first-order autocorrelation in analysts' forecast errors, suggesting that analysts fail to revise sufficiently in light of earnings information. Abarbanell and Bernard show that the magnitude of the autocorrelation is insufficient to explain the SUE effect. This is consistent with Mendenhall's finding that investors tend to underreact even to analysts' inadequate revisions.

may exhibit a greater level of sophistication than equity prices. As option prices begin to come out of line with stock prices, however, arbitragers will act quickly to force stock prices into alignment with option prices.[2] The existence of option trading on a stock may, therefore, increase the level of efficiency of that stock and reduce the magnitude of the SUE effect. In a recent study, Botosan and Skinner (1993) find that, although the expected SUE effect exists for a sample of stocks prior to the commencement of options trading on those stocks, the SUE effect disappears once options are listed for trading. They suggest that the advent of options trading effectively reduces the cost of processing information and trading stocks, and the resulting increase in the market's efficiency significantly reduces the SUE effect. However, Botosan and Skinner rely upon mechanical time-series models to forecast earnings, and these methods have been shown to be less accurate and to generate errors with a lower correlation with announcement returns than analysts' earnings forecasts. We use analysts' forecasts and attempt to determine empirically whether or not the SUE effect exists for optioned stocks.

Even if the SUE effect is diminished for optioned firms, it may be worth considering the option market as a vehicle for taking advantage of the effect. Price changes of at-the-money options are magnified to several times the size of price changes in the equity market. In addition, option trading allows investors to trade on more specialized types of information, for example predicting volatility changes in addition to stock price changes. The existence and size of the SUE effect for options is the other empirical issue addressed in this paper.

---

[2] Stephan and Whaley (1990) provide results suggesting that pricing discrepancies between the option and equity market persist for an average of 15 to 20 minutes.

Data and Sample Selection

We started by constructing a sample of firm-quarter observations from the years 1983-1988 for which we could calculate a measure of earnings surprise and three-month post-earnings-announcement returns. Earnings surprise is computed by subtracting the mean forecasted earnings per share (EPS) from actual EPS and dividing this difference by the share price ten days before the earnings announcement. Actual EPS and announcement dates were obtained from Compustat while EPS forecasts were obtained from either the Institutional Brokers Estimate System (I/B/E/S) or from the Value Line Investment Survey. We obtained stock price and return data from the Center for Research in Security Prices (CRSP) tape, and the Chicago Board Options Exchange (CBOE) provided a listing of firms for which listed options were traded on any U.S. exchange over the period of study. Once this sample was constructed, we ranked observations on earnings surprise and retained those firm-quarters that ranked in the top (most positive) and bottom (most negative) quintiles. For these firm-quarter observations we collected prices for the two call-option contracts (one in-the-money, one out) nearest to being at the money and with at least three months remaining before expiration. Closing prices were collected from the *Wall Street Journal* for the second day following the earnings announcement date (the "start" date) and for the first trading day at least three months following the start date. If an option price was unavailable on a particular start date , we allowed the holding period to be shifted forward by up to two days to find a beginning option price. If an option price was unavailable on a particular finish date, we allowed the holding period to be extended forward up to two days to find an ending price. If the option price was still not available, the observation was deleted from the sample.

RESULTS

The tests consist of comparing the returns of the most positive quintile group (good earnings news) with those of the most negative quintile group (bad earnings news) for both stocks and options. We start with stocks to establish the existence of a SUE effect in the equity market for optioned firms.

Equities

We use two methods to compare the abnormal return between the good- and bad-news equities. First, using a method suggested by Foster, Olsen, and Shevlin (1984), we define the abnormal return for each firm as its 3-month holding period return minus that of the average firm of the same NYSE-AMEX size decile. Using this method we obtain an abnormal return of +1.34% for the good news firms and -2.81% for the bad news firms. Both are significantly different from zero while the difference of 4.15% is statistically significant with a t-statistic of 5.61.

The second method is a regression test based on Brennan and Copeland (1988). In this test we regress the raw firm holding period returns against three independent variables: the holding-period return of the market index; the holding period return of the market index times an indicator variable for good news; and the good news indicator variable by itself. The CRSP Value-Weighted index is used as the measure of market return.
Results are presented below:

$$\underset{}{FRET} = \underset{(-4.87)}{-0.0318} + \underset{(14.92)}{1.17}\ MRET - \underset{(-0.89)}{0.09}\ (DG*MRET) + \underset{(5.32)}{0.0464}\ DG$$

N = 1368

Adjusted R-square = 26.80%

Where FRET is the raw firm return, MRET is the raw market return and DG is an indicator variable taking on a value of 1 if the event is good news and 0 if it is bad news.

The market return variables are included in the regression to control for market-wide effects. The coefficient of 1.17 on MRET is an estimate of the average beta for the bad news firms. The (DG*MRET) term allows for different average betas across the good and bad news groups. The t-statistic of -0.89 indicates that we cannot reject the hypothesis that the groups have equal betas.

Of more importance in this paper is the coefficient on DG. It indicates a difference in returns between the good and bad news groups of 4.64% (in the expected direction) with a t-statistic of 5.32. These results are consistent with those reported for the size-decile adjusted test and lead us to conclude that a significant SUE effect exists for firms with exchange listed options.

Options

Given that the SUE effect exists for the underlying stocks, it is highly likely that it exists for the options themselves. In Table I we begin by presenting the mean and median values of several relevant option prices and return metrics for both in- and out-of-the-money options by type of earnings news. Unbracketed [bracketed] entries in the table are mean [median] values.

The first two variables are the beginning and ending prices for the three-month holding period that starts two days after the earnings announcement. As expected, in-the-money calls have higher prices than out-of-the-money calls due to their additional intrinsic

value. We also noted a higher initial price for good-news earnings options than for bad news options. Investigating this we found that it was because good-news firms had higher stock prices than the bad-news firms. The mean (median) stock price for the good-news firms at the start date was $41.64 ($34.00), while that of the bad-news was $31.25 ($27.50).

More important to this study is how the option prices change over the three-month period. The third variable, "Price Gain," shows the mean and median change in price over the holding period, Option returns are highly positively skewed, [see, for example, Bookstaber and Clarke (1984)] and as expected, the median contracts lost value in each case. While most contracts lose money, some contracts earn enough to entice investors. Notice the difference between the good- and bad-news earnings observations. In both cases (in- and out-of-the-money) the good-news contracts gain value on average, while the bad-news contracts lose value. The next variable, "Value-Weighted Return," simply divides the average gain or loss by the average Beginning Price. This is the three-month return an investor would have obtained by purchasing one contract (or N contracts) of each type. This is a reasonable weighting scheme for an investor attempting to use the option market to take advantage of the SUE effect. Although the investment is weighted by the price of the option, it provides roughly equal exposure to the price movements of the underlying securities.

The next line, "Equal-Weighted Return," indicates the return to an investor who puts the same dollar amount into each option contract. So, if one option costs $1.00 and another costs $3.00, the investor would buy three times as many of the former as the latter. It is calculated by subtracting the beginning price from the ending price and dividing by the beginning price for each option individually. This makes the option-portfolio return more

sensitive to the return performance of the stocks with low-priced options than to that of the stocks with high-priced options.

The "Market Return" variable is included to show that the good-news options outperformed the bad-news options even though the stock-market performance was generally better during the bad-news holding periods. On average, the three-month holding period return of the NYSE-AMEX Value-Weighted index was about one-percent higher during the bad-news holding periods than during the good-news holding periods. To attempt to correct for market movements and risk levels we calculated the "Abnormal Returns" based on Galai and Geske (1984). To calculate abnormal returns, an expected return is subtracted from the actual raw return. The expected return is defined by the Capital Asset Pricing Model:

$$E(ORET) = RFR + OBETA\ (MRET - RFR),$$

where RFR is the three-month treasury bill rate at the beginning of the holding period and OBETA is the theoretical option beta proposed by Galai and Geske. The option beta is the estimated beta of the stock times the hedge ratio estimated from the Black-Scholes option-pricing model times the stock price divided by the option price.

Notice that the difference in abnormal returns between the good- and bad-news options is over 34% for the out-of-the-money options and over 27% for the in-the-money options. Each of these differences is statistically significant with t-statistics of 3.10 and 4.48, respectively. Also notice that most of the abnormal performance seems to be attributable to the bad-news options. While this was true for the stocks in our sample as well, it seems somewhat more pronounced for options.

To verify the results obtained using the Galai and Geske (1984) methodology, we used the same regression test (Brennan and Copeland (1988)) that we used for equities. The results are as follows:

Out-of-the-Money

$$\underset{}{\text{ORET}} = \underset{(-2.59)}{-0.2233} + \underset{(6.20)}{6.43}\ \text{MRET} - \underset{(-0.07)}{0.09}\ (\text{DG-MRET}) + \underset{(2.51)}{0.2905}\ \text{DG}$$

N = 1278

Adjusted R-square = 6.78%

In-the-Money

$$\underset{}{\text{ORET}} = \underset{(-3.75)}{-0.1915} + \underset{(6.14)}{3.86}\ \text{MRET} + \underset{(1.15)}{0.93}\ (\text{DG-MRET}) + \underset{(3.67)}{0.2501}\ \text{DG}$$

N = 1048

Adjusted R-square = 11.53%

The regression results support those of the Galai and Geske (1984) method. Compared to the previous differences in abnormal returns between the good- and bad-news options of about 34% and 27% for the in- and out- of the money groups, here we find differences of about 29% and 25%, respectively. Again the differences are significant and attributable primarily to the bad-news options. Consistent with the previous results, a t-test indicates that the sum of the intercept and the coefficient of DG is not significantly different form zero. This implies that the good-news options did not exhibit *significantly* positive abnormal returns.

Conclusions

In this paper we show that firms for which options are listed exhibit significant post-earnings-announcement drift. The difference in three-month abnormal returns between the most positive and most negative earnings-surprise quintiles of our sample is between 4% and 5% and is statistically significant. In addition, we show that near-the-money call options on these stocks also exhibit a significant SUE effect. The difference in three-month abnormal returns for the good- and bad-news options is on the order of 25% to 35%.

For both stocks and options the SUE effect was stronger for bad-news events than for good. While the abnormal returns for the good-news stocks were significantly greater than zero, those of the good news options were positive, but not significantly different from zero.

Table I: Means and Medians of Call Option Prices and Returns
For Good and Bad News Earnings Surprises

	Out-of-the-Money		In-the-Money	
	Good News	Bad News	Good News	Bad News
N	641	637	547	501
Beginning Price	$2.37 [$1.75]	$1.69 [$1.31]	$4.60 [$4.25]	$3.93 [$3.50]
Ending Price	$2.76 [$1.00]	$1.63 [$0.50]	5.36 [$3.75]	3.64 [$2.63]
Price Gain	$0.39 [-$0.44]	-$0.06 [-$0.50]	$0.75 [-$0.19]	-$0.29 [-$0.88]
Value-Weighted Return	16.46%	-3.68%	16.30%	-7.38%
Equal-Weighted Return	30.25% [-40.00%]	9.05% [-55.6%]	21.47 [-3.45%]	-2.82% [-24.1%]
Market Return	3.71% [3.81%]	4.88% [4.53%]	3.25% [3.59%]	4.22% [3.46%]
Abnormal Return	5.91% [-44.44%]	-28.76% [-59.34%]	6.21% [-10.65%]	-20.94 [-27.04%]

*Unbracketed entries are mean values. Bracketed entries are medians.

References

Abarbanell, J. and V. Bernard. "Tests of Analysts' Overreaction/Underreaction to Earnings Information as an Explanation for Anomalous Stock Behavior." *Journal of Finance*, July 1992, pp. 1181-1207.

Ball R. and P. Brown. "An Empirical Evaluation of Accounting Income Numbers." *Journal of Accounting Research*, Autumn 1968, pp.159-178.

Bernard, V. and J. Thomas. "Post-Earnings-Announcement Drift: Delayed Price Response or Risk Premium?" *Journal of Accounting Research*, Supplement 1989, pp. 1-36.

Bernard, V. and J. Thomas. "Evidence that Stock Prices Do Not Fully Reflect the Implications of Current Earnings for Future Earnings." *Journal of Accounting and Economics*, 1990, pp. 305-340.

Bookstaber, R. and R. Clarke. "Option Portfolio Strategies: Measurement and Evaluation." *Journal of Business*, 1984, pp. 469-492.

Botosan, C. and D. Skinner. "the Relation between Post-Earnings Announcement Drift and Options Listing." University of Michigan working paper, May 1993, pp.1-22.

Brennan, M. and T. Copeland. "Beta Changes Around Stock Splits: A Note." *Journal of Finance*, 1988, 1099-1014.

Foster, G. "Quarterly Accounting Data: Time-Series Properties and Predictive-Ability Results." *The Accounting Review*, January 1977, pp. 1-21.

Foster, G., C. Olsen, and T. Shevlin. "Earnings Releases, Anomalies, and the Behavior of Security Prices." *The Accounting Review*, October 1984, pp. 574-603.

Freeman, R. and S. Tse. "The Multi-Period Information Content of Accounting Earnings: Confirmations and Contradictions of Previous Earnings Reports." *Journal of Accounting Research*, Supplement 1989, pp. 49-79.

Ho, L. "Option Trading and the relation Between Price and Earnings: A Cross-Sectional Analysis." *The Accounting Review*, April 1993, pp.368-384.

Galai and Geske. "Option Performance Measurement." *Journal of Portfolio Management*, 1983/1984, pp. 42-46.

Mendenhall, R. "Evidence on the Possible Underweighting of Earnings-Related Information." *Journal of Accounting Research*, Spring 1991, pp. 170-179.

Rendleman, R., C. Jones, and H. Latané. "Empirical Anomalies Based on Unexpected Earnings and the Importance of Risk Adjustment." *Journal of Financial Economics*, November 1982, pp. 269-287.

Rendleman, R., C. Jones, and H. Latané. "Further Insight into the Standardized Unexpected Earnings Anomaly: Size and Serial Correlation Effects." *The Financial Review*, February 1987, pp. 131- 144.