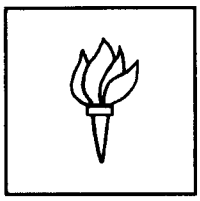

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Abstract

This study examines transactions in stocks during the thirty trading days prior to earnings announcements. Using two methodologies, we find evidence of informed trading for initiators of large transactions (presumably institutions) but not for initiators of small transactions (presumably individuals). Specifically, we find that, relative to a control period, initiators of large transactions tend to buy (sell) stocks prior to earnings announcements that exceed (fall short of) analysts' forecasts. In addition, the fraction of total stock price movement that occurs on large transactions is substantially higher during the pre-announcement period than during the control period. Results of both tests suggest, contrary to previous research, that some large traders have and use superior private information prior to large earnings surprises.

1. Introduction

In this study, we attempt to detect evidence of informed trading prior to earnings announcements. We examine stock transactions data for six weeks (thirty trading days) prior to earnings announcements for which there are large (positive or negative) analyst forecast errors. We compare the characteristics of the transactions data during this pre-announcement period with those of a control period. Using two research methods, we find evidence of informed trading for initiators of "large" trades. The rest of the introduction briefly describes the methodologies and the results of each.

Lee (1992) argues that investors possessing information regarding future price movements in a stock will most likely be the initiators of transactions. For example, an investor anticipating a near-term stock price increase (decrease) should initiate a buy (sell) transaction. Lee and Ready (1991) describe a method of using stock-market transaction data to classify each trade according to whether the initiator was the buyer or the seller.

The Lee-Ready methodology may be used to test for increased buyer- (seller-) initiated trading activity before an event that conveys good (bad) news. Lee constructs a sample of good and bad news earnings announcements and then classifies the trades around the announcements as either large or small. He explains that for the data source he uses (the same as that used in this paper), the size of the trade normally corresponds to the order submitted by the initiator. He provides evidence that his size classification method roughly indicates whether the trade initiator was an institution (large trades) or an individual (small trades).

With his size-classification scheme and the Lee-Ready method, Lee examines the buy-sell patterns of large traders (presumably institutions) and small traders (presumably

individuals) around earnings announcements. He fails to find evidence of informed trading for either small or large traders during the six and one-half trading hours (one trading day) before the earnings announcement.

One interpretation of this result is that very few investors have superior prior information regarding the nature of the news conveyed to the market by earnings announcements. This explanation is inconsistent with the findings of Amin and Lee (1993) who provide evidence of informed trading in the option market prior to earnings announcements and with those of Bernard and Thomas (1990), who show that a significant portion of the variation in returns around future earnings announcements can be explained by the pattern of previous earnings changes. Another possibility is that Lee's test design inappropriate or insufficiently powerful to detect significant levels of informed trading. For several reasons we choose to investigate the latter explanation.

Lee focuses on a very short time period before the event, 13 one-half hour time intervals (one 6.5 hour trading day). *Abnormal* buyer- (or seller-) initiated activity is defined relative to a non-event period that includes the entire year of his study (1988), except the 26 trading hours around earnings and dividend announcements that occurred during the year. This means that the non-event period includes the several weeks leading up to the earnings announcement. The results of Bernard and Thomas (1990) suggest that investors could have substantial information regarding the direction of the price response to the earnings announcement (and, of course, could be acting on it) during this time. This implies that the fraction of buyer- (and seller-) initiated trades during the non-event period could be biased so as to cause a failure to reject the null hypothesis. Finally, Lee does not select his sample on

the basis of earnings surprise. He chooses the sample on the basis of other criteria and then divides almost the entire sample into good- and bad-news events (i.e., in Lee's paper events are excluded from these tests only if the forecast is unavailable or the forecast is exactly equal to actual earnings). In other words, the power of the test is reduced because it does not focus on earnings announcements that have the greatest information content, those with the largest positive and negative surprises.

This paper also investigates for abnormal levels of buyer-initiated activity before earnings announcements. Using the Lee-Ready method to classify trades and Lee's (1992) statistical tests, we find significantly elevated levels of buyer- (seller-) initiated activity prior to good- (bad-) news earnings announcements for large transactions. One interpretation of our results is that some institutions (who are presumably initiating the large trades) are informed regarding the nature of future earnings surprises and that they act on this information. Small traders (presumably individuals) exhibit no evidence of informed trading, however, and, in fact, exhibit significantly elevated levels of *buying* prior to *bad*-news announcements. We believe the differences between our results and Lee's are attributable to three changes in the research method. First, we select the sample only from firms experiencing extreme earnings surprises. Second, we examine abnormal buyer-initiated trading activity for six weeks prior to the earnings announcement and aggregate the results over time. Finally, we use a non-event period removed by at least one year from the test period.

The other method we use to test for informed trading prior to earnings announcements was first used by Barclay and Warner (1993). Barclay and Warner cite prior research [French

and Roll (1986) and Barclay, Fitzenberger, and Warner (1990)] that suggests that most stock-price volatility is caused by private information revealed through trading. From this, they postulate that by dividing traders into groups (such as trade-size categories) and by comparing the proportion of the cumulative stock-price change that occurs in each category prior to an event, one cane infer which group includes the higher (or highest) fraction of informed traders. Results using this method are consistent with those that classify trades into buyer-and seller-initiated transactions. For both good and bad news, the proportion of the cumulative price change in the period prior to the earnings announcement that is attributable to large traders is substantially higher in the pre-event period than it is in the control period. This result is consistent with some institutions having a greater informational advantage over individuals in the period prior to extreme earnings surprises than at other times.

The rest of the paper is organized as follows. The next section describes the data sources and the method of sample selection. The third section describes the methods used to test the hypothesis. Next we present and discuss the results before summarizing the paper in the final section.

2. Data description and sample selection

The availability of transactions data limits our sample to 1988, 1989, and 1990 calendar years. For a firm-quarter to be included in the sample, sufficient data must be available to construct an earnings-forecast error. This requires actual earnings per share from *Compustat*, a recent forecast of earnings per share from *IBES*, and a stock price two weeks prior to the earnings announcement from *CRSP*. For this purpose the earnings announcement date was taken from *Compustat*. The earnings forecast error is defined as actual earnings

minus predicted earnings divided by price. We discarded all observations *except* those whose forecast errors would have placed them in one of the most extreme earnings surprise deciles (1 or 10) in the calendar quarter immediately preceding the quarter of the earnings announcement. This method includes only large earnings-surprise announcements while avoiding "hindsight" bias (see Foster, Olsen, and Shevlin [1984]). We then randomly selected 140 observations from each of the most positive and most negative deciles.[1]

Next, we obtained the exact date and time of each earnings announcement from the *Dow Jones News Service*. Finally, we collected sixty days of transactions data from tapes obtained from the *Institute for the Study of Security Markets* (ISSM) based at Memphis State University. The event period consists of the thirty trading days immediately prior to the earnings announcement of interest. The non-event period consists of the thirty trading days centered in time between the *fourth* and *fifth* earnings announcements prior to the announcement of interest. The selection of this non-event period avoids other earnings announcements and avoids problems associated with the autocorrelation of earnings surprises documented by Bernard and Thomas (1990).[2] The final sample consists of 134 good-news

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[1]We considered classifying observations according to the sign and magnitude of the prior reaction at the time of the earnings announcement. The results of Foster, Olsen, and Shevlin (1984) suggest, however, that we are less likely to detect informed trading using this method. Unlike studies using analyst (or time-series) forecast errors, they find no anticipatory stock-price movements prior to earnings announcements when partitioning their sample on the market reaction at the time of the announcement. Amin and Lee (1993), on the other hand, find evidence of informed trading in the option market prior to earnings announcements using both methods.

[2] Bernard and Thomas(1990) document that earnings surprises, as defined by seasonal random walk forecast errors or by price reaction, exhibit positive and declining first-, second-, and third-order autocorrelation. This implies that an earnings announcement occurring up to three quarters before or after a good- (bad-) news earnings announcement, has a greater than

(positive surprise) earnings announcements and 133 bad-news (negative surprise) earnings announcements.

3. Methodology

3.1 Classifying transactions by initiator

Lee (1992) provides a complete and concise description of the Lee-Ready (1991) algorithm. We use this method to classify trades as either buyer-initiated or seller-initiated. Essentially, the *relevant* quotes are defined as the most recent quotes preceding the transaction by at least five seconds (quotes updated within five seconds of the trade are ignored) and the classification depends on a comparison of the trade price to the relevant bid and ask. If a trade occurs at a price above (below) the midpoint of the relevant bid and ask, then it is considered buyer- (seller-) initiated. If the trade price is *at* the bid-ask midpoint, then the classification depends on the last price change. If the last price change was positive (negative), the trade is classified as a buy (sell).

This algorithm allows us to classify nearly all trades as either buyer (buyer-initiated) or seller (seller-initiated). Lee and Ready provide evidence suggesting that the method classifies transactions correctly about 95% of the time.

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even chance of conveying good (bad) news. To avoid this bias, we choose a non-event period prior to the fourth preceding earnings announcement. Since the fourth-order autocorrelation of seasonal random walk errors and price reactions is negative, this choice very slightly increases the power of the test in the presence of informed trading, but induces no bias under the null hypothesis of no informed trading.

3.2 Lee Statistical tests

Following Lee (1992), we classify transactions, not only as buyer- (or seller-) initiated, but also by size. Lee classifies trades as either small or large using the following algorithm (Lee [1992], p. 270):

1. Obtain the closing price of the firm as of the end of the current calendar year.

2. Compare the closing price to $10,000 and determine the largest number of round lot shares that is less than or equal to $10,000. Trades for the firm during this year at this number of shares or less are considered small trades.

Lee argues that this method approximates partitioning the sample into those trades initiated by individual investors (the small trades) and those initiated by institutional investors (the large trades). Clearly the dichotomy is not perfect, but each category probably consists of a sufficient majority of the *correct* type of investors to make the distinction between the results potentially interesting.

The statistical tests used here are identical to those used by Lee (1992) in section *5.2 Directional reaction (order imbalance)* except that he examines one-half hour periods and we examine days. Here, the trades for each firm for each day are aggregated into a single direction measure:

$$FDIR_{it}^{Z} = \frac{FBUY_{it}^{Z} - FSELL_{it}^{Z}}{TRD_{i}^{Z}} \times 100,$$

where $FBUY_{it}^{Z}$ ($FSELL_{it}^{Z}$) represents the number of buy (sell) orders for firm i, trade size Z (i.e., small or large), and day t, and TRD_{i}^{Z} is the total number of trades of size Z for firm i during the non-event period. $FDIR_{it}^{Z}$ represents a frequency-based measure of the direction

(buyer-initiated versus seller-initiated) of trading on day t. Higher values of $FDIR_{it}^{Z}$ indicate a higher proportion of buys to sells.

For each firm, for both trade-size categories, the median value m_i^Z of $FDIR_{it}^{Z}$ is computed for the non-event period. From the median, the probability that a particular $FDIR_{it}^{Z}$ will exceed the median (PM_i^Z) is calculated. That is,

$$PM_i^z = \frac{Number\ of\ FDIR_{it}^z > m_i}{Number\ of\ non\text{-}missing\ FDIR_{it}^z}.$$

For each day in the event period we compare $FDIR_{it}^{Z}$ with the non-event period median m_{it}^{Z} and define VM_{it}^{Z} as follows:

$$VM_{it}^Z = 1 \text{ if } FDIR_{it}^Z > m_i^Z$$

$$= 0 \text{ if } FDIR_{it}^Z \leq m_i^Z.$$

To determine whether there are significantly more buys than sells (or vice versa) on each day in the event period, we aggregate the VM_{it}^{Z} across firms to obtain $YMED_t^Z$:

$$YMED_{\alpha}t^Z = \frac{\sum_{i=1}^{R} VM_{it}^Z - 0.5 - \sum_{i=1}^{R} PM_i^Z}{(\sum_{i=1}^{R} [PM_i^Z(1-PM_i^Z)])^{1/2}}$$

where R equals the number of observations on day t in the event period.

Finally, we aggregate over the thirty-day event period to obtain a joint test over all days in the event period as follows:

$$CUMED^{Z} = \frac{\sum_{i=1}^{R}\sum_{t=1}^{T} VM_{it}^{Z} - 0.5 - T\sum_{i=1}^{R} PM_{i}^{Z}}{\sum_{i=1}^{R}[T\,PM_{i}^{Z}(1 - PM_{i}^{Z})]^{1/2}}.$$

Since both $YMED_t^Z$'s and $CUMED^Z$'s distributions are approximately Normal with mean zero and standard deviation 1, they can be interpreted as Z-statistics.

3.3 Barclay-Warner cumulative price movement tests

Our cumulative price movement tests are identical to those of Barclay and Warner (1993). The stock-price change that occurs on a given trade is defined as the difference between that trader's price and the price of the previous trade. For each firm the price changes are summed by trade-size category (small and large) for the event and non-event periods. Each sum is then divided by the cumulative price change for the period (i.e., the price of the last trade minus the price of the first trade of the period). This provides the proportion of the cumulative price change over the period that is attributable to trades of each size category.

Barclay and Warner claim that the proportion of the cumulative price change attributable to a class of trader (such as large or small) is a measure of that group's private information. This follows from results suggesting that most private information is revealed through trading [see, e.g., French and Roll (1986) and Barclay, Fitzgerald, and Warner (1990)]. If some large investors have superior private information prior to earnings announcements, then that informational advantage should be evidenced by large trades

accounting for a greater proportion of the cumulative price change prior to extreme earnings surprises than at other times, e.g., the non-event period.

4. Results

For the Lee(1992) tests, the daily results ($YMED_t^Z$) and the aggregate event period results ($YMED^Z$) appear in Table 1. Panel A indicates the results for earnings announcements exhibiting positive forecast errors. These results indicate significantly elevated levels of buyer-initiated activity prior to good-news earnings announcements for large transactions. The aggregate Z-statistic is 2.41 and indicates significance at the .01 level (one-tailed test). On the other hand, small transactions do not exhibit abnormal levels of buyer-initiated activity prior to good-news earnings announcements (Z-statistic =-0.36). Taken together, these results suggest that some investors engaging in large transactions (presumably institutions) anticipate the news in good-news earnings announcements, while few, if any, investors who engage in small trades (presumably individuals) have predictive ability.

For the most part, our results cannot be compared with Lee's since they overlap at most by one day. Lee uses one-half hour intervals and begins six and one-half hours prior to the half-hour of the earnings announcement. We examine calendar days, the latest of which is the last day on which trading closed before the earnings announcement (i.e., the day of the earnings announcement if it occurred after 4:00 EST, the preceding day otherwise). We fail to find any support, however, for Lee's finding that small traders tend to buy on the day preceding the earnings announcement. Recall, however, that we examine only extreme earnings surprises, while Lee's sample excludes only observations with a zero forecast error.

The results for negative-forecast-error firms are presented in Table 1, Panel B. Again there is evidence that investors initiating large trades anticipate the sign of the earnings news, at least on average over the entire six-week pre-announcement period. The aggregate Z-statistic is -3.14 which indicates a significantly (at the .01 level) elevated level of seller-initiated trades prior to bad-news earnings announcements. Surprisingly, unlike the good-news results, the daily results seem to indicate that most of the informed trading occurs in the earlier half of the event period. In fact, elevated levels of selling (although not all significant) appear in each of the first thirteen days (days -30 through -18). One possible explanation for this asymmetry is a fear, on the part of management, of legal action by shareholders upon the announcement of surprisingly poor earnings. We can only conjecture that perhaps managers convey this bad news to at least some shareholders well in advance of the earnings announcement. Those investors most likely to be informed are institutions or other large investors who are in close communication with management. These same investors are also more capable of organizing and funding legal action than are small investors.[3]

Also unlike the good-news results, investors engaging in small trades exhibit an extreme propensity to submit *buy* orders prior to *bad* news earnings announcements. The fraction of buy orders appears elevated on 23 of 30 event-period days and the Z-statistic is 4.55. At this point, we have no explanation for this apparent behavior.

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[3] If some analysts reporting to IBES were informed by managers of an impending bad-news announcement and revised their forecasts a few weeks before the earnings release, that would probably be too late to be reflected in our data set. These firms would still be classified as extreme bad-news firms.

Results for the Barclay-Warner (1993) analysis appear in Table 2. Panel A compares the event and non-event periods for the good-news sample. Notice that large trades are responsible for only 5.4% [(43.7%-41.3%)/41.3%] more total trades and 2.2% [(84.7%-82.9%)/82.9%] more of the volume for the event period than for the non-event period. The percent of cumulative price change attributable to large trades, however, increases by 45.0% [101.8%-70.2%)/70.2%] when comparing the event period to the non-event period.

Results for the bad-news group are similar. In this case, the percent of trades and percent of volume attributable to large transactions actually decline when comparing the event to the non-event period. The proportion of the cumulative price movement increases by 42.4% [(94.3%-66.2%)/66.2%]. In both the good- and bad-news cases, large trades are responsible for almost all of the cumulative price movement leading up to extremely informative earnings announcements.

5. Summary and Conclusions

Lee (1992) examines the six and one-half trading hours prior to earnings announcements and fails to find elevated levels of buyer- (seller-) initiated trading prior to good- (bad-) news earnings announcements. We use an almost identical methodology with the following alterations:

(1) The event period consists of the six-weeks prior to the earnings announcement and test statistics are aggregated over time;

(2) The non-event (benchmark) period is removed from the event period by at least one year; and

(3) The sample is constructed from observations that fall in extreme forecast error deciles only.

Our results indicate that some investors engaging in large transactions (believed to be institutions) successfully predict both positive and negative analyst earnings surprises. Investors engaging in small transactions (believed to be individuals) show no ability to predict good-news earnings announcements and tend to increase their purchases significantly prior to bad-news earnings.

In addition, we find that the fraction of cumulative price change attributable to large trades is much higher in the period leading up to extreme earnings surprises (both positive and negative) than during a control period. If most private information is revealed through trading, as suggested by prior research, this result suggests that large traders possess and act on more private information in the period prior to extreme earnings announcements than at other times. Results of both sets of tests, therefore, suggest that some large traders (presumably institutions) have and use private information prior to large earnings surprises.

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Table 1

Lee (1992) Z-statistics for abnormal buyer-initiated activity prior to earnings announcements representing large positive analyst forecast error ("good news") or large negative forecast errors ("bad news")

	Panel A - Good News				Panel B - Bad News			
	Small Trades		Large Trades		Small Trades		Large Trades	
Day	N	Z-stat.[a]	N	Z-stat.	N	Z-stat.	N	Z-stat.
-30	126	0.0557	111	0.5267	125	-0.9690	99	-0.8716
-29	125	-0.4229	112	0.4080	126	-1.7719	116	-1.2307
-28	126	-0.5215	112	0.1473	127	-0.6210	112	-0.9062
-27	127	-1.3062	117	-0.7168	125	1.7123	116	-1.9045
-26	128	0.3279	115	-1.9386	125	0.7936	112	-0.5141
-25	129	-0.8800	115	-0.4166	125	0.9974	115	-0.7673
-24	127	-0.0097	117	-0.1322	126	-1.2347	113	-1.9261
-23	128	-0.1009	111	-1.5230	122	0.6934	110	-0.4210
-22	128	0.4661	117	-1.0000	129	0.5163	116	-0.2392
-21	130	0.3706	116	-0.2205	126	0.7786	115	-1.1040
-20	125	-1.5092	114	-0.3399	127	-0.0479	113	-3.2115*
-19	126	0.3910	114	1.8253	127	0.3348	115	-1.3355
-18	127	-1.6428	117	-0.5118	125	-0.8037	110	-2.5273
-17	127	-0.7733	113	-0.4526	129	1.6119	112	0.2117
-16	128	0.1223	114	-1.3172	123	2.9597*	109	0.0625
-15	131	-0.9954	115	1.2442	128	2.1520	115	0.3942
-14	127	0.1093	113	0.2468	127	1.5827	107	-1.3537
-13	125	-0.2445	112	1.0370	128	-0.5223	110	0.6932
-12	127	0.1372	115	0.3613	125	2.0867	113	0.8123
-11	126	-0.0725	115	-0.2937	123	0.6005	111	-0.6404
-10	125	0.6944	110	0.8196	126	1.2943	110	-0.0725
-9	127	0.6204	110	2.1348	128	1.3194	109	-0.4198
-8	127	1.5782	113	0.6985	126	0.5637	105	0.5320
-7	129	-0.5299	114	1.1831	127	1.9300	107	-0.8615
-6	127	0.0095	115	0.2512	127	1.5613	106	0.6289
-5	128	0.6599	112	1.7903	128	0.6203	113	0.1704
-4	129	0.5508	113	1.5432	125	0.9515	110	-2.9646*
-3	126	-1.5296	114	0.6138	126	1.4288	110	-0.6867
-2	127	-0.0294	110	1.6988	124	0.9241	108	0.2075
-1	126	-0.1567	110	2.9006	127	0.8234	105	0.3177
-30 to -1	134	-0.3592	132	2.4118*	132	4.5507*	132	-3.1419*

[a] Positive (negative) numbers indicate a higher fraction of buyer- (seller-) initiated trades during the event period than during the non-event period.

*Significant at .01 level.

Table 2

Mean percentage of cumulative stock-price change, percentage of trades and percentage of volume by trade size for large positive-forecast-error ("good news") and large negative-forecast-error ("bad news") earnings announcements. Event period is the thirty trading days prior to the announcement. The non-event period is the thirty trading days prior to the announcement. The non-event period in thirty trading days between the fourth and fifth prior announcements.

	Panel A - Good News			Panel B - Bad News		
Trade size	Percent of cumulative price change	Percent of trades	Percent of volume	Percent of cumulative price change	Percent of trades	Percent of volume
Small trades						
Non-event	29.8	58.7	17.1	33.8	56.7	15.8
Event	-1.8	56.3	15.3	5.7	65.2	20.7
Large trades						
Non-event	70.2	41.3	82.9	66.2	43.3	84.3
Event	101.8	43.7	84.7	94.3	34.8	79.3