The "Dartboard" Column: Second-Hand Information and Price Pressure

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Abstract

This study analyzes the effect of second-hand information on the behavior of security prices and volume using analysts' recommendations published in the monthly "Dartboard" column of the *Wall Street Journal*. For the two days following the publication of the recommendations, average positive abnormal returns of 4 percent—nearly twice the level of abnormal returns documented in previous research on analyst recommendations—and average volume double normal volume levels on the two days following publication of the recommendations are documented. The positive abnormal return on announcement is partially reversed within 25 trading days. The authors conclude that the positive abnormal return on announcement of the recommendations is a result of naive buying pressure as well as the information content of the analysts' recommendations.

I. Introduction

This research analyzes security returns and trading volume around the announcement of analysts' recommendations appearing in the monthly "Dartboard" column of the *Wall Street Journal*. The evidence presented suggests that the price response observed on the announcement of analysts' recommendations is at least partially driven by buying pressure in the recommended securities.

Several researchers have documented the existence of abnormal returns on the announcement of an analyst's recommendation. Many of these researchers have concluded that investors would be prudent to follow the advice of analysts.[1] The question left unanswered by this body of research, which is addressed here,

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[1]Bjerring, Lakonishok, and Vermaelen (1983) conclude that investors following the advice of a leading Canadian brokerage house would have earned positive abnormal returns after allowing for transactions costs. Groth, Lewellen, Schlarbaum, and Lease (1979) reach a similar conclusion about the investment advice of a U.S. brokerage house. Generally positive abnormal performance on the announcements of E. F. Hutton recommendations (Glascock, Henderson, and Martin (1986)), Heinz Biel's recommendations published in *Forbes* (Lee (1986)), the *Wall Street Journal* "Heard on the Street" column (Davies and Canes (1978); Liu, Smith, and Syed (1990)) and the guest recommendations on the Wall Street Week television program (Pari (1987)) have also been documented.

is what *drives* the abnormal performance associated with these recommendations. Two potential hypotheses are investigated: the *price pressure* hypothesis and the *information* hypothesis. The price pressure hypothesis poses that the recommendation creates temporary buying pressure by naive investors in the recommended securities and this buying pressure causes the observed abnormal returns. The information hypothesis maintains that the analyst's recommendation reveals relevant information and, thus, the abnormal performance on the announcement of a recommendation represents a fundamental revaluation of the security.

This study concludes that the evidence provided by the "Dartboard" column is consistent with *both* the price pressure and information hypotheses. Stocks selected by professional analysts in the "Dartboard" column earn in excess of 4 percent (t = 10.77) abnormal returns for the two days after the publication of the recommendations in the *Wall Street Journal*. This price response is nearly double that documented in previous research on analysts' recommendations. Furthermore, about half of this initial price response is reversed within 25 trading days—a finding that is consistent with the price pressure hypothesis. This paper also documents that average volume on the day of publication of the analysts' recommendations is more than double normal volume levels. Finally, consistent with the price pressure hypothesis, the paper documents that the securities with the largest abnormal volume on the publication day experience, on average, a larger initial price response *and* a larger subsequent price reversal.

These empirical findings suggest certain investors buy securities based on professional analysts' recommendations. This buying pressure leads to a *temporary* price response in the recommended securities. The fact that a portion of the initial price response is permanent suggests there is also some information contained in the recommendations.

II. The Data

The "Dartboard" column has been published monthly in the *Wall Street Journal* since October 4, 1988. In this column, the *Wall Street Journal* selects four investment analysts and asks them to recommend one stock each. The four selections of the investment analysts are called the "Pros' Picks." The *Wall Street Journal* compares the performance of these four stocks to the performance of four securities that are randomly selected. The dartboard stocks literally are selected by the throw of a dart by *Journal* staffers. The *Journal* refers to the randomly selected securities as "Dartboard Stocks." This paper analyzes the return and volume behavior of the Pros' Picks and Dartboard Stocks for the first two years of the column—through October 1990. Data are available for 95 of the Pros' Picks and 94 of the Dartboard Stocks.

Daily price, return, and volume data were compiled for the Pros' Picks and Dartboard Stocks from FactSet Data Systems. Table 1 presents key characteristics of the Pros' Picks, the Dartboard Stocks, the Standard & Poor's 500, and NYSE Firms. Values were calculated for the 95 Pros' Picks and the 94 Dartboard Stocks as of September 30, 1989, for ease of comparison. This date represents the midpoint of the sample. The Pros' Picks are approximately the same size as the Dartboard Stocks and the median size of NYSE firms. The Pros' Picks, however, have

substantially lower dividend yields, substantially higher historic and projected EPS growth, and slightly higher PE ratios and betas. It is suspected that these differences are driven by selection biases professional analysts have—selecting high growth firms with the attendant low dividend yields. Low yielding stocks were also prudent in this particular contest since only capital appreciation is used to measure performance. These differences offer no reason to predict abnormal performance of the Pros' Picks relative to the Dartboard Stocks or market averages.

TABLE 1

Median Characteristics of 95 Pros' Picks, 94 Dartboard Stocks, S&P 500, and NYSE Firms as of September 30, 1989

	Mkt. Value of Equity ($mm)	Div. Yield (%)	PE Ratio	Mthly $ Volume ($mm)	Beta	EPS Growth (%) Five-Year Historic	EPS Growth (%) IBES Projected
Pros' Picks	623.7	0.7	14.2	59.6	1.16	20.6	14.0
Dartboard Stocks	608.7	2.1	13.5	31.3	1.00	3.6	10.0
S&P 500	2,435.7	2.5	14.6	136.2	1.11	11.7	11.0
NYSE Firms	519.6	2.1	13.9	19.5	1.02	7.6	11.5

Market value of equity outstanding as of 9/30/89.

Dividend Yield is Compustat "Indicated Annual Dividend" divided by 9/30/89 closing price.

PE ratio is 9/30/89 closing price divided by sum of last four reported quarterly earnings as of 9/30/89.

Average monthly dollar volume in quarter preceding 9/30/89 for each firm.

Beta is estimated over 60 months prior to September 1989, from OLS regression using value-weighted S&P 500 Index as market proxy.

Five-year historic EPS Growth is calculated from Compustat EPS figures based on 20 quarters ending the second calendar quarter of 1989.

IBES Projected EPS Growth is based on the median IBES Long-Term Growth Forecast as of September 1989.

III. Excess Returns

The well-known market model technique is used to calculate abnormal returns around the publication of the Pros' Picks in the *Wall Street Journal*. The parameters of the market model were estimated over a period that extends from 125 days prior through 26 days prior to the publication day and abnormal returns were calculated for the 51 days centered around the publication day, day $t = 0$ being the publication day.[2] The return on the CRSP equal-weighted NYSE/ASE/NASDAQ index is used as a proxy for the return on the market portfolio. All test statistics on abnormal returns and cumulative abnormal returns are calculated using a method implemented by Mikkelson and Partch (1988) and described by Salinger (1992), which accounts for the intertemporal correlation in estimated abnormal returns. Table 2 presents the results of this analysis.[3]

[2]The market model was also calculated using the aggregated coefficients (three lagged and one lead variable) method of Dimson (1979), a simple market adjustment model, a beta only adjustment, and various alternative indexes. The results are similar to those using ordinary least squares and the selected index.

[3]Four of the recommended securities were short sales. This study reverses the sign of the abnormal returns for these securities. Eight of the 95 Pros' Picks had earnings announcements or dividend

TABLE 2

Percentage Mean Abnormal Returns ($\overline{AR}_t$) and Cumulative Abnormal Returns ($\overline{CAR}_t$)[1] in Pros' Picks and Dartboard Stocks around *Wall Street Journal* Publication Date

	Pros' Picks					Dartboard Stocks				
Event Day	$\overline{AR}_t$	$\overline{CAR}_t$	$t(\overline{AR}_t)$	$t(\overline{CAR}_t)$	% $AR_{it} > 0$	$\overline{AR}_t$	$\overline{CAR}_t$	$t(\overline{AR}_t)$	$t(\overline{CAR}_t)$	% $AR_{it} > 0$
−25.00	0.02	0.02	0.12	0.12	46	0.13	0.13	−0.35	−0.35	45
−20.00	−0.01	0.61	−0.08	1.25	47	0.36	0.42	1.38	0.55	60
−15.00	−0.24	0.33	−1.20	0.40	40	−0.49	−1.05	−1.41	−0.75	39*
−10.00	0.24	0.90	0.95	0.60	53	0.49	0.27	1.81	0.49	57
−5.00	0.34	0.54	1.39	0.43	55	−0.02	−0.09	−0.09	−0.18	51
−4.00	0.30	0.84	1.17	0.61	52	−0.20	−0.29	−0.28	−0.26	48
−3.00	0.02	0.86	0.12	0.63	44	−0.33	−0.62	−1.77	−0.34	41
−2 00	−0.16	0.70	−0.67	0.49	47	−0.27	−0.89	−0.50	−0.42	45
−1.00	−0 12	0.58	−0.58	0.38	48	0.09	−0.80	0.13	−0.40	41
0.00	3.53	4.11	12.19	2.43	73*	−0.22	−1.02	−0.53	−0.48	51
1.00	0.53	4.64	3.05	2.71	55	−0.05	−1.07	0.22	−0.49	44
2.00	0.03	4.67	−0.12	2.63	41	−0.48	−1.56	−1.20	−0.51	53
3.00	−0.09	4.58	−0.67	2.54	41	−0.07	−1.63	−0.01	−0.68	47
4.00	−0.47	4.11	−2.03	2.31	35*	−0.02	−1.65	−0.12	−0.69	50
5.00	−0.22	3.89	−1.46	2.20	39*	−0.15	−1.79	−0.21	−0.74	48
10.00	−0.18	4.49	−1.17	2.23	47	−1.06	−3.23	−2.33	−1.37	35*
15.00	0.08	3.73	0.84	1.91	49	1.82	−2.00	1.83	−0.51	54
20.00	−0.17	3.05	−0.80	1.40	51	1.14	−2.52	1.75	−0.80	46
25.00	0.24	2.56	1.29	1.12	54	0.13	−2.42	0.23	−0.75	49

*Null hypothesis of equal number of positive and negative abnormal returns is rejected at the 5-percent significance level.

[1]The abnormal returns are estimated as actual returns less expected returns. The market model is used to estimate expected returns with parameters estimated using Ordinary Least Squares over an estimation period beginning 125 days prior to publication and ending 26 days prior. The return on the equal-weighted NYSE/ASE/NASDAQ Index is used to proxy for the return on the market portfolio. Test statistics are calculated using a method implemented by Mikkelson and Partch (1988). There are 95 observations for the Pros' Picks on each event day; 94 for the Dartboard Stocks.

The common stocks selected by the professional analysts, on average, experience a 4.06 percent ($t = 10.77$) abnormal return over the two-day period consisting of the *Wall Street Journal* publication day and the subsequent day.[4] In contrast, the Dartboard Stocks experience no significant abnormal returns over the same period. The initial price response on publication is partially reversed within 25 trading days; from day two through day 25 following the publication day, the Pros' Picks, on average, experience a negative abnormal return of 2.08 percent ($t = -1.56$). In contrast, at conventional significance levels, the Dartboard Stocks, on average, do not experience abnormal returns over the same period ($t = -0.45$). This observation is investigated more thoroughly later in the paper and evidence is found that this modest reversal is largely a result of a more pronounced reversal in stocks that experience unusually large trading volume on the announcement of the analyst recommendation.

announcements within five days of the publication day. The price response absent these observations was also about 4 percent over the two days following publication.

[4]On average, 52 percent of the publication day return occurs from the close of trading on the previous day to the open of trading on the publication day. The average return from the open of trading to the close of trading is 1.54 percent, and represents 44 percent of the publication day return.

These results are analogous to the results of Harris and Gurel (1986) and Lamoureux and Wansley (1987), who analyze the price behavior of firms added to the S&P 500. They document that the initial price reaction to the announcement of a firm's inclusion in the S&P 500 is subsequently reversed. They conclude that the initial price response is a reaction to price pressure buying by institutional investors and that the announcement of a firm's inclusion in the S&P 500 has no information content. This position is also supported by the research of Pruitt and Wei (1989), which documents significant increases in the institutional holdings of firms included in the S&P 500. Shleifer (1986) and Dhillon and Johnson (1991) document a similar initial price reaction, but are unable to detect the reversal. Shleifer concludes there is a permanent shift in the demand for S&P 500 stocks, while Dhillon and Johnson tend to favor the information hypothesis.

The results presented here provide additional support for the existence of a buying pressure phenomenon in security markets. The initial price response on the publication of the Pros' Picks is arguably a result of price pressure buying by investors who follow the analysts' selections. If the analysts' recommendations, on average, convey information, the price response would be permanent. The subsequent reversal that this paper documents suggests that the initial price response is at least partially a result of price pressure buying.

IV. Abnormal Volume

This section documents positive abnormal volume in the Pros' Picks for at least six days after publication of the analysts' recommendations in the *Wall Street Journal*. The abnormal volume in these securities dissipates very slowly. This is in contrast to the Dartboard Stocks, which do not experience unusual volume around the publication day.

A market model for trading volume is used to measure the abnormal volume in the common stocks as outlined by Ajinkya and Jain (1989). A log transformation of dollar volume (the natural log of one plus dollar volume) is performed as suggested by Ajinkya and Jain (1989) to obtain a variable that more closely approximates a normal distribution. The market model for the log transformed trading volume,

$$\tilde{V}_{it} = \alpha_i + \beta_i \tilde{V}_{mt} + \tilde{\epsilon}_{it}, \tag{1}$$

is estimated over an "estimation window" using estimated generalized least squares (EGLS) for security i from 125 days preceding to 26 days preceding the *Wall Street Journal* publication day. The "event window" is defined as 51 days centered around the publication day. The total dollar volume in the market, V_{mt}, is defined as the log transformed dollar volume of the S&P 500.[5]

The abnormal volume in security i within the event window, AV_{it}, is defined as the difference between the actual and predicted[6] log transformed trading volume on day t,

[5]Dollar trading volume in the S&P 500 was calculated as the sum of the dollar trading volume in the 500 individual stocks composing the index. The composition of the index was updated at the beginning of each year. Abnormal volume was also estimated using a mean-adjustment model and the results were similar to those reported.

[6]The predicted trading volume is estimated accounting for the residual autocorrelation through a procedure outlined by Judge, et al. ((1982), sect. 15.4) and described by Ajinkya and Jain (1989).

$$\widehat{AV_{it}} = V_{it} - E(\tilde{V}_{it}|V_{mt}). \quad (2)$$

The standard error of abnormal volume is estimated cross-sectionally on day t. The exponent of the abnormal volume measure is the ratio of one plus actual dollar volume to one plus predicted dollar volume on day t.[7]

Table 3 presents the results of this analysis for the Pros' Picks and the Dartboard Stocks. For purposes of brevity, only the abnormal volume numbers for the 31 days around the publication day are presented. For the Pros' Picks, actual volume is nearly double predicted volume on the publication day ($e^{(0.80)} = 2.22$). This abnormal volume pattern persists for at least six days after the publication day. In addition, the point estimate for abnormal volume is positive for all 15 days after the publication day. This evidence suggests that analyst recommendations induce trading. In contrast, the Dartboard Stocks do not experience abnormal volume around the publication day. If anything, there is some evidence of abnormally low volume around the publication day in these securities.

The abnormal volume documented here is substantially larger than that documented by Liu, Smith, and Syed (1990) around the publication of the "Heard on the Street" column. The abnormal volume measure developed in this section allows this paper to better distinguish between the information and price pressure hypotheses posed at the outset of this research by analyzing the behavior of securities with differential abnormal volume on the announcement of the analysts' recommendations.

V. Analysis of Partitioned Sample

The post-announcement reversal is analyzed more closely by partitioning the securities recommended by the analysts into two subsamples. One subsample consists of firms that experience positive abnormal volume on the announcement of the analysts' recommendations (high volume subsample), and the other subsample consists of firms that experience no positive abnormal volume on the announcement of the recommendation (low volume subsample).

The price pressure and information hypotheses yield different predictions about the behavior of the two subsamples. The observation of a differential price reaction in the low and high volume subsamples is consistent with the information hypothesis, as there is considerable research that suggests volume and the flow of information are correlated (see, e.g., Holthausen and Verecchia (1990) or Karpoff (1986)). However, the information hypothesis would not predict a price reversal in either subsample. In contrast, a necessary condition for the existence of a price pressure phenomenon is a larger initial price reaction *and* subsequent reversal in the high volume subsample.

[7]Some algebra makes this observation transparent,

$$e^{\widehat{AV_{it}}} = e^{\left[\mathrm{Ln}\left(1+V'_{it}\right) - \mathrm{Ln}\left(1+E\left(V'_{it}|V_{mt}\right)\right)\right]} \quad (3)$$

$$= \frac{1+V'_{it}}{1+E\left(V'_{it}|V_{mt}\right)}, \quad (4)$$

where, V'_{it} is the dollar volume on day t and V_{it} is the transformed variable.

TABLE 3

Mean Abnormal Volume[1] in Pros' Picks and Dartboard Stocks around *Wall Street Journal* Publication Date ($t = 0$) Measured as Actual Volume Less Volume Predicted by Estimated Generalized Least Squares Volume Market Model:

Event Window: $(-25, +25)$ $AV_{it} = V_{it} - E(\tilde{V}_{it} | V_{mt})$

Estimation Period: $(-125, -26)$ $\tilde{V}_{it} = \alpha_i + \beta i \tilde{V}_{mt} + \tilde{\epsilon}_{it}$

Event Day	Pros' Picks			Dartboard Stocks		
	Obs.	$\overline{AV}_t$	$t(\overline{AV}_t)$	Obs.	$\overline{AV}_t$	$t(\overline{AV}_t)$
−15	95	−0.001	−0.01	93	−0.025	−0.29
−14	95	0.057	0.58	94	−0.042	−0.48
−13	95	0.156	1.49	94	0.046	0.56
−12	95	0.004	0.04	94	−0.156	−1.75
−11	95	−0.015	−0.15	94	0.092	0.86
−10	95	−0.012	−0.14	94	0.028	0.31
−9	95	0.052	0.59	94	−0.016	−0.17
−8	95	0.037	0.42	93	0.088	0.88
−7	95	0.061	0.66	94	−0.033	−0.31
−6	95	0.071	0.82	93	−0.122	−1.16
−5	95	0.147	1.70	94	−0.020	−0.23
−4	94	0.176	2.04	94	−0.048	−0.45
−3	95	0.155	1.66	93	−0.160	−1.90
−2	95	0.059	0.58	93	−0.178	−2.35
−1	95	0.141	1.62	93	−0.029	−0.31
0	95	0.800	6.71	94	−0.039	−0.42
1	95	0.590	4.97	93	−0.026	−0.30
2	95	0.318	3.06	94	0.002	0.02
3	95	0.367	3.92	94	−0.050	−0.46
4	95	0.320	3.20	94	−0.134	−1.33
5	95	0.291	3.40	94	−0.210	−1.93
6	95	0.190	2.13	94	0.055	0.57
7	94	0.059	0.69	93	0.031	0.36
8	95	0.155	1.81	93	−0.036	−0.37
9	95	0.249	3.15	94	−0.196	−2.05
10	95	0.136	1.56	94	−0.182	−2.14
11	95	0.085	0.99	94	−0.043	−0.45
12	95	0.139	1.66	94	−0.190	−1.93
13	95	0.119	1.31	93	−0.087	−0.85
14	94	0.173	1.99	93	0.021	0.19
15	95	0.218	2.60	93	−0.146	−1.45

[1]Volume is measured as the log of one plus dollar trading volume in each security. The exponent of the abnormal volume measure is the ratio of one plus actual trading volume to one plus predicted trading volume.

The sample is partitioned into the two subsamples by testing for the existence of abnormal volume on days $t = 0, 1$. The test statistic for each firm is calculated using the time series standard error of abnormal volume over the estimation window, $t = (-125, -26)$. The null hypothesis that abnormal volume over the two-day window is zero or significantly negative is tested against the alternative hypothesis that abnormal volume is significantly positive at the 5-percent significance level. The null hypothesis is rejected in 39 cases, thus forming the "high volume subsample." The remaining 56 firms are placed in the "low volume subsample." On average, securities in the high volume subsample experience actual volume levels three times those predicted by the volume market model, while securities in the low volume subsample experience no abnormal volume.

The mean abnormal returns are calculated for each of the subsamples around the announcement of the analysts' recommendations as before. In addition, tests

are conducted for significant differences between the two subsamples. Table 4 summarizes the results of this analysis.

TABLE 4

Mean Cumulative Abnormal Returns (%)[1] over Selected Intervals in Pros' Picks with Positive Abnormal Volume[2] at Announcement and in Pros' Picks with No Positive Abnormal Volume at Announcement

		Cumulative Abnormal Return from Day i to Day j—(i, j)							
		−25,−1	0,1	2,5	6,10	11,15	16,20	21,25	2,25
39 Pros' Picks	Mean	1.61	7.84	−2.23	−0.25	−1.93	−0.19	−0.01	−4.61
with Positive	*t*-stat	2.03	13.18	−2.52	−0.48	−1.52	−0.36	−0.01	−2.27
Abnormal Volume	% < 0	46	21*	69*	59	62	49	56	72*
56 Pros' Picks	Mean	−0.11	1.39	0.29	1.21	0.06	−1.03	−0.83	−0.30
with No Positive	*t*-stat	−0.54	2.99	0.50	1.67	0.23	−1.15	−0.78	−0.18
Abnormal Volume	% < 0	46	32*	54	39	53	56	51	49
Differences	Mean	1.72	6.45	−2.52	−1.46	−1.99	0.84	0.82	−4.31
	t-stat	1.03	5.15	−2.78	−1.76	−1.79	0.96	0.75	−2.03

*Null hypothesis of equal number of positive and negative abnormal returns is rejected at the 5-percent significance level.

[1]The abnormal returns are estimated as actual returns less expected returns. The market model is used to estimate expected returns with parameters estimated using Ordinary Least Squares over an estimation period beginning 125 days prior to publication and ending 26 days prior. The return on the equal-weighted NYSE/ASE/NASDAQ Index is used to proxy for the return on the market portfolio.

[2]Securities are classified as having positive abnormal volume if abnormal volume is significantly greater than zero using a one-tailed *t*-statistic at the 5-percent significance level. Standard errors for each security are calculated using the time series variation of abnormal volume over the estimation window.

The results support the predictions of the price pressure hypothesis. First, the high volume subsample realizes two-day abnormal returns of 7.84 percent (t = 13.18) compared to abnormal returns of 1.39 percent (t = 2.99) for the low volume subsample. Moreover, the difference in these returns of 6.45 percent is reliably positive (t = 5.15).[8] Second, the pattern of post-announcement returns in the two subsamples is significantly different. The low volume subsample has no significant price reversal from days two through 25. In contrast, the high volume subsample has abnormal returns from day two through day 25 of −4.61 percent (t = −2.27). The difference in the price reversal between the high volume subsample and the low volume subsample is reliably negative (−4.31 percent, t = −2.03). A closer partition of the excess returns from day two through 25 reveals that nearly half of the reversal is concentrated in days two through five.[9]

If indeed the initial price reaction is at least partially a response to price pressure buying, it is expected that larger price responses would be observed for those firms that are less liquid. To test this conjecture, size, mean daily volume, and standard deviation of returns are regressed on the two-day abnormal return.

[8]Tests of differences in mean abnormal return are calculated, assuming draws from distributions with same variance, different means. See Mood, Graybill, and Boes (1974), p. 435.

[9]The low volume subsample had median market values and monthly trading volume that were 52 percent and 59 percent higher than their high volume counterparts. The authors did not find this result surprising since less actively traded securities are most likely to be affected by buying pressure. Assuming a constant amount of noise trading occurs on the announcement of a recommendation, ceteris paribus, it is expected that more visible levels of percentage abnormal volume and the resulting buying pressure will occur in the lower volume securities.

Size is measured as the natural log of the market value of common equity on the day preceding the analyst recommendations. Volume is the mean of the log of one plus daily dollar volume over the period $t = (-260, -11)$. Standard deviation is the sample standard deviation of common stock returns over the same period. Size is chosen to proxy for the arrival of information. Presumably, smaller firms are less closely followed and, thus, the magnitude of the price response on the arrival of information is greater. This prediction is consistent with the Ohlson model (1979) on frequency of disclosure, for example, and consistent with the empirical findings of Stickel (1985) that small firms experience larger price reactions on the announcement of Value Line rankings changes. Volume and standard deviation of returns are selected to proxy for the liquidity of each security as there is research that suggests each of these variables is correlated with liquidity.[10] The results of this regression are presented in Table 5.

TABLE 5

Regression of Two-Day Abnormal Return ($AR_{i,t=(0,1)}$) on Size, Mean Volume, and Standard Deviation of Returns

$$AR_{i,t=(0,1)} = \alpha + \gamma_1 \text{SIZE}_i + \gamma_2 V_i + \gamma_3 \sigma_i + \epsilon_i$$

	Coefficient Estimate on:			
Intercept	SIZE_i	V_i	σ_i	R^2
23.01	0.11	−1.71	1.99	32.3%
(2.42)	(0.15)	(−2.09)	(2 02)	

t-statistics (in parentheses) are estimated using White's correction for heteroskedasticity. Size is market value of equity on the day preceding publication of the analysts' recommendations. Volume is the mean of the log of one plus daily dollar volume over the period $t = (-260, -11)$ Standard deviation is the sample standard deviation of common stock returns over the same period.

The coefficient estimates on volume and standard deviation are statistically significant and have signs consistent with the hypothesis that less liquid firms have a larger price reaction to these recommendations. After controlling for these liquidity measures, size is no longer important as an explanatory variable. The authors believe these results, in combination with the observation of a price reversal, provide additional support for the price pressure hypothesis.

Finally, while providing support for the price pressure hypothesis, these results do not allow rejection of the information hypothesis, as the price pressure and information hypotheses are not mutually exclusive. The reliably positive abnormal returns in the low volume subsample and the subsequent lack of reversal suggests there is some marginal information conveyed by the analysts' recommendations.

VI. Conclusions

This study's results contrast with prior results on the dissemination of second-hand information. Table 6 summarizes the abnormal returns documented in this and prior research. The largest abnormal return observed on the announcement of analysts' recommendations was the −2.37 percent abnormal return documented

[10] For example, Garbade (1982) discusses the relation between volume and liquidity, and Stoll (1978) discusses the relation of volatility and liquidity.

TABLE 6

Review of Second-Hand Information Literature, Type of Recommendation, Period of Study, Abnormal Returns on Recommendation Announcement, Abnormal Returns Post-Recommendation

Researcher	Type of Recommendation	Period	Abn. Ret. (%) Anmt.	Abn. Ret. (%) Post-Anmt.
Barber and Loeffler (1993)	*Wall Street Journal* "Dartboard" Column	1988–90	3.53 (12.19)	−2.08 (−1.56) [2,25]
Liu, Smith, and Syed (1990)	*Wall Street Journal* "Heard on the Street" Column Buy Recommendations	1982–85	1.54 (16.37)	−0.94 (−1.67) [2,10]
Liu, Smith, and Syed (1990)	"Heard on the Street" Column Sell Recommendations	1982–85	−1.99 (−15.46)	−0.32 (−0.37) [2,10]
Pari (1987)	*Wall Street Week* Guest Recommendations	1983–84	0.66 (5.55)	−1.42 — [2,9]
Lee (1986)	Heinz Biel's *Forbes* Recommendations	1962–79	0.87 (1.47)	n. a.
Glascock, Henderson, and Martin (1986)	E. F. Hutton's Aggressive Purchase Recommendations	1982	1.20 (3.10)	12.20 (2.14) [1,90]
Stickel (1985)	*Value Line* Rank Changes from Rank 2 to Rank 1	1976–80	0.86 (10.92)	0.01 (0.74) [7,50]
Davies and Canes (1978)	*Wall Street Journal* "Heard on the Street" Column Buy Recommendations	1970–71	0.92 (9.55)	0.03 — [2,20]
Davies and Canes (1978)	"Heard on the Street" Column Sell Recommendations	1970–71	−2.37 (−9.87)	0.85 — [2,20]
Bjerring, Lakonishok, and Vermaelen (1983)	Canadian Brokerage House Recommendations (weekly data)	1977–81	1.49 (3.76)	8.68 (2.90) [1,38]
Groth, Lewellen, Schlarbaum, and Lease (1979)	Brokerage House Recommendations (monthly data)	1964–70	1.56 —	−0.93 — [1,12]

Reported *t*-statistics are in parentheses when available. The announcement returns are calculated on the day of the announcement ($t = 0$). The post-announcement returns are calculated over the period in square brackets.

by Davies and Canes (1978) for 1970–1971 sell recommendations published in the *Wall Street Journal* "Heard on the Street" column. It can be speculated that the highly visible recommendations of the analysts selected by the *Wall Street Journal* lead to substantial buying pressure in the selected securities. The substantially larger abnormal returns documented here are potentially a result of the substantially larger circulation of the *Wall Street Journal* relative to the other methods used to disseminate analysts' recommendations. The circulation of the *Wall Street Journal* nearly doubled from 1970–1971 to 1988–1990, possibly accounting for the substantially larger abnormal returns documented here. In addition, the "Heard on the Street" column appears much more frequently than the "Dartboard" column. Lakonishok, Shleifer, and Vishny (1991) find some evidence of herding (buying the same stocks that others do) by pension fund managers in small stocks. It

is believed that this herding is most likely to occur on the announcement of a well-publicized recommendation such as that analyzed here.

Prior research has not been able to consistently document price reversals following the announcement of second-hand information. Davies and Canes (1978) and Liu, Smith, and Syed (1990) both document negative excess returns on the days following the buy recommendations in the "Heard on the Street" column, but not of the magnitude observed following the publication of the "Dartboard" column. When the initial price response is small, it is difficult to develop a powerful test of a subsequent reversal over a multi-day event window. This paper has analyzed a sample with a large initial price response and, thus, is able to establish the subsequent reversal.

These results complement a growing body of research supporting the price pressure hypothesis. In addition to the literature on the S&P 500 inclusion effect cited earlier, there is also evidence that the price response to equity issues (see Asquith and Mullins (1986)) and secondary distributions (see Mikkelson and Partch (1985)) is related to the size of the issue. This body of research, in combination with the results presented here, creates an increasingly persuasive argument that the demand curve for stocks is not perfectly elastic.

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