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Insider Trading and the Dissemination of Firms' Forecast Information

Evidence is given in this paper which indicates that corporate insiders time their trades in their firms' stock relative to the date of the disclosure of their forecasts of annual earnings. Further, insiders earn abnormal returns to their joint trading and information dissemination activities, and the paper provides measures of these returns.

It is generally supposed that corporate insiders have access to information superior to that of outsiders. Empirical work on insider trading by Jaffe (1974) and Finnerty (1976*a*, 1976*b*) has found that insiders do earn higher returns on their shareholdings than outsiders, on average. Further, insiders in different managerial positions appear to earn differential abnormal returns (Baesel and Stein 1979).[1] Investors subscribe to services which summarize insider trading activity[2] and act on the information released in the SEC's *Official Summary of Insider Trading* (Jaffe 1974). This evidence suggests that insiders do indeed have superior information and use that information in trading in their firms' securities. This paper investigates more directly the link between observed insider information and insider trading and also the link between insider trading and information-dissemination activities.

The tests reported here examine the security trading of corporate insiders around the time they make public announcements about their

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1. The results of other work on insider trading are given in the Jaffee (1974) paper.

2. Wein (1977) gives a summary of available services.

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firms' prospects—specifically, their forecasts of annual earnings. Annual earnings forecasts are published voluntarily by management and have been shown to convey information which, on average, affects stock prices (Patell 1976; Jaggi 1978; Nichols and Tsay 1979; Penman 1980). Thus there is a potential for insiders to earn abnormal returns by taking market positions prior to these announcements. The tests here assess whether there is any relationship between the timing of insiders' trades and their forecast announcements and provide measures of the abnormal returns earned by insiders, on average, from trading around the announcement of a forecast.

The possible link between insider trading and the publication of inside information has been recognized in Hirshleifer (1971) and Fama and Laffer (1971). Those who possess privileged information have an incentive to take market positions on the basis of their information and then announce their information publicly. The prevailing view among policymakers is that the functioning of orderly financial markets requires that such activity be minimized. Indeed, it is explicitly illegal for insiders to trade on their information. Hirshleifer (1971) and Ross (1978) recognize the moral hazard associated with differential information: insiders can make trading profits by trading (short) in advance of their poor management. However, it has also been suggested that insider trading may have a positive role in the economy. Manne (1966) argues that insider trading may be desirable because its rewards provide incentives for innovative activity. Demsetz (1969) and Hirshleifer (1971) suggest that insider trading permits individuals to capture the gains from information production: By permitting those with information to take market positions in conjunction with an announcement of that information, insider trading promotes the production and dissemination of information about firms and their projects. Because of the public goods nature of information, this information may not otherwise be produced, and thus there may be an underinvestment in information in the economy. The purpose here is to establish whether the link between insider trading and information dissemination exists, whatever its desirability.

Given that trading on the basis of insider information is illegal, the paper can also be seen as an examination of the effectiveness of the SEC's policing of such activity. Sections 17(a) and 10(b) of the Securities and Exchange Act of 1934, together with the SEC's Rule 10(b)-5, make it illegal for an insider to trade without public disclosure of all material facts relevant to the firm's prospects. Section 16(a) requires corporate officers, directors, and holders of more than 10% of any type of security to report transactions in their holdings to the SEC. Section 16(b) requires all profits on purchases and subsequent sale within 6 months to be returned to the corporation. The law on public disclosure

was not enforced until the Cady Roberts (1961) case in 1961.[3] This case and most subsequent cases prosecuted by the SEC dealt with selective disclosure to others (in many cases, security analysts) rather than use of information by insiders for their own trading purposes. It probably is very difficult for the SEC to gather evidence in such cases, as suggested by statements by SEC officials.[4] Prosecution efforts appear to be directed toward cases where dramatic news is withheld (as in the famous SEC v. Texas Gulf Sulphur [1969] case) or to cases where specific complaints are made against corporate officials. It is thus unclear whether the effective penalty for trading on the basis of undisclosed forecast information is at all prohibitive.

Measures of Abnormal Returns Associated with Forecast Disclosures

There are two stages to the empirical analysis. First, we examine the association between the timing of insiders' trades and their forecast disclosures. Second, we assess whether the degree of association is such that insiders earn abnormal returns and provide measures of the abnormal returns to insiders from their trading-disclosure activities. The second stage is accomplished by (real time) simulation of portfolio strategies based on observations of insiders' trades. For this analysis, it is assumed that equilibrium expected returns to holding securities, given information which is publicly available, are described by the capital asset pricing model (CAPM):

$$E(\tilde{R}_{it}) = R_{ft} + \beta_{it}[E(\tilde{R}_{mt}) - R_{ft}].$$

The quantity $\tilde{R}_{it}$ is the rate of return on security i for period t; $\tilde{R}_{mt}$ is the rate of return on the market portfolio for the same period; $\beta_{it} = \text{cov}(\tilde{R}_{it}, \tilde{R}_{mt})/\text{var}(\tilde{R}_{mt})$ is the relative risk of security i in the market portfolio in period t; and R_{ft} is the rate of return on the risk-free asset in period t.[5] The Sharp-Lintner version of the model is given here, although this is not important for the empirical tests. The ex post model,

$$\tilde{R}_{it} = \alpha_{it} + \beta_{it}\tilde{R}_{mt} + \tilde{\epsilon}_{it},$$

where $E(\tilde{R}_{it}|R_{mt}) = \alpha_{it} + \beta_{it}R_{mt}$ and $\tilde{R}_{mt}$ and $\tilde{\epsilon}_{it}$ are independent,

3. In the matter of Cady, Roberts & Co., SEC Release no. 6668, CCH Federal Securities Law Reporter, par. 76, 803 (1961).

4. See "Proof Eludes SEC in Battling Insider Trades," *Wall Street Journal* (August 13, 1980), p. 31. For a survey of insider trading cases, see Dooley (1980) and Scott (1980). It has been recently reported that the SEC is pursuing insider trading more vigorously. Since 1978 they have brought "more than 40 cases" which is "more than had been brought during the previous 44 years," according to an SEC official. See "Wall Street Doubts the SEC Will Curtail Insider Trading," *Wall Street Journal* (October 29, 1981), p. 1.

5. See Jensen (1972) and Hakansson (1977) for a review of this model.

implies and is implied by the CAPM if the parametric constraint, $\alpha_{it} = (1 - \beta_{it})R_{ft}$, is imposed.[6] The return, $\tilde{\epsilon}_{it}$, is the return on a derived security such that $\tilde{\epsilon}_{it} = \tilde{R}_{it} - (1 - \beta_{it})R_{ft} - \beta_{it}\tilde{R}_{mt}$, which requires zero investment and provides a cardinal measure of deviations from "normal" returns (Ohlson 1978). Of course, $E(\tilde{\epsilon}_{it}) = 0$, reflecting the equilibrium nature of this return. If one has private knowledge of a signal, y_i, about firm i, such that $E(\tilde{\epsilon}_{it}|y_i) \neq 0$, it is possible to form an asset which earns positive returns with zero investment. If $E(\tilde{R}_{mt} \mid y_i) = 0$, then such a strategy is an optimal and (from an experimental point of view) statistically efficient use of the information (Ohlson 1979). The expectation $E(\tilde{\epsilon}_{it} \mid y_i)$ is a measure of the expected return to the information, and, if the information is made public, ϵ_{it} is the actual return to the investment strategy based on the information.

Table 1 summarizes values of $\tilde{\epsilon}_{it}$ with respect to 1,188 announcements of annual earnings forecasts by corporate managements which appeared in the *Wall Street Journal* during the 6 years 1968–73 and for which returns data were available. A detailed description of these data and an analysis of their effects on stock prices are given in Penman (1980). The first column enumerates selective trading days relative to the publication date in the *Wall Street Journal* which is given as day 0. The daily abnormal returns are taken from the Center for Research in Security Prices (CRSP) *Daily Excess Returns File* (1977). Because of the way these excess returns are estimated,[7] the expected value of these returns may not be zero. Thus the mean excess return for each security estimated over 80 days prior to day −60 was subtracted from the excess return for each day. Column 2 gives the mean of the resulting "abnormal" returns, $\bar{\epsilon}_t$, over all firms for the respective days given in the first column. The third column gives the estimated cross-sectional standard deviation of the abnormal returns, $\hat{S}_t$, and the last column the value of $t = (\bar{\epsilon}_t/\hat{S}_t) \cdot \sqrt{1188}$.[8] Two observations can be made from these results. First, the values of $\bar{\epsilon}_t$ on days close to the *Wall*

6. If logarithmic transforms of the returns are used (as in the tests), the parametric restriction is $\alpha_{it} = R_{ft}(1 - \beta_{it}) - \frac{1}{2}(\sigma_{it}^2 + \beta_{it}^2\sigma_{mt}^2 - \beta_{it}\sigma_{mt}^2)$ where $\sigma_{it}^2 = \text{var} \log(1 + \tilde{R}_{it})$ and $\sigma_{mt}^2 = \text{var} \log (1 + \tilde{R}_{mt})$. This description of returns implies continuous trading but with the parameters of model defined over a discrete time interval. See Merton (1971, 1973).

7. The daily excess return for a security is defined as the difference between the security's daily return and the return on a portfolio of which it is a member. All returns are defined as $ln(1 + \text{return})$ and portfolio returns are weighted averages of returns of component securities. In each calendar year, securities are assigned to portfolios on the basis of a ranking of securities on their estimated relative risks, estimated from daily returns over the previous calendar year (or part of the year, if a full year's data were not available) according to procedures described in Scholes and Williams (1977). These excess returns are not strictly CAPM residuals but overcome some of the problems in estimating them.

8. The forecasts were scattered over 6 years, so it is reasonable to assume that the $\tilde{\epsilon}_{it}$'s are independent. As a check, procedures were employed (as described in Penman [1980]) which allowed for cross-sectional correlation in returns, with similar results.

TABLE 1 **Summary of Abnormal Security Returns Associated with Announcements of Corporate Earnings Forecasts**

Day t (1)	$\bar{\epsilon}_t$ (2)	$\hat{S}_t$ (3)	t Statistic (4)
−40	−.0002	.0233	−.36
−30	.0005	.0208	.75
−20	−.0003	.0231	−.52
−10	.0009	.0230	1.29
−9	.0001	.0222	.14
−8	.0003	.0234	.37
−7	−.0006	.0234	−.89
−6	.0009	.0244	1.24
−5	.0003	.0242	.39
−4	.0008	.0229	1.17
−3	.0021	.0285	3.12
−2	.0014	.0250	1.99
−1	.0092	.0334	9.49
0	.0017	.0374	1.54
1	.0017	.0254	2.25
2	.0007	.0220	1.14
3	.0010	.0234	1.51
4	.0005	.0223	.71
5	−.0004	.0214	−.72
6	−.0001	.0224	−.10
7	−.0008	.0214	−1.21
8	−.0002	.0227	−.35
9	−.0002	.0232	−.33
10	.0000	.0224	.06
20	−.0006	.0222	−.87
30	−.0000	.0230	−.06
40	.0008	.0232	1.15

Street Journal date are significantly different from zero. The dissemination of earnings forecasts by corporate managements appears to be associated with a significant revision in stock prices. By taking positions in the stocks of these firms on the basis of their private knowledge of the forecast, insiders could earn abnormal returns, on average. The mean abnormal return on day −1, where the largest effect is observed, is .92%. Many forecasts apparently become public on the day before they are reported in the *Wall Street Journal*. Second, the abnormal returns associated with the publication of the forecasts are, on average, positive. Indeed, these firms can be characterized as those enjoying "good times" in terms of earnings and security returns (see Penman 1980). Corporate officers tend to publish forecasts when they have "good news." This may indicate a desire to publish information which increases the market value of the firm and to suppress that which decreases it. It also coincides with a trading motive; given the restriction on short selling by insiders, there may be an incentive to publish only good news because purchase positions can be taken with respect

to the information. Some bad news forecasts are published.[9] Obviously "good news" and "bad news" disclosures by insiders imply different trading strategies, and this is allowed for in the experimental design of the tests which follow.[10]

Description of Insider Trading Data

The data on insider trading were collected from the *Official Summary of Insider Trading* (United States Securities and Exchange Commission 1967–74) published on the basis of trading reports which insiders must file with the commission within 10 days of the end of the month in which a trade occurs. Along with the number of shares traded, the *Summary* gives the class of shares traded, the date of the trade, the name of the trader and his or her relationship to the corporation, the nature of the ownership of shares ("direct" or "indirect"—through a trust, family member, or other intermediary), the trader's month-end holdings of securities of the firm, and descriptive footnotes indicating the character of the transaction. Prior to August 1972, the *Summary* omitted reports with less than 100 shares traded during a month. Most transactions (78% of those in the sample) were outright purchases or sales of securities, but others involved excise of options and rights (13%) and shares received as compensation, bonus, gifts, and inheritances. The tests which follow use only data on outright purchases and sales, although similar results were obtained when transactions involving an exercise of options or rights were included.

The insider trading data used in this paper were originally collected for the purpose of another study (Penman 1978). There the sample included firms making forecasts from 1968 to 1973 which had at least 5 years of returns data on the CRSP tapes prior to the fiscal year in which the forecast was made. Insider trading data were collected on firms covering the 12 months of the calendar year in which the forecast was made plus the December and November in the year prior (i.e., 14 months in all). As the tests which follow require trading data for the 3 months before and after the month in which the forecast was published, this meant that only forecasts published from February to September (inclusive) could be used. As a result of these constraints, 550 of the 1,188 forecasts were used in the tests in this paper. As the

9. Penman (1980) provides a separate description for "good news" and "bad news" forecasts.

10. The results in table 1 are based on all forecasts collected from the *Wall Street Journal*. The analysis was repeated including only 795 cases where no other announcements relevant to the firm appeared in the *Wall Street Journal* on the same day as the forecast. Results were similar to those here, with the mean daily abnormal return on day −1 of .83%.

majority of firms had fiscal years ending December 31 (65% of the original sample), the majority of forecasts in the final sample were made prior to the end of the third fiscal quarter. The returns-data constraint means that firms included were well-established firms which had been trading on the New York Stock Exchange or the American Stock Exchange for at least 5 years prior to the forecast.

Insider Trading around Forecast Announcement Dates

Table 2 summarizes insider trading in months close to the month in which the forecast was published. The 550 firms in the sample were ranked on the size of their abnormal returns at the forecast announcement date and then grouped into 20 nonoverlapping portfolios with odd-numbered portfolios containing 28 securities and even-numbered portfolios with 27 securities. The figures in the table described insider trading for each of these portfolios. Because one cannot be sure on what specific day the forecast was made public, the ranking of securities was performed, alternatively, using abnormal returns over different numbers of days near to the *Wall Street Journal* date (day 0), all of which included day −1 and day 0. One such ranking was on the basis of the abnormal return for day −1, the day where the largest effect was observed in table 1. The descriptions in table 2 are based on a ranking of securities on the basis of the observed abnormal return over 3 days, −2 to 0, defined as $\Pi_{t=-2}^{0}\ (1 + \epsilon_{it}) - 1$, but similar results were produced with alternative rankings.[11] As the abnormal returns may be drawn from distributions with different variances, the rankings were also performed after rescaling the abnormal returns to unit variance, with similar results to those reported here.

The (arithmetic) mean values of the abnormal returns for each portfolio are given in the second column of table 2 together with the mean over all portfolios at the bottom of the table. The mean and median values are positive, consistent with the results in table 1. However, some forecast disclosures are associated with a (measured) negative reaction, as indicated by the mean abnormal returns for portfolios 13–20.[12] The first line of trading figures for each portfolio gives the mean (over firms) of net purchases (purchases-sales) by insiders of the common shares of their own firms in the calendar months relative to the forecast month (month 0) given at the top of the table. (Months −4, −3, −2, and −1 are the 4 calendar months immediately preceding the forecast month, and months 1, 2, 3, and 4 the

11. The other rankings were based on abnormal returns defined over days −1 and 0, −2 to 1, −3 to 1, −3 to 4, −10 to 1, −10 to 4.

12. A further analysis revealed that the distribution of negative abnormal returns was statistically different from that which would be expected if they were drawn from a distribution with mean zero.

TABLE 2 **Insider Trading Activity Relative to Forecast Date**

Portfolio	Mean Abnormal 3-Day Return	Trading in Months Relative to Forecast Month										Mean Shares Outstanding (in Thousands)
						Month 0						
		Month −4	Month −3	Month −2	Month −1	Before Forecast	After Forecast	Month 1	Month 2	Month 3	Month 4	
1	.1443	−2,175	1,346	−682	685	6,679	52	−2,253	393	−618	−947	3,743
		(−2)	(6)	(5)	(15)	(1)	(1)	(9)	(1)	(−10)	(−8)	
2	.0860	−951	374	−1,154	−2,924	53	−10,728	−8,108	−1,801	−4,622	881	10,538
		(−16)	(7)	(36)	(7)	(2)	(−3)	(−14)	(−11)	(6)	(−5)	
3	.0628	−330	−1,096	−3,248	812	−165	−725	−1,349	486	−442	−2,446	8,179
		(1)	(−3)	(23)	(16)	(−2)	(−2)	(4)	(28)	(1)	(14)	
4	.0507	−1,186	−750	−318	−1,258	79	70	2,680	−221	2,237	1,811	6,930
		(15)	(5)	(16)	(10)	(−1)	(7)	(6)	(25)	(0)	(8)	
5	.0408	−750	−2,445	−859	−19	150	−59	3,717	83	888	673	7,223
		(−10)	(−2)	(−3)	(4)	(8)	(2)	(4)	(15)	(11)	(2)	
6	.0308	−36	−183	638	−259	292	−865	−4,628	−666	−208	−171	12,583
		(−3)	(8)	(8)	(−5)	(14)	(−2)	(−25)	(−14)	(9)	(−1)	
7	.0254	−1,429	230	−808	12	−940	−9	−329	−581	−478	−1,138	12,339
		(−15)	(5)	(12)	(18)	(6)	(3)	(19)	(6)	(25)	(24)	
8	.0196	−12	−482	−635	−232	−2,807	402	−992	−1,730	−775	−647	17,135
		(−5)	(2)	(−1)	(2)	(1)	(−2)	(−7)	(−13)	(−2)	(−12)	
9	.0149	−1,534	−2,831	−1,484	5,692	460	361	−990	−1,760	−355	208	29,895
		(−7)	(−11)	(4)	(14)	(3)	(3)	(−3)	(−1)	(−1)	(4)	

10	.0113	−1,248	−2,489	−2,196	−35,804	150	−231	−1,300	−2,709	−2,575	−775	19,866
		(−1)	(−2)	(−11)	(−14)	(2)	(−3)	(−8)	(−7)	(−22)	(−16)	
11	.0068	−356	−1,919	−412	203	93	279	189	−259	85	22	30,416
		(−9)	(−1)	(−9)	(13)	(4)	(2)	(3)	(−6)	(12)	(−2)	
12	.0020	1,586	711	−2,147	275	274	227	−113	−559	−587	−633	10,408
		(34)	(19)	(−1)	(12)	(2)	(14)	(−5)	(2)	(5)	(−5)	
13	−.0013	−421	204	−221	−142	119	−7	−794	−1,500	−1,607	−202	10,117
		(−10)	(−3)	(−5)	(−3)	(0)	(0)	(−10)	(−8)	(−14)	(−1)	
14	−.0040	−1,062	−1,318	879	340	−283	−14	−132	1,528	−830	−596	12,551
		(−11)	(−45)	(−14)	(−1)	(−6)	(−3)	(−3)	(−2)	(−10)	(−6)	
15	−.0084	440	−108	150	−5,162	1,309	5,667	7,010	−475	−8,686	−1,506	21,877
		(3)	(−16)	(−4)	(9)	(1)	(11)	(21)	(−13)	(−12)	(−16)	
16	−.0149	88,743	2,917	−36,110	−2,299	−2,279	−259	−269	−12	−9,760	−6,642	20,604
		(−4)	(13)	(−11)	(13)	(−2)	(3)	(−2)	(−5)	(−7)	(−21)	
17	−.0220	−1,723	−2,094	−6,430	−592	−929	82	−1,943	−903	−814	−1,979	13,311
		(−11)	(−10)	(−12)	(2)	(−24)	(0)	(−9)	(−7)	(−14)	(−20)	
18	−.0308	−183	−1,874	−595	5	−1,129	52	−1,061	911	−80	−120	15,703
		(−11)	(0)	(−3)	(−4)	(−6)	(8)	(−7)	(11)	(21)	(−1)	
19	−.0501	−146	−2,017	−7,646	141	−44	−21	−106	−451	1,937	−551	9,919
		(38)	(−20)	(−15)	(7)	(2)	(1)	(−3)	(11)	(0)	(−2)	
20	−.0900	−599	−3,269	−3,151	−954	−364	−374	−851	−703	−5,677	−109	14,073
		(−3)	(−17)	(−4)	(−6)	(−8)	(−3)	(−16)	(−10)	(−22)	(−4)	
Grand	.0138	3,831	−855	−3,322	−2,074	36	−305	−581	−546	−1,648	−743	14,370
Means		(−27)	(−65)	(11)	(109)	(−3)	(37)	(−46)	(5)	(−24)	(−68)	

NOTE.—Odd-numbered portfolios contain 28 securities; even-numbered, 27 securities. The first line of trading figures for each portfolio gives the *mean* net purchases (shares purchased − shares sold) in the respective months. The figures in parentheses are the *total* number of net purchase transactions (number of purchase transactions − number of sale transactions) in the respective months.

4 months immediately after). For month 0, the mean net purchases for trades within the forecast month but before the day of the forecast announcement and the mean net purchases for trades within the forecast month but after (and including) the day of the forecast announcement are given separately.[13] On the second line (in parentheses) the *total* number of insider net purchase transactions (number of purchase transactions − number of sale transactions) for the portfolio in the respective months is given.

In the absence of data covering a history of insider trading (which would provide estimates of "normal" trading), it is difficult to assess abnormal trading associated with the observed abnormal returns. However, if insiders time their trades relative to their forecast announcements, one would expect to see more purchases (and fewer) sales of shares before an announcement resulting in an upward revaluation of firms than after, and fewer purchases (more sales) prior to announcements resulting in a downward revaluation of firms than after. These patterns are evident in table 2. For 15 of the 20 portfolios, mean net purchases in month 0 before the forecast date relative to those after are in the direction predicted by the sign of the mean abnormal return. The exceptions are portfolios 7, 8, 11, 13, and 20, only one of which falls in the top six or bottom six portfolios where one would expect the pattern to be strongest. A similar comparison for the number of net purchase transactions reveals only three portfolios (4, 12, and 19) where the direction of the differences is inconsistent with the sign of the mean abnormal return for the portfolio. Of the 12 portfolios with a positive mean abnormal return, nine exhibit net purchases in month −1 which are greater than those in month 1, and 10 total net purchase transactions in month −1 which are greater than or equal to those in month 1. However, of the eight portfolios with negative mean abnormal returns, five have mean net purchases in month −1 which are greater than in month 1, while seven have total net purchases which are greater in month −1 than in month 1. Looking at months −2, −3, and −4 relative to months 2, 3, and 4, respectively, there do not appear to be any persistent differences in the trading figures for portfolios with positive mean abnormal returns, but for portfolios with negative mean abnormal returns, net purchases and net purchase transactions in month −2 are, in general, lower than in month 2.

Table 3 highlights the main results from table 2. Here net purchases

13. An average was calculated over the day of the month on which the forecast was published. For no portfolio was the average greater than 20 or less than 13, and for 18 of the 20 portfolios it was between the fourteenth of the month and the eighteenth of the month. Hence, the forecast comes out near the middle of the month, on average, for all portfolios, so at the portfolio level the amount of time before and after the forecast date in month 0 is about the same.

TABLE 3 Comparisons of Net Purchases before and after Forecast Date for Selected Portfolios

Portfolio Group	Mean Abnormal 3-Day Return	$\overline{IT}_0$	$\overline{IT}_1$	$\overline{IT}_2$	$\overline{IT}_3$	$\overline{IT}_4$	Mean Shares Outstanding (in Thousands)	$\overline{T}_0$	$\overline{T}_1$	$\overline{T}_2$	$\overline{T}_3$	$\overline{T}_4$
1–4	.0860	4494	6080	5016	5846	4860	7,348	.690	1.115	1.012	.955	.749
		(3)	(40)	(77)	(95)	(84)						
11–14	.0009	−71	311	33	188	457	15,873	.014	.074	.120	.187	.245
		(−13)	(23)	(5)	(−18)	(0)						
17–20	−.0482	−551	89	−4,080	−5,235	−5,208	13,252	−.127	−.013	−1.448	−1.605	−1.767
		(−42)	(−8)	(−47)	(−72)	(−32)						

NOTE.—Portfolios 11–14 are the four portfolios with the lowest absolute values of mean abnormal returns. $\overline{IT}_m$ = mean of $[P_{mb} - S_{mb}] - [P_{ma} - S_{ma}]$ over firms in the sample, where P_{mb} = shares purchased in the m months before forecast date, S_{mb} = shares sold in the m months before forecast date, P_{ma} = shares purchased in the m months after forecast date, S_{ma} = shares sold in the m months after forecast date, $m = 0$ refers to the period within the forecast month but before or after the date of the forecast. $\overline{T}_m$ is defined the same as $\overline{IT}_m$, except all trades are standardized by shares outstanding (in thousands).

before the forecast date are compared with those after for firms in the top four portfolios (which have a mean abnormal return of 8.6%), those in the bottom four portfolios (with a mean abnormal return of −4.8%), and those in the four portfolios with the lowest absolute value of the mean abnormal return, portfolios 11–14 (with a mean abnormal return of .09%). The measures, IT_m, $m = 0$–4, are the net purchases in the m months before the forecast date (including net purchases in month 0 before the forecast date) minus net purchases in the m months after the forecast date (including net purchases in month 0 on or after the forecast date). A more formal definition is given in the notes to the table. Note that $IT_1 = IT_0$ + net purchases in month −1 minus net purchases in month +1, $IT_2 = IT_1$ + net purchases in month −2 minus net purchases in month 2, and so on. The figures in parentheses refer to total net purchases transactions calculated in the same way. For portfolios 1–4, exhibiting relatively large mean abnormal returns, the values of these measures are considerably larger than the corresponding values for portfolios 11–14, where there is, on average, a relatively low market reaction to the forecast. With the exception of the value of $\overline{IT}_1$, which is positive but relatively small, the measures for the bottom four portfolios with a relatively large negative mean abnormal return are also relatively large and negative. The results are similar if one calculates these figures for the top and bottom five or six portfolios. So it appears that, where the forecast has a significant effect on stock prices, we do observe, on average, trading patterns consistent with the direction of the effect of the announcement. These data do suggest that insiders use their forecast information in trading and time their trades relative to the forecast date.

Comparisons of trading across firms on the basis of the figures presented assume that shares traded are in equivalent units. The difference between net purchases in two portfolios for a given month (although not the signs) could be due to the fact that the shares are denominated differently in terms of market value. At the far right of table 2 and in the middle of table 3, the mean number of total shares outstanding (in thousands) for firms in the relevant portfolio(s) is given. For each firm, the shares outstanding are the average shares outstanding over the fiscal year in which the forecast was made. These figures make the inferences even stronger. Mean shares outstanding are considerably higher for portfolios near to the median abnormal return than for the extreme portfolios where the trading patterns are suggested, particularly for portfolios with high positive mean abnormal returns. This means that not only is the size of the differences of the number of shares traded before and after the forecast greater for the extreme portfolios, but also the differences relative to shares outstanding are probably even greater. These insiders probably were buying or selling a greater *proportion* of their firms than would be

TABLE 4 **Comparisons of Purchases and Sales before and after Forecast Date for Selected Portfolios**

Insider Trading Measure	Portfolio Group	Standardized Trades for Values of m				
		0	1	2	3	4
$P_{mb} - P_{ma}$	1–4	.487	.415	.845	1.184	1.138
	11–14	.013	.081	.001	.029	.105
	17–20	−.095	−.020	−.215	−.322	−.313
$S_{mb} - S_{ma}$	1–4	−.203	−.700	−.167	.229	.389
	11–14	−.001	.006	−.119	−.158	−.140
	17–20	.032	−.007	1.238	1.283	1.455
$P_{mb} - S_{ma}$	1–4	.258	−.271	.156	.532	.512
	11–14	.032	.057	−.196	−.345	−.329
	17–20	.006	.011	−.085	−.251	−.282
$S_{mb} - P_{ma}$	1–4	.027	−.015	.522	.881	1.014
	11–14	−.020	.030	.078	.216	.294
	17–20	−.069	−.039	1.113	1.212	1.425

NOTE.—See note to table 3 for definitions of insider trading measures. Trades are standardized by shares outstanding (in thousands).

indicated by looking at the undeflated trading figures. To confirm this, means of deflated measures, $\overline{T}_1$, $\overline{T}_2$, $\overline{T}_3$, and $\overline{T}_4$, are given in the last four columns of table 3. These measures are calculated in a similar way as $\overline{IT}_1$, $\overline{IT}_2$, $\overline{IT}_3$, and $\overline{IT}_4$, except that each trade is deflated by shares outstanding (in thousands). The value of $\overline{T}_1$ for portfolios 1–4 (e.g.) indicates that insiders of these firms net purchased .1115% more of their firms in the month prior to the forecast relative to the month after, while the value of $\overline{T}_2$ for portfolios 17–20 indicates that insiders of these firms net sold .1448% more of their firms in the 2 months prior to the (on average) negative forecast announcement than in the 2 months after. The observation that firms with a smaller number of shares outstanding appear to have a larger reaction to their forecast announcements is itself interesting and will be discussed further in the next section.

Insiders can benefit from the timing of trades relative to a good news announcement by purchasing before the forecast date or selling after. Similarly, they can sell before a bad news announcement or defer purchases until after. The trading measures in tables 2 and 3 capture all these trading patterns and thus provide a comprehensive summary of insider trading activity around the forecast date. However, the aggregation involved does obscure some relationships. Effectively, a sale after the forecast date is treated as equivalent to a purchase before. Table 4 reveals further relationships. In the first panel of the table, purchases before the forecast date for the three portfolio groups in table 3 are compared with purchases after. In the second panel, sales before are compared with sales after. All trades are standardized by shares outstanding (in thousands). The figures indicate that trading

with respect to good news forecasts involves both higher relative purchasing before the forecast date and higher relative selling after. The former appears to be stronger, particularly in months further out from the forecast month. Trading with respect to bad news forecasts appears largely to involve higher relative selling before the forecast date, although some timing of purchases is also evident. Note that, while purchases and sales with respect to good news forecasts appear to take place close to the forecast date, trading with respect to bad news is only evident 2 months out from the forecast month.

In the last two panels of table 4, purchases before the forecast date are compared with sales after, and sales before with purchases after. These comparisons provide a measure of round-trip trading at the firm level. Of particular interest is the comparison of purchases before the forecast date minus sales after for good news firms. It appears that from the first line of the third panel that purchases in the 2 months prior to the forecast are roughly matched with sales after. This does not necessarily imply round-trip trading by individual insiders, however, as the sales could be by persons who are different from those who purchased. Given that there is little relative trading in the month either side of the month of bad news forecasts, the figures in the last line of the last panel do not suggest any round-trip trading, on average, relative to these forecasts.[14]

As the distributional properties of insider trading are unknown, these inferences are not statements based on statistical differences in trading in the relevant months. Indeed, it is evident that there is quite a bit of noise in these inferred trading patterns. Although the grand mean abnormal return (in table 2) is positive (1.38%), mean net purchases are lower before the forecast date than after for the sample as a whole. The number of net purchase transactions before the forecast date is, however, well in excess of that after. For portfolios with relatively high positive mean abnormal returns, there are many months before the forecast date when mean net purchases are negative. This is inconsistent with the predicted pattern of trading, although, in general, insider sales tend to outnumber insider purchases.[15] Of course, given potential penalties associated with insider trading, one would expect trading

14. The inferences above may not be good generalizations if the aggregations are influenced by a few extremely large transactions. The large mean negative net purchases in month 0 for the portfolio 2 influences the value of $\overline{IT}_1$ in table 3 and S_{ma} in table 4 quite considerably, e.g. The results on the number of purchase transactions, which abstract from the size of the transaction, are reassuring in this regard. The outlier problem was investigated quite thoroughly and, although the size of some of the differences was not as great, the same general patterns were sustained when large trades were ignored.

15. Analysts who follow insider trading report that sales tend to outnumber purchases two to one. See "Analysts Think Selling Spree May Mean Early End to Bull Market," *Wall Street Journal* (October 8, 1980), p. 29. Also see "Insiders' Signals on Sales Cause Some Concern as Ratio to Their Buys Is Again on Upswing," *Wall Street Journal* (June 15, 1981), p. 43. Based on trading over the whole fiscal year, the ratio for this sample was 1.113 to 1.0. These firms are those enjoying "good times" on average, however.

TABLE 5 **Relationship between the Sign of Abnormal Returns and the Direction of Insider Trading Measures**

Abnormal Returns	Trading		
	+	−	Totals
+	153	116	269
	(153)	(91)	(244)
−	83	100	183
	(80)	(83)	(163)
Totals	236	216	452
	(233)	(174)	(407)

NOTE.—The figures without parentheses refer to firm values of IT_2. The figures within parentheses refer to firm values of the number of net purchase transactions within the 2 months prior to the forecast date minus the number of net purchase transactions within the 2 months after the forecast date. The value of χ_1^2 based on the IT_2 figures is 5.795. The value of χ_1^2 based on the figures in parentheses is 7.407.

with respect to information to be associated with much noise so systematic trading would be more difficult to detect.

Table 5 is a 2 × 2 contingency table on the sign of the abnormal return over the 3-day period around the forecast date and the sign of IT_2 for firms in the sample. The measure IT_2 appears to be the measure which best picks up all aspects of trading with respect to both good news and bad news. In parentheses in the table are figures for a comparison of the sign of the abnormal return with the sign of the number of net purchase transactions within the 2 months before the forecast month minus the number of net purchase transactions within the 2 months after the forecast month. If the trading measure in either case was zero (indicating in nearly all cases no transactions by insiders at all), then the firm was excluded from this analysis. The values of the χ^2 statistics (given in the note to the table) for the test of independence between the sign of the abnormal return and the direction of trading as described by the two trading measures are significant at the .05 level for both comparisons. Arguably, it is not appropriate to conduct the comparison using the strongest measure of trading in table 3. This is for illustration only: The other measures in tables 3 and 4 produced similar results. Although not independent of the observations above (or of each other), these tests strengthen the inferences about trading patterns because they are not affected by the size of trades, only their direction, and they provide a statistical inference without a distributional assumption.

Abnormal Returns from Insider Trading

In the last section, the experimental variable, $\tilde{\epsilon}_i$, functioned as an instrumental variable. We now exploit the interpretation of $\tilde{\epsilon}_i$ as the return to an optimal portfolio strategy in order to assess the returns to

insiders from trading around a forecast disclosure. In doing this we also provide a means for further statistical inference regarding the relationship between abnormal returns at the disclosure date and insider trading. In tables 2–4 a positive relationship was observed between abnormal returns at the forecast date and certain measures of insider trading activity. Suppose that this relationship were linear of the form:

$$\tilde{\epsilon}_i = \gamma_0 + \gamma_1 T_{mi} + \tilde{e}_i, \tag{1}$$

where $\tilde{\epsilon}_i$ is the abnormal return at the forecast date for firm i and $E(\tilde{e}_i) = 0$. The measure T_{mi} is the insider trading measure for firm i for which mean values were given in the last four columns of table 3 for $m = 1, 4$. Trades are standardized by shares outstanding (consistent with the linear relationship), and so the measure captures the proportion of the equity of the firm acquired or sold by insiders. A test of the relationship between abnormal returns and insider trading is a test of the hypothesis that $\gamma_1 = 0$.

Our aim is to assess the abnormal returns earned by insiders on average from their trading and information dissemination activities. We accomplish this by a (real-time) simulation of insiders' trades using the cross-sectional data on abnormal returns and insider trading. The model in (1) allows us to make some interesting inferences in doing this. If one invested in the n firms making forecast announcements using weights $\{x_i, i = 1, 2, \ldots, n\}$, the expected abnormal return on the resultant portfolio would be given by:

$$E(\Sigma_i x_i \tilde{\epsilon}_i) = \gamma_0 (\Sigma_i x_i) + \gamma_1 (\Sigma_i x_i T_{mi}).$$

If the investment was such that investment weights, $x_i = 1/n$ for all i (equal investment in each security), the expected abnormal return would be

$$E(\Sigma_i \tilde{\epsilon}_i/n) = \bar{\epsilon} = \gamma_0 + \gamma_1 \Sigma_i T_{mi}/n$$

(corresponding to the expected abnormal return on day -1 [say] in table 1). This is the expected abnormal return to unit investment knowing firms will issue a forecast but not using information on insiders' trades. Suppose one had information on the relative intensity of insiders' trading. A portfolio could be formed following those trades such that $x_i = T_{mi}/\Sigma_i T_{mi}$. The expected abnormal return to this investment is given by

$$\begin{aligned} E[(\Sigma_i T_{mi} \tilde{\epsilon}_i)/\Sigma_i T_{mi})] &= (\Sigma_i T_{mi} \gamma_0)/\Sigma_i T_{mi} + (\Sigma_i T_{mi}^2 \gamma_1)/\Sigma_i T_{mi} \quad (2) \\ &= \gamma_0 + (\Sigma_i T_{mi}^2 \gamma_1)/\Sigma_i T_{mi} \\ &= \bar{\epsilon} - \gamma_1 \Sigma_i T_{mi}/n + (\Sigma_i T_{mi}^2 \gamma_1)/\Sigma_i T_{mi} \\ &= \bar{\epsilon} - \gamma_1 (\Sigma_i T_{mi}/n - \Sigma_i T_{mi}^2/\Sigma_i T_{mi}) \\ = \bar{\epsilon} - \gamma_1 (\Sigma_i T_{mi}/n) [1 - (\Sigma_i T_{mi}^2/n)/(\Sigma T_{mi}/n)^2]. & \quad (3) \end{aligned}$$

This strategy also requires unit investment unless mean trade is negative, in which case the weight given to each security is $-T_{mi}/\Sigma_i T_{mi}$ and the investment involves unit short selling. This expected abnormal return, based on observed trading behavior, is a measure of the abnormal returns to insider trading. From (3) it can be seen as deviating from $\bar{\epsilon}$ (the return to random investment in forecasting stocks) according to the size of γ_1, the mean level of insider trading, and the mean sum-of-squared trading relative to the mean squared (i.e., the variance of trading).

The estimated abnormal return to the insider depends not only on the mean level of trading and the extent to which trades deviate from the mean but also upon γ_1. This can be viewed not only as the cross-sectional slope coefficient but also as the return on a portfolio with particular characteristics—as indeed can γ_0, which is evident in (2). Assume $\text{cov}(\tilde{e}_i, \tilde{e}_s) = \sigma^2$ if $i = s$, and zero otherwise. If the relationship in (1) were estimated from cross-sectional data on n firms using ordinary-least-squares (OLS) procedures, the vector of estimated coefficients, $\hat{\gamma}$, is given by

$$\hat{\gamma} = \begin{bmatrix} \hat{\gamma}_0 \\ \hat{\gamma}_1 \end{bmatrix} = (T_m' \, T_m)^{-1} \, T_m' \, \tilde{\epsilon},$$

where T_m is an $n \times 2$ matrix with the first column all ones and the second column the n values of the trading measure, and $\tilde{\epsilon}$ is an n-dimensional vector of abnormal returns. Thus the estimates are linear combinations of realized abnormal returns where the weights are given by the first and second rows of the matrix $(T_m'T_m)^{-1}T_m'$. Postmultiplying this so that $(T_m'T_m)^{-1}T_m'T_m = I$, we see that $\hat{\gamma}_0$ is the realized abnormal return on a portfolio where the weights sum to one and $\hat{\gamma}_1$ is the realized abnormal return on a portfolio whose weights sum to zero. The OLS estimators are unbiased by construction. By the Gauss-Markov theorem they are also the unique minimum-variance estimators among all linear unbiased estimators, so that these portfolio returns are those which minimize the variance of portfolio return subject to summation constraints on the weights. Further, the actual returns, $\hat{\gamma}_0$ and $\hat{\gamma}_1$, are estimates of expected returns γ_0 and γ_1 on ex ante minimum-variance portfolios formed by the respective strategies.[16]

Suppose weights were chosen to form a portfolio from all firms in the sample such that $\Sigma_i \, x_i = 0$ and $\Sigma_i \, x_i T_{mi} = 1$. The expected abnormal return to this investment is given by γ_1. This is the return on a portfolio requiring zero investment but trading in such a way as to imitate unit insider trading. Thus it is a measure of the "free return" to insiders. Given the definition of T_{mi}, unit trading is interpreted as purchasing (selling) a k share of a firm's equity before the forecast date, where $0 <$

16. This interpretation of coefficients is drawn in Black and Scholes (1974) and Rosenberg and Marathe (1978).

$k < 1$, and selling (purchasing) $1 - k$ after. If, for example, $k = ½$, this represents selling (buying) the same amount after the forecast date as purchased before, that is, taking a round trip around the forecast date. If the investment is such that $\Sigma_i x_i = 0$, this is done without any net use of funds. The expected abnormal return to insider trading can now be seen from (3) as a combination of the return to random investment in securities, $\bar{\epsilon}$, and the γ_1 "free return," where the weight of the latter is determined by the variance of trading relative to the mean trade. Suppose now that weights were chosen for investment in the n assets such that $\Sigma_i x_i = 1$ and $\Sigma_i x_i T_{mi} = 0$. The expected abnormal return to this strategy which requires unit investment and information on insiders' trades is given by γ_0. Given the definition of T_{mi}, this is the expected abnormal return on an asset with no difference in net purchases by insiders before and after the forecast announcement. Thus it measures the expected abnormal return to not timing trades relative to the forecast date. The size of γ_0 relative to $\bar{\epsilon}$ for a given γ_1 depends on how insiders trade at the average and thus is a measure of the abnormal return earned by insiders at the mean relative to a random strategy.

Table 6 presents the results of the estimations of γ_0 and γ_1 based on the 550 sample observations, together with sample mean values and standard deviations of insider trades and the abnormal return over the forecast period to investing in the sample stocks on the basis of the relative size of insiders' trades (given in eq. [2]). As in table 2, the abnormal return used in the estimations reported is the abnormal return over days -2, -1, and 0 relative to the forecast date, day 0. The sample mean value of these abnormal returns, $\bar{\epsilon}$, is .0138. Abnormal returns for different days surrounding day 0 were also used with similar sorts of results. Results for T_m are given in the first panel of table 6. In the second and third panels two other measures of insider trading are given. The first is PS_m = (number of shares *purchased* by insiders in the m months prior to the forecast month and in the forecast month prior to the day of the forecast plus the number of shares *sold* in the m months after the forecast month and in the forecast month after the day of the forecast)/average shares outstanding during the fiscal year of the forecast. This is chosen because mean abnormal returns are positive and the strategy of buying before and selling after the forecast date is a particularly appealing one.[17] In effect, sales after the forecast are treated as purchases before. The other measure is P_{mb} = number of shares purchased in the m months prior to the forecast month and in the month of the forecast before the forecast date/average shares outstanding. This is chosen because mean abnormal returns are positive and because it has been reported that insiders' purchases are more

17. There are legal restrictions on insiders' buying and selling securities within 6 months, however.

TABLE 6 **Results of Regression of Abnormal Returns at the Forecast Date on Measures of Insider Trading**

Insider Trading Measure	Mean Trading	SD Trading	Weighted Abnormal Return (from [2])	$\hat{\gamma}_0$	$t(\hat{\gamma}_0)$	$\hat{\gamma}_1$	$t(\hat{\gamma}_1)$
T_m:							
$m = 1$	.059	5.29	.6459	.0138	6.54	.0013	3.36
$m = 2$	−.355	8.41	.1572	.0141	6.72	.0009	3.43
$m = 3$	−.445	8.60	.1269	.0142	6.75	.0008	3.47
PS_m:							
$m = 1$	.736	4.05	.0702	.0120	5.65	.0025	4.91
$m = 2$	1.158	4.83	.0556	.0114	4.80	.0021	4.80
$m = 3$	1.464	5.38	.0523	.0110	5.09	.0019	5.03
P_{mb}:							
$m = 1$	.344	2.81	.0556	.0132	6.19	.0018	2.41
$m = 2$	.547	3.41	.0535	.0128	5.99	.0019	3.01
$m = 3$	.699	4.02	.0576	.0125	5.85	.0019	3.62

NOTE.—Mean abnormal return, $\bar{\epsilon}$, for days −2, −1, and 0 relative to the forecast announcement date is .0138. Trades are standardized by the average shares outstanding for the firm during the fiscal year of the forecast, in thousands.

informative than insiders' sales.[18] In all three cases, shares outstanding are expressed in thousands. Other trading measures were also used but are not reported here.[19]

The estimate of γ_1 in all cases is positive and significantly different from zero. For T_1, for example, this return over the 3-day period is .13% per dollar invested for each unit of insider trading which, because of the way trades have been deflated, is 1/1000 of a firm. The corresponding weighted abnormal return is 64.6%. This return declines for $m = 2$ and $m = 3$, as does the γ_1 return, which is consistent with the previous observation that trading with respect to the forecast tends to be close to the forecast month. The estimates of insiders' returns (2) based on PS_m and P_{mb} are less than that based on T_m, which uses more information on the timing of all trades. In all cases this weighted abnormal return dominates the expected return to random investment (.0138). The γ_1 returns for the last two trading measures are higher than those for T_m, but the per unit trade is defined differently. The results for PS_1 relative to P_{1b} indicates that some insiders take advantage of their information by deferring sales until after the forecast announcement.

The trading measure T_1 has a positive mean value (more net purchases before the forecast than after) but is close to zero. Hence the

18. See the first article quoted in n. 15 above.

19. These were purchases before the forecast date minus purchases after, and purchases before the forecast date minus sales before the forecast date, both standardized by shares outstanding.

value of $\hat{\gamma}_0$ is very close to $\bar{\epsilon}$. The mean values of T_m for $m = 2$ and 3 are negative so that timing trades without regard to the forecast date (such that net purchases before the forecast date equal those after) would improve the abnormal return earned by insiders at the mean, as indicated by the values of γ_0 relative to $\bar{\epsilon}$. As PS_m and P_m cannot be negative, there is not a meaningful interpretation of γ_0 for these trading measures.[20]

It is evident from table 2 that for many firms in the sample there was not a large price reaction to the announcement of the forecast as measured by the estimated abnormal return. Apparently the information in the forecasts of these firms was not "new information" to the market. We would not expect abnormal insider trading with respect to these announcements (if insiders can predict the price reaction to their announcements), and hence the insider trading of these firms could be regarded as "noise" in our estimations. The estimations were repeated including only those firms for which the estimated abnormal return was greater than 1.95 or less than −1.95 estimated standard deviation units on day −2, −1, or 0, or the sum of the abnormal returns standardized by their estimated standard deviations on days −2, −1, and 0 satisfied this criterion. There were 290 such cases exhibiting a higher mean abnormal 3-day return of .0239 and correspondingly higher mean trading measures of .264, .117, and .034 for T_m, $m = 1$, 2, and 3,[21] .925, 1.304, and 1.624 for PS_m, $m = 1$, 2, and 3, and .368, .641, and .874 for P_{mb}, $m = 1$, 2, and 3, respectively. Thus insiders of these firms were purchasing (or net purchasing) a higher proportion of their firms than on average for all the sample, and this is associated with a higher mean abnormal return. The respective weighted abnormal returns for T_m, $m = 1$, 2, and 3, were .2573, .5919, and 2.1436, and γ_1 values were higher than in table 5 (.0016 and significantly different from zero in all three cases). These returns suggest positions taken in months 2 and 3 are important in the case of these firms but also suggest an outlier problem in these results and with respect to the relatively large weighted abnormal return observed for T_1 in table 6. The weighted abnormal returns and the γ_1 returns also increased for the PS_m and P_{mb} measures.[22]

20. Some forecasts in the sample were published in conjunction with other announcements. Some of these are announcements which are not made voluntarily by managements. The tests here were repeated excluding those cases where the forecast was accompanied by an annual or interim earnings announcement, a dividend announcement, or an announcement of a stock split or stock dividend, with similar results.

21. When companies which had no insider trading at all in the relevant period were rejected, the three mean values were .549, .424, and .320, respectively.

22. For PS_m, $m = 1$, 2, and 3, the values of $\hat{\gamma}_1$ were .0026, .0024, and .0024, respectively, and the corresponding weighted abnormal returns were .1040, .0898, and .0870. The mean values for PS_m, $m = 1$, 2, and 3, were .925, 1.304, and 1.624, respectively. For P_{mb}, $m = 1$, 2, and 3, the values of $\hat{\gamma}_1$ were .0021, .0021, and .0020, respectively, and the corresponding weighted portfolio returns were .0974, .0846, and .0863. The mean values of P_{mb}, $m = 1$, 2, and 3 were .368, .641, and .874, respectively.

TABLE 7 **Regression Results with Announcement Date Set to 8 Days Prior to Forecast Date**

Insider Trading Measure	Mean Trading	SD Trading	Weighted Abnormal Return (2)	$\hat{\gamma}_0$	$t(\hat{\gamma}_0)$	$\hat{\gamma}_1$	$t(\hat{\gamma}_1)$
T_m:							
$m = 1$	−.309	6.07	−.0329	.0004	.26	−.0003	−1.10
$m = 2$	−.545	8.39	.0052	.0005	.33	.0000	.25
$m = 3$	−.267	11.80	.0308	.0005	.33	.0001	.48

NOTE.—Mean abnormal return, $\bar{\epsilon}$, for days −2, −1, and 0 relative to day −8 is .0005.

It is possible that factors other than an actual relationship between insider trading and abnormal returns could be producing these significant results. Insider trading or the deflator, shares outstanding (which probably is related to firm size), could be correlated with errors in estimating abnormal returns, and heteroscedasticity in the disturbances due to a relationship between trading (or, more likely, shares outstanding proxying for size) and the variance of the abnormal returns, may be biasing the estimates of the variances of the estimators. A relationship between disturbances is unlikely as abnormal returns are calculated after taking out the market return, and the 3-day return periods are scattered across a 6-year period. It is well-known that return (and residual) distributions for return periods of a few days are more peaked and have fatter tails than the normal, so it is possible that the statistical significance of the estimated coefficients is overstated. Also, trading measures calculated relative to any date may be related to abnormal returns at that date and not just those dates on which management publish information on their firms. As a means of comparison and control, the estimations were repeated, using abnormal returns calculated over days −10, −9, and −8, that is, with the "announcement date" taken as 8 days before the forecast date and with the insider trading measures recalculated relative to that date. The results for the T_m measures are given in table 7. The arithmetic mean abnormal return for this 3-day period was .0005. The estimations of γ_1 are close to zero and negative for T_1, and thus investment on the basis of trades relative to day −8 produces a negative return. For T_2 this return is very close to $\bar{\epsilon}$. Only when trading is observed over the 7-month period (T_3) is there any suggestion of a return that is higher than $\bar{\epsilon}$. Note that, when the date around which T_m is calculated is shifted by 8 days, the mean value of T_1 becomes negative and lower than its value in table 6. This suggests that trading in these 8 days before the forecast date is of significance with respect to the forecast. Similar results to these were obtained when estimations were made on the basis of 79 firms whose abnormal returns over the 3-day period based on day −8 satisfied the

1.95 standardized unit cutoff criterion above.[23] These comparative results support the belief that there is a relationship between abnormal returns around day 0 and the size and timing of insiders' trades.

Further checks were made to see whether a few large trades were particularly affecting the estimates. This outlier problem is not a concern in terms of measuring the actual returns earned by insiders in this sample but is in terms of deriving estimates of coefficients and expected returns. For the T_m measure, estimates were derived rejecting, first, all individual trades greater than .5% of shares outstanding in the calculation of T_m and, second, all firms with T_m greater than 5.0 (.5% of shares outstanding) or less than -5.0. With the exception of T_1 for the first run, mean values of T_m were higher than in table 6, and in the second set of estimates they were all positive (.066, .075, and .067 for m, 1, 2, and 3, respectively). This indicates large negative trades are affecting the mean values in table 6. The estimates of γ_1 were higher than those reported in table 6 (.0013, .0020, and .0018 for the first set of estimations), indicating that "smaller" trades are related to the forecast announcement and that larger trades may be due to considerations other than the forecast announcement, which is not surprising given that large trades are more noticeable. The weighted abnormal returns for T_1 were much smaller than those in table 6 (.1726 for the first run), suggesting that the table 6 return is in part due to a few large trades. The weighted abnormal returns for T_2 and T_3 were .1828 and .2052, higher than in table 6, again suggestive of the importance of smaller trades in the relationship.

It is possible that the observed positive coefficient estimate, $\hat{\gamma}_1$, reflects not a relationship between insider trading and abnormal returns associated with the forecast but a negative relationship between firm size (as approximated by the deflator, shares outstanding) and abnormal returns. Indeed, in table 2 we observed such a relationship. Banz (1981) reports a relationship between size (market values) and returns, and it has been reported to me that abnormal returns calculated similarly to those here are a decreasing function of firm size—probably a result of the way in which the market index is constructed. The control results in table 7 indicate that this is not the reason for the results in table 6, and in fact the estimation of a regression of abnormal returns over days -10, -9, and -8 on 1/shares outstanding suggested no relationship. However, conditional upon an information announcement, there may be a relationship between size and abnormal returns. Atiase (1980) has observed that the size of the market's reaction to quarterly earnings announcements is negatively related to size (possibly because more information about earnings of large firms is

23. Weighted abnormal returns for T_m, $m = 1$, 2, and 3 were .0026, .0176, and .0174, respectively.

available prior to the release of the earnings figure), and this could be so in the case of forecast announcements. A regression of abnormal returns at the forecast date on 1/shares outstanding discovered a significant relationship, with an estimated correlation coefficient of .16. Of course, if smaller firms do experience a larger abnormal price change on the release of forecasts, one might expect insider trading with respect to the announcement to be relatively higher for these firms, for there is greater benefit to trading. Again, the descriptive results in table 2 support this. Thus the correlation between the trading measure and abnormal returns may be induced by a correlation between shares outstanding and abnormal returns in a substantive way. However, it is also possible that, if insiders of smaller firms tend to hold a larger portion of outstanding shares than those of larger firms (as is often the case of "family controlled" firms), then trading for portfolio adjustment reasons as a percentage of shares outstanding (as measured by PS_m and P_{mb}, although not T_m) is likely to be higher for these firms and thus statistically related to abnormal returns.

In order to control for shares outstanding, the following regression was estimated:

$$\tilde{\epsilon}_i = \gamma_0 + \gamma_1 T_{mi} + \gamma_2 1/S_i + \tilde{\nu}_i,$$

where S_i is shares outstanding for firm i. Similar estimations were made for the PS_m and P_{mb} trading measures. The estimated correlations between the T_m measures and $1/S$ were quite small (.05 for T_1 and $-.01$ for T_2 and T_3), so inclusion of the shares outstanding variable had little effect on the estimate of γ_1 and (as would be expected from the inclusion of another variable) t values increased.[24] The low correlation between the T_m measures and $1/S$ is probably due to the fact that T_m takes into account the timing and direction of trades and thus can be negative. This is not so with the PS_m and P_{mb} measures where the estimated correlations between these and $1/S$ were on the order of .20 and .10, respectively. The estimated values of γ_1 in these cases were slightly lower, as would be expected given the positive correlation, but still significantly different from zero. Thus it seems in all cases that within firms of similar sizes there is a positive relationship between the trading measures and abnormal returns associated with the forecast announcement.

Conclusion

The evidence here does suggest that corporate insiders time their trades relative to announcements of their firms' earnings prospects. By

24. The estimates of γ_2 were positive and significantly different from zero. Thus there is a return to trading on the basis of firm size with zero investment, conditional upon knowing that a forecast will be released.

trading to take advantage of the price revision resulting from those announcements, insiders earn abnormal returns (and there is a sense in which they earn "free returns") to their information. The paper has provided estimates of these returns. These estimates should be regarded as lower bounds, as the analysis was conducted only on trades reported to the SEC and only on trading in common stock. It is possible that some trading on information is not reported and that insiders trade in other instruments, for example, options. The observed trading patterns are similar to those suggested in the works of Manne (1966), Demsetz (1969), and Hirshleifer (1971). Insiders apparently respond to the incentive to take market positions on the basis of information they publicly announce. The disincentives of a potential SEC investigation are not sufficient to eliminate this incentive—at least in the period covered in the study. The systematic pattern is associated with much noise, however; the result is an "on average" result, and there are many cases of insiders trading against the pattern suggested by their forecast announcements.

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