Are Insider Trades Informative?

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We examine insider trading activities of all companies traded on the NYSE, AMEX, and Nasdaq during the 1975–1995 period. In general, very little market movement is observed when insiders trade and when they report their trades to the SEC. Insiders in aggregate are contrarian investors. However, they predict market movements better than simple contrarian strategies. Insiders also seem to be able to predict cross-sectional stock returns. The result, however, is driven by insider's ability to predict returns in smaller firms. In addition, informativeness of insiders' activities is coming from purchases, while insider selling appears to have no predictive ability.

There is a substantial demand for insider trading information. For example, the *Wall Street Journal* and *Barron's* report large insider transactions every week. Money managers have direct access to insiders' activities through systems such as Bloomberg. There are data vendors, such as CDA/Investnet, who use insiders' trades to predict returns, primarily for institutional investors. CDA/Investnet also publishes a newsletter, "Insiders' Chronicle," geared to individual investors, that offers an abridged list of insider transactions along with commentaries and recommendations.

The reason for all the attention that goes to insiders' activities is best summarized in a recent article in *Individual Investor* (Feb. 1998, p. 54): "Company executives and directors know their business more intimately than any Wall Street analyst ever would. They know when a new product is flying out the door, when inventories are piling up, whether profit margins are expanding or whether production costs are rising...You always hear about

the smart money. Generally, that is the smart money." If so, the thinking of many investors is that there should be a way for investors to benefit from observing what insiders are doing.

Previous studies based on U.S. data unanimously show that insiders are indeed better informed and earn abnormal returns [Jaffe (1974), Finnerty (1976), Seyhun (1986, 1998), Rozeff and Zaman (1988), Lin and Howe (1990), and Jeng, Metrick and Zeckhauser (1999)]. A counterexample is a recent study by Eckbo and Smith (1998), that finds that insiders of firms listed on the Oslo Stock Exchange do not earn abnormal profits.

There are other related studies of managerial decisions that also suggest that insiders are better informed about their companies' prospects. Moreover, those studies find that the market is slow in adjusting to managerial signals. For example, Ikenberry, Lakonishok, and Vermaelen (1995) find prolonged positive abnormal returns in companies that have announced open market share repurchases. One of the main motivations for repurchases seems to be that insiders perceive the company's stock as being cheap. On the other hand, a case can be made that companies tend to issue seasoned equity when they perceive the market to be too optimistic about the prospects of their company. Indeed, Loughran and Ritter (1995) observe a prolonged underperformance following seasoned equity offerings.

However, in spite of the evidence that in general suggests that insiders are informed, it is still debatable whether outsiders can profit from knowing what insiders are doing. Seyhun (1986) and Rozeff and Zaman (1988) show that, net of transaction costs, outsiders do not benefit by imitating insiders. In a more recent study, however, Bettis, Vickrey, and Vickrey (1997) show that outside investors can earn abnormal profits, net of transaction costs, by analyzing publicly available information about large insider transactions by top executives.

On the other hand, *Hulbert Financial Digest* (the best known service that tracks performance of newsletters that provide financial advice to investors) reports poor performance by a newsletter that since 1985 has recommended stocks solely based on insider transactions. Net of transaction costs, *Hulbert Financial Digest* reports for this newsletter an annual rate of return of 16.0% for the period from January 1985 to July 1997. The comparable rate of return for the S&P 500 during the same period was 18.4%.

This article contributes to the existing literature by conducting a comprehensive examination of the information content of insiders' trades and the market's response to those trades. We use the most extensive database available, covering the period from 1975 to 1995. The database includes all the companies that trade on the NYSE, AMEX, and Nasdaq markets. Insiders are sending us plenty of signals, about 50,000 trades per year and more than one million transactions overall. How best to interpret these signals is the main objective of this article.

Insider trading refers to transactions by top officers, directors, and large shareholders who own 10% or more of company's shares. Previous studies in general have focused on top officers and directors; we also examine trades by large shareholders whose trading activities, in terms of dollar trading volume, have the same magnitude as those of top officers and directors.

We start by examining the magnitude of insider trading activity and how this activity has changed over time. We then examine how the market reacts around insider trading and reporting dates. If insiders' activities are informative and the market is efficient in responding to this information, we should observe a substantial market response around trading and/or reporting dates. We also investigate whether the response depends on company characteristics.

Next, we investigate whether insiders' aggregated activity can predict future market movements. There are indications that insiders can time the market [Seyhun (1988, 1998)]. For example, insiders were heavy sellers prior to the market crash of October 1987, and they were heavy buyers following the crash. Previous research has found that market returns over longer horizons exhibit negative autocorrelation [Poterba and Summers (1988)]. Therefore, simple contrarian strategies have worked in the past and were useful in timing the market. We find that insiders tend to be contrarian investors (see also Rozeff and Zaman (1998)). Hence, in examining the ability of insiders to time the market, it is crucial to adjust for past market movements.

Finally, we test whether insider trading activity explains the cross-sectional variation of individual stock returns. We also explore whether the predictability of returns depends on the strength of insiders' activities and stock characteristics. Similar issues have been addressed in a recent study by Seyhun (1998). In Seyhun (1998), abnormal returns are calculated in excess of the equally weighted NYSE, AMEX, and Nasdaq index return. However, recent articles [Kothari and Warner (1997), Barber and Lyon (1997), Ikenberry, Lakonishok and Vermaelen (1995), and Lee (1997)] clearly show that long horizon abnormal returns are extremely sensitive to the benchmarks used and assumptions made about portfolio rebalancing.

The focus of this article is on longer-horizon returns. Moreover, insiders tend to be contrarian and prefer to buy value stocks that historically have performed well. They are also active in small stocks, an asset class that in the past has generated relatively high returns. Therefore, without carefully calculating abnormal returns, we cannot conclude whether insiders' activities contribute to predicting stock returns. In many of the earlier articles on insider trading activity, authors were not particularly sensitive to how abnormal returns were calculated. In addition, these articles focused on returns over relatively short horizons. Therefore the usefulness of insider trading activity in predicting stock returns is still largely an open issue.

Recent articles document instances where the market underreacts to managerial signals such as stock repurchases [Ikenberry, Lakonishok, and Vermaelen (1995)], initial public offerings (IPOs) [Ritter (1991)], seasoned

equity offerings (SEOs) [Loughran and Ritter (1995)], convertible bond issues [Lee and Loughran (1998)], and stock splits [Ikenberry, Rankine, and Stice (1996)]. However, the findings of these articles are challenged by Fama (1998), who claims that the results are not robust and are sensitive to the benchmarks used in calculating abnormal returns. Our findings on insider trading will provide additional evidence on whether the market indeed under-reacts to managerial decisions.

Our results show that insiders are active and that there is at least some insider trading in more than 50% of the stocks in a given year. On average, insider purchases (sales) per year amount to 0.6% (1.3%) of their companies' market capitalization. Insider purchases of shares through exercise of options and insider open market sales have significantly increased in the 1990s. This enhanced activity by insiders is a direct result of changes in executive compensation schemes where a higher emphasis is placed on aligning the interests of shareholders and management [Yermack (1995)].

In spite of the attention that insiders' activities receive, we do not observe any major stock price changes around the time of insider trading or around the reporting dates. This is very surprising given the attention that insiders' activities receive. However, we find that insiders' trades are informative for longer investment horizons, suggesting that the market underreacts to this information.

Aggregate insider trading seems to predict market movements and could be used as a tool to time the market, as previously documented by Seyhun (1988, 1998). Insiders are definitely contrarian investors, but insiders are better at timing the market than simple contrarian strategies. When insiders are optimistic, markets do well, and when insiders are pessimistic, markets do poorly, with an annual spread in returns between the two states exceeding 10%. Insiders are doing a better job in predicting aggregate movements of small companies than of large companies.

For individual firms, insiders' activities also predict stock returns. Before controlling for size and book-to-market effects, firms with extensive insider purchases during the prior six months outperform companies with extensive insider sales by 7.8% over the next 12 months. After controlling for size and book-to-market effects, the spread in returns decreases to 4.8%. The useful-ness of insider trading activity depends on company size. Consistent with previous work, we find that large companies are priced more efficiently than small companies. Hence the biggest potential benefit of exploiting insider trading activity is in the smaller companies.

The article is organized as follows: Section 1 describes the data and Section 2 presents some summary statistics. Section 3 examines how the market reacts when insiders trade and when they report their transactions to the SEC. Section 4 analyzes the relation between aggregate insider trading and market returns. Section 5 presents cross-sectional results on the performance of various portfolios based on insider trading information. Section 6 summarizes the results and concludes the article.

1. Data

The sample consists of companies that appear both on the 1995 NYSE/AMEX and Nasdaq CRSP tapes and on the 1995 Compustat tapes (including the research tapes, covering delisted firms) during the 1975–1995 period. We exclude noncommon shares (shares with CRSP share codes other than 10 or 11, which include American Depository Receipts, closed-end funds, and real estate investment trusts) from the original sample. We also exclude firms whose stock prices are less than $2 at the beginning of each calendar year to avoid unnecessary noise in estimating returns [e.g., Conrad and Kaul (1993)].

We obtain all insider transaction information from the Securities and Exchange Commission (SEC) Ownership Reporting System (ORS) data file. The ORS data start in 1975 and contain all transactions by insiders that are subject to disclosure according to Section 16(a) of the Securities and Exchange Act of 1934. According to Section 16(a) of the act, insiders are required to report their transactions by the tenth day of the calendar month after the trading month. The data are from Forms 3, 4, and 5.[1] From the reported insider transactions, we exclude transactions with less than 100 shares to focus on the more meaningful events.[2] In addition, we use various filters to clean up our insider trading data. For example, we cross-checked the prices and trading volume of insiders' trades against the data on CRSP. Suspicious numbers were discarded.[3]

Using the ORS data, insiders are classified into three groups. The "Management" group includes CEOs, CFOs, chairmen of the board, directors, officers, presidents, and vice presidents. "Large shareholders" are those who own more than 10% of shares and are not management. "Others" are all investors who are required to report their trading to the SEC but are neither managers nor large shareholders (e.g., company lawyers who might possess material inside information). Typically any transactions by spouses, minor children, and other relatives of an insider should be reported as if the insider traded the shares in his indirectly owned account.

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[1] The data do not include reports from Form 144, which should be filed whenever insiders plan to sell restricted (or unregistered) shares, nor from Form 13D. Since 1970, Section 13(d) of the Securities and Exchange Act of 1934 has required that any person who had acquired 5% or more of the stock of a public corporation must file a Schedule 13D with the SEC within 10 days of crossing the 5% threshold. Section 13(d) is intended to provide early warnings to target firms that potential acquirers are buying up their stock. Any subsequent acquisitions or dispositions of shares require a Form 13D amendment. Amendments are no longer required once an investor's position drops below the 5% level. Those who own more than 10% must file both Form 4 and a Form 13D amendment each time they trade.

[2] We checked the sensitivity of our results by excluding transactions less than 1,000 shares and found that the results were essentially the same.

[3] For our sample firms, there were 1.38 million transactions after eliminating duplicated and amended records in the ORS data. We then excluded about 100,000 transactions for which we did not have price information and about 100,000 transactions that involved less than 100 shares. To eliminate potentially problematic cases, we dropped the transactions whose trade price was not within 20% of the CRSP closing price on that day. In addition, we removed trades for which the number of shares traded exceeded 20% of the number of shares outstanding. The last two screens reduced the number of transactions by about 150,000. The final sample includes 1,028,020 transactions.

One thing to note is that commercial banks, brokers, insurance companies, investment banks, investment advisers, employee benefit plans, pension funds, and mutual funds are exempt from the reporting requirement even if they hold more than 10% of shares of a company, as long as they acquired the shares without the purpose of changing or influencing the control of the company. Most institutions listed above do not regularly report their transactions even though they are beneficial owners of more than 10%. However, from time to time institutions do report their transactions as a precaution against possible legal complications even though they might not need to report. This type of reporting has become more common in recent years after a series of regulatory changes which led to stricter enforcement of the reporting requirement and made investors more fearful of the legal consequences of not reporting their transactions.

We examine three types of trading. "Purchases" and "Sales" refer to open market or private purchases and sales, respectively.[4] "Option" refers to the purchase of shares through the exercise/conversion of options, warrants, or convertible bonds. Sales of those shares acquired through the exercise of options are reported as sales. All other types of transactions (e.g., grant or award transactions) are excluded from the analysis.

Throughout this article we classify our sample firms into three size and three book-to-market (B/M) equity groups. To form three size groups, we initially create 10 size portfolios based on the market capitalization at the end of April of each year.[5] The cutoff points for the 10 size portfolios are based only on market capitalization of NYSE-listed firms. We define firms in the bottom three size deciles as small firms, those in the next four size deciles as medium-size firms, and those in the largest three deciles as large firms.

We also divide our sample firms into three B/M groups based on the B/M ratio at the end of April of each calendar year. We form 10 B/M portfolios based on the NYSE firms. Companies with negative B/M are excluded. Low B/M firms are the firms in the bottom three B/M deciles, medium B/M firms include the firms in the next four deciles, and high B/M firms are the firms in the top three deciles. We calculate B/M by dividing the book equity value (Compustat data item 60) by the market value of equity at the end of April of each year. We assume a four-month lag in reporting book values.

2. Summary Statistics

Table 1 presents the following summary statistics for each category of firm size and insiders: the average fraction of companies with at least one insider

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[4] We do not distinguish between open market and private transactions because the ORS data began combining these transactions on April 11, 1991.

[5] In Table 1, we form three size groups at the end of December to present the results in calendar-year basis.

transaction per year; the average number of trades per year (including companies without any trading); the average total dollar volume per year of insider transactions; and the average insider trading volume per year as a percentage of market capitalization (including those firms without any insider transactions). For the purchases of shares through the exercise/conversion of options, warrants, or convertible bonds, we calculate the dollar value of each transaction by multiplying the number of shares purchased by the closing market price on the trading date.

The results show that on average, per year, in at least 55% of our sample firms, there was purchasing or selling activity by managers. Managers are more active in larger firms where in at least 72% of the firms, there were insider activities. In their attempt to diversify their portfolios, insiders sell much more than they buy. Managers of our sample firms bought on average $1.7 billion (in 1995 dollars, using the Consumer Price Index to adjust the amounts) of their stocks per year through either open market or private transactions and $2.0 billion through exercise/conversion of options, warrants, or convertible bonds. They sold much more, $8.0 billion of their stocks per year. The aggregate dollar trading volume of large shareholders is comparable to that of managers, but large shareholders trade much less often than managers. This implies that the size of average trades by large shareholders is substantially larger than that of managers. The "Others" category is much less material.

In a typical company, per year, insider purchases (sales) amount to 0.6% (1.3%) of their companies' market capitalization. Relative to market capitalization, insiders' activities are more pronounced for small companies than for large ones. Assuming a 50% annual turnover, insider sales account for 2% of trading in small stocks and around 0.5% in large stocks. Purchases account for roughly half of the selling activity. The market microstructure literature stresses the importance of trades by informed investors. We provide some evidence on the magnitude of the activity of "legal" insiders that are perceived by many market participants to be informed. Whether this activity is enough to materially impact trading costs is not the topic of this article.

Overall, Table 1 shows that insiders send numerous signals to investors. In most companies there are at least some insider activities. In large firms, there are on average close to 20 trades a year (5 purchases, 10 sales, and 5 option exercises). Finding out how informative those trades are is the main motivation behind this article.

The structure of executive compensation has changed over the period of this study. More emphasis is being placed on aligning the interests of managers and shareholders. We would expect to find that over time a higher percentage of managers' wealth is in their own stocks. Therefore managers should have an incentive to diversify their portfolios, which should result in an increase in sales over time. This is indeed the picture that we see in Table 2, where we examine changes in insiders' activities over our sample period.

Table 1
Summary statistics

	Management			Large shareholders			Others			Total		
	Purchase	Sales	Option	Purchase	Sales	Option	Purchase	Sales	Option	Purchase	Sales	Option
Total (96,147 firm years)												
Fraction	0.52	0.56	0.28	0.06	0.05	0.00	0.04	0.08	0.03	0.55	0.58	0.29
# of trades	2.77	4.74	1.56	0.91	0.41	0.01	0.20	0.34	0.07	3.88	5.49	1.64
Total $(m)	$1,693	$8,016	$2,023	$3,316	$6,340	$157	$831	$1,193	$212	$5,840	$15,549	$2,391
% Mkt Cap	0.33%	0.88%	0.20%	0.29%	0.33%	0.03%	0.03%	0.10%	0.01%	0.64%	1.31%	0.23%
Small companies (60,973 firm years)												
Fraction	0.46	0.46	0.19	0.06	0.05	0.00	0.03	0.05	0.01	0.49	0.49	0.20
# of trades	2.48	3.11	0.71	0.85	0.36	0.01	0.11	0.21	0.03	3.44	3.68	0.74
Total $(m)	$449	$1,368	$271	$400	$546	$48	$35	$187	$10	$885	$2,119	$329
% Mkt Cap	0.44%	1.02%	0.22%	0.32%	0.35%	0.04%	0.03%	0.12%	0.01%	0.79%	1.49%	0.26%
Medium companies (23,421 firm years)												
Fraction	0.59	0.69	0.40	0.06	0.06	0.00	0.04	0.11	0.04	0.62	0.71	0.41
# of trades	3.21	6.74	2.46	1.01	0.50	0.01	0.21	0.42	0.12	4.43	7.66	2.59
Total $(m)	$701	$2,971	$745	$984	$1,452	$69	$94	$340	$30	$1,779	$4,764	$844
% Mkt Cap	0.20%	0.82%	0.20%	0.27%	0.34%	0.02%	0.02%	0.09%	0.01%	0.50%	1.25%	0.23%
Large companies (11,753 firm years)												
Fraction	0.70	0.81	0.53	0.05	0.05	0.00	0.09	0.19	0.09	0.72	0.83	0.54
# of trades	3.41	9.18	4.17	1.04	0.49	0.01	0.67	0.82	0.23	5.12	10.49	4.42
Total $(m)	$543	$3,658	$1,007	$1,931	$4,342	$40	$702	$665	$172	$3,177	$8,665	$1,218
% Mkt Cap	0.04%	0.27%	0.07%	0.12%	0.22%	0.00%	0.04%	0.05%	0.01%	0.20%	0.54%	0.09%

This table reports summary statistics of insider trading for all NYSE/AMEX and Nasdaq CRSP- and Compustat-listed common shares (CRSP share code 10 or 11) during 1975–1995. We exclude from the sample those firms with stock prices under $2 at the beginning of each calendar year. We define "Management" as CEOs, CFOs, chairmen of the board, directors, officers, presidents, and vice presidents. "Large shareholders" are those who own more than 10% of shares and are not in management. "Others" are all those who are required to report their trading to the SEC but are neither managers nor large shareholders. "Purchases" includes both open market and private purchases and "Sales" includes both open market and private sales transactions. "Option" includes the purchase of shares through the exercise/conversion of options, warrants, or convertible bonds. "Fraction" refers to the average annual fraction of firms with at least one insider trade of each type among our sample firms. "# of trades" is the average annual number of trades per company of our sample firms, defined as the average of the number of total inside transactions divided by number of years listed on the CRSP. "Total $" is the average annual total insider transaction dollar volume (in 1995 $millions) of all companies in each category. "% Mkt Cap" is the average ratio of the annual individual company's total insider trading dollar volume to the market capitalization of the corresponding company at the beginning of each year. Small, medium, and large firms are firms in the bottom three, the next four, and the last three size deciles, based on NYSE firms' decile cutoff points at the beginning of each year, respectively.

Table 2
Year-by-year summary statistics

	Management			Large shareholders			Fraction and # of firms	S&P 500 return
	Purchase	Sales	Option	Purchase	Sales	Option		
1975	$735	$2,616	$641	$1,201	$307	$455	0.80	37.23%
	0.05%	0.18%	0.04%	0.08%	0.02%	0.03%	(3,653)	
1976	$862	$2,918	$1,121	$1,471	$586	$4	0.79	23.93%
	0.05%	0.15%	0.06%	0.08%	0.03%	0.00%	(4,006)	
1977	$812	$2,243	$939	$1,422	$569	$9	0.76	−7.16%
	0.04%	0.10%	0.04%	0.06%	0.03%	0.00%	(4,226)	
1978	$952	$2,767	$1,132	$1,797	$722	$27	0.76	6.57%
	0.05%	0.14%	0.06%	0.09%	0.04%	0.00%	(4,206)	
1979	$1,159	$3,950	$1,155	$2,500	$1,228	$23	0.76	18.61%
	0.06%	0.22%	0.06%	0.14%	0.07%	0.00%	(4,188)	
1980	$1,791	$4,703	$1.262	$2,363	$1,804	$196	0.77	32.50%
	0.10%	0.25%	0.07%	0.13%	0.10%	0.01%	(4,183)	
1981	$1,472	$4,252	$1,871	$3,735	$1,355	$16	0.76	−4.92%
	0.07%	0.19%	0.09%	0.17%	0.06%	0.00%	(4,337)	
1982	$1,286	$5,506	$1,218	$2,727	$1,746	$64	0.76	21.55%
	0.07%	0.29%	0.06%	0.14%	0.09%	0.00%	(4,334)	
1983	$1,952	$8,551	$1,975	$3,054	$3,063	$116	0.78	22.56%
	0.09%	0.40%	0.09%	0.14%	0.14%	0.01%	(4,307)	
1984	$1,839	$7,385	$1,558	$5,655	$25,202	$167	0.72	6.27%
	0.07%	0.29%	0.06%	0.22%	1.00%	0.01%	(4.888)	
1985	$1,752	$8,421	$1,483	$2,967	$4,822	$158	0.73	31.73%
	0.07%	0.36%	0.06%	0.13%	0.20%	0.01%	(4,694)	
1986	$1,704	$8,317	$924	$2,490	$4,398	$82	0.74	18.67%
	0.06%	0.29%	0.03%	0.09%	0.15%	0.00%	(4,718)	
1987	$1,717	$6,615	$892	$5,706	$3,161	$80	0.72	5.25%
	0.05%	0.21%	0.03%	0.18%	0.10%	0.00%	(5,006)	
1988	$1,274	$5,144	$1,131	$5,706	$3,161	$54	0.68	16.61%
	0.04%	0.17%	0.04%	0.15%	0.08%	0.00%	(4,902)	
1989	$966	$4,746	$917	$4,286	$14,733	$52	0.72	31.69%
	0.03%	0.16%	0.03%	0.14%	0.48%	0.00%	(4,725)	
1990	$1,460	$4,613	$748	$5,011	$3,000	$30	0.76	−3.11%
	0.04%	0.13%	0.02%	0.14%	0.08%	0.00%	(4,515)	
1991	$1,5757	$8,601	$895	$3,469	$5,962	$39	0.76	30.47%
	0.05%	0.28%	0.03%	0.11%	0.19%	0.00%	(4,034)	
1992	$2,277	$13,633	$6,350	$1,814	$9,130	$895	0.79	7.62%
	0.06%	0.34%	0.16%	0.05%	0.23%	0.02%	(4,516)	
1993	$2,576	$19,390	$2,280	$2,910	$19,132	$378	0.79	10.08%
	0.06%	0.45%	0.05%	0.07%	0.44%	0.01%	(5,048)	
1994	$3,570	$12,190	$5,444	$3,396	$12,033	$308	0.75	1.32%
	0.07%	0.25%	0.11%	0.07%	0.25%	0.01%	(5,750)	
1995	$2,229	$23,182	$3,840	$2,563	$14,431	$84	0.72	37.58%
	0.05%	0.50%	0.08%	0.06%	0.31%	0.00%	(5,911)	

This table reports the year-by-year summary statistics of insider trading for all NYSE/AMEX and Nasdaq CRSP and Compustat-listed common shares (CRSP share code 10 or 11) during 1975–1995. We exclude from the sample all firms with stock prices under $2 at the beginning of each calendar year. We define "Management" as CEOs, CFOs, chairmen of the board, directors, officers, presidents, and vice presidents. "Large shareholders" are those who own more than 10% of shares and are not in management. "Purchase" includes both open market and private purchases, and "Sales" includes both open market and private sales transactions. "Option" includes the purchase of shares through the exercise/conversion of options, warrants, or convertible bonds. "Fraction" refers to the average annual fraction of firms in our sample with at least one insider trade. "# of firms" is the number of our sample firms in each year, including those without any insider transactions. " S&P 500 return" includes dividends. We report the annual total insider transaction dollar volume (in 1995 $millions) of all sample companies at the top of each cell. At the bottom of each cell, for all the companies in the sample, we report the ratio of total insider-transaction dollar volume during each year to total market capitalization at the beginning of each year.

Management sales increased dramatically over the sample period from $2.6 billion (in 1995 dollars) to $23.1 billion. As a percentage of market capitalization, the increase was from 0.18–0.50%. Since many of the stock-related compensation schemes take many years to vest and have long maturities, the increase in sales by management became noticeable in the 1990s. Moreover, in every single year, sales by management substantially exceed purchases. No material change in management purchases as a percentage of market capitalization is observed over time. However, we do see some increase in option exercise during our sample period. Many options are still unexercised, implying that considerable manager wealth is currently tied up in their companies.

The sales activity of large shareholders has also picked up over time. We conjecture that the stricter enforcement of filing requirements was a contributing factor. Institutions that did not report their transactions in earlier years started to report because of the possible legal complications. This increase in reporting probably rose substantially after the passage of the Securities Enforcement Remedies and Penny Stock Reform Act of 1990 (SERPSRA), which became effective in May 1991. When we examine the data for recent years, we encounter transactions reported by employee stock option plans, pension plans, and investment advisors, parties that typically did not report in the earlier years.

3. Trading and Reporting Periods Returns

We examine how the market reacts to insider trading during the trading and reporting periods. Table 3 presents our results. We calculate abnormal returns by summing daily abnormal returns over the five-day period starting from the event date (either the transaction date or the reporting date).

Daily abnormal returns are calculated by subtracting the daily equally weighted NYSE/AMEX/Nasdaq CRSP index return from the daily return of each company. Here the reporting date corresponds to the date on which insiders file Forms 3, 4, or 5 with the SEC to report their transactions.[6] As soon as insiders file their transactions, any investors can get access to that information. However, in reality, it might take a few days to obtain the information. For example, CDA/Investnet's Insider Trading Monitor, an on-line database that began reporting insider transactions from June 1984, because of a processing delay, typically reports insider transactions a few days after the SEC filing dates. This is why we use a longer window (five days). We exclude transactions that have no exact trading or reporting dates.

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[6] For insider transactions from April 11, 1991 to October 10, 1992, the ORS data do not have exact filing dates, even though the data include filing months. In calculating the average abnormal returns around reporting periods, we exclude those transactions. However, those transactions are included in calculating trading-period abnormal returns.

Table 3
Abnormal percentage returns around trading and reporting dates for insider transactions

	All			Low B/M			Medium B/M			High B/M		
	Manager	Large shareholders	Others	Manager	Large shareholders	Others	Manager	Large shareholders	Others	Manager	Large shareholders	Others
Trading period AR												
All	0.59	0.53	0.12	0.44	0.42	0.25	0.49	0.41	−0.02	0.78	0.66	0.18
	(0.17)	(0.30)	(0.21)	(0.22)	(0.37)	(0.24)	(0.09)	(0.28)	(0.20)	(0.15)	(0.14)	(0.17)
Small	0.93	0.74	0.56	0.96	0.70	0.78	0.87	0.62	0.40	0.95	0.81	0.54
	(0.36)	(0.46)	(0.52)	(0.46)	(0.51)	(0.75)	(0.32)	(0.83)	(0.54)	(0.23)	(0.10)	(0.18)
Medium	0.30	0.36	0.01	0.29	0.33	0.48	0.21	0.37	−0.15	0.43	0.38	−0.13
	(0.13)	(0.22)	(0.04)	(0.19)	(0.34)	(−0.14)	(0.03)	(−0.16)	(0.20)	(0.08)	(0.47)	(0.35)
Large	−0.06	0.01	−0.15	−0.27	−0.06	−0.16	0.02	−0.01	−0.13	0.18	0.11	−0.16
	(−0.10)	(−0.17)	(0.00)	(−0.07)	(−0.11)	(0.04)	(−0.16)	(−0.21)	(−0.02)	(−0.11)	(−0.19)	(−0.00)
Reporting period AR												
All	0.13	0.04	0.05	0.03	−0.01	−0.26	0.09	−0.06	0.16	0.24	0.13	0.17
	(−0.23)	(−0.30)	(0.05)	(−0.25)	(−0.38)	(0.06)	(−0.23)	(−0.28)	(0.11)	(−0.21)	(−0.14)	(−0.05)
Small	0.24	0.17	0.39	0.13	−0.07	0.31	0.19	0.10	0.52	0.32	0.30	0.37
	(−0.26)	(−0.37)	(0.08)	(−0.32)	(−0.42)	(−0.20)	(−0.22)	(−0.44)	(0.73)	(−0.20)	(−0.25)	(−0.01)
Medium	0.06	−0.21	−0.04	0.05	0.16	−0.32	0.04	−0.29	0.22	0.11	−0.34	−0.16
	(−0.19)	(−0.27)	(0.29)	(−0.17)	(−0.47)	(0.50)	(−0.20)	(−0.09)	(−0.00)	(−0.24)	(0.20)	(0.13)
Large	−0.11	−0.09	−0.15	−0.15	−0.04	−0.58	−0.08	−0.11	−0.01	−0.08	−0.13	0.13
	(−0.25)	(−0.09)	(−0.20)	(−0.25)	(−0.02)	(−0.15)	(−0.27)	(−0.20)	(−0.19)	(−0.19)	(0.17)	(−0.29)

This table reports the 1975–1995 average abnormal percentage returns around insider transactions for all companies in the sample. We define "Management" as CEOs, CFOs, chairmen of the board, directors, officers, presidents, and vice presidents. "Large shareholders" are those who own more than 10% of shares and are not in management. "Others" are all those who are required to report their trading to the SEC, but who are neither managers nor large shareholders. In each cell, we report the daily abnormal returns (as percentages) for purchasing transactions at the top. The abnormal percentage returns for selling transactions appear in parentheses. Abnormal returns are the sum of the daily abnormal returns over a five-day period starting from the event date (either transaction date or the reporting date). We calculate daily abnormal returns by subtracting the NYSE/AMEX/Nasdaq equally weighted CRSP daily index return from the daily return of a company's stock. Small (Low B/M), medium (medium B/M), and large (high B/M) firms are the firms in the bottom three, the next four, and the last three size (B/M) deciles, based on the NYSE firms' decile cutoff points, respectively. We form all deciles at the end of April of each year, and base them on the market capitalization and the book equity value at the end of April. We assume a four-month lag in reporting for the book-equity information.

In general, the abnormal returns around the reporting dates of insiders' trades are not economically meaningful.[7] This suggests that the market initially dismisses this information. For example, looking at all cases for managers, the abnormal returns are 0.13% and −0.23% for purchases and sales, respectively. In addition, the abnormal returns around the reporting period do not seem to depend on size or B/M.

The trading period abnormal returns are somewhat larger in magnitude, especially for purchases. Moreover, the trading period abnormal returns seem to depend on size. For example, when managers are purchasing, the trading period abnormal return is 0.93% for small stocks and −0.06% for large stocks.

It is somewhat of a puzzle that the market seems to react around the trading period, but not around the reporting period, unless information about insider trades in the smaller firms somehow leaks to the market before the trades have to be reported. Another possibility is that price pressure can explain some of the returns. Chan and Lakonishok (1995) document substantial execution costs for small firms, which might explain the returns around purchases. The marginally positive returns for sales can be a result of managers patiently trading and strategically executing their trades.

Overall, the market shows only a mild response around trading and reporting. The combined effect of the two events is around 1% for small firms, and is practically zero for large firms. Seyhun (1986) and Pascutti (1996) find similar results.

4. Aggregate Insider Trading and Market Returns

4.1 Methodology

Seyhun (1988, 1992, 1998) shows that aggregate insider trading significantly predicts future market movements. We reexamine Seyhun's finding by applying a different methodology. We attempt to distinguish between returns produced by insider trading and returns based on simple contrarian strategies. We use the net purchase ratio (NPR), which is the ratio of net purchases to total insider transactions, as our measure of insider trading activities. We calculate the NPR measure for three size groups and for the total sample.

Each month from January 1976 to January 1995, we count the total numbers (or total dollar volume) of insider purchases and sales during the prior six-month period for all the firms in each group. We then calculate the NPR of each group by dividing the net aggregate number of insider purchases (i.e., the number of insider purchases minus the number of insider sales) by the total aggregate number of insider transactions over the prior six-month period.

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[7] However, most abnormal returns reported in Table 3 are significantly different from zero. This is consistent with Pascutti (1996).

Throughout the article we calculate the NPR measures based on insider transactions during the prior six-month interval. Calculating an insider trading measure based on a shorter period, such as one month, would result in many companies having no trades. Therefore, to get a better picture of insiders' activities, we use a longer period. To check the sensitivity of the results, we calculate NPRs for other intervals, such as the prior 3, 9, and 12 months. In general, the results are similar, although measures calculated over longer horizons seem to have a somewhat higher predictive power.

We present results, for which we calculate the NPRs based on insider transactions by managers, by large shareholders, and by both managers and large shareholders, for all the companies and for each of the size groups. We also calculate the NPRs based on the dollar volume instead of the number of insider transactions.

We predict market returns for 1-, 3-, 6-, and 12-month horizons. The results in Table 4 are for 3 and 12 months. In general, the predictive power improves for longer horizons. Since insiders cannot make more than two round-trip transactions a year without incurring a penalty, and because they cannot trade on any obvious short-term information, it makes sense to expect benefits to materialize over a longer horizon.[8] When we use longer horizons, we end up with overlapping periods. Therefore, in calculating t-statistics, we use the Newey–West autocorrelation and heteroskedasticity-consistent covariance estimates [see Newey and West (1987)].[9]

We run the following regression as the first step in examining the relation between aggregate insider trading and the return on the corresponding portfolio:

$$\prod_{k=t}^{t+T}(1 + R_k^i) - \prod_{k=t}^{t+T}(1 + R_k^f) = \alpha_0 + \alpha_1{}^*NPR_t^i + \alpha_2{}^*PR24_t^i,$$

where R_k^i is the return of portfolio i in month k, R_k^f represents the monthly Treasury bill rate in month k, NPR_t^i represents the NPR of portfolio i in month t, and $PR24_t^i$ is the prior two-year holding period return of portfolio i at time t. Portfolio returns are equally weighted and include companies without any insider activities. We include the prior two-year holding period return in our regressions to control for the insiders' tendency to be contrarian. Prior studies [e.g., Fama and French (1988)] document long-term mean

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[8] Section 16(b) of the Securities and Exchange Act of 1934 prohibits insiders from profiting on round-trip trades completed within a six-month period and requires them to return all profits from such trades to the corporation.

[9] To avoid possible problems with the use of overlapping period returns, Seyhun (1992, 1998) uses non-overlapping period returns for the examination of aggregate insider trading and the market return. However, this procedure introduces another problem, the extremely small number of observations.

Table 4
Monthly aggregate insider trading and market returns

Holding period # of months	Number of transactions			Dollar volume		
	Management	Large shareholder	All	Management	Large shareholder	All
All firms						
3	0.03, −0.13	0.02, −0.14	0.04, −0.13	0.00, −0.14	0.01, −0.14	0.00, −0.14
	(0.75, −3.03)	(0.78, −3.29)	(0.78, −3.05)	(0.09, −3.21)	(0.85, −3.30)	(0.04, −3.18)
12	0.22, −0.27	0.08, −0.31	0.24, −0.26	−0.01, −0.32	0.07, −0.32	0.01, −0.32
	(2.09, −1.96)	(0.84, −2.49)	(2.04, −1.95)	(−0.15, −2.52)	(1.37, −2.56)	(0.11, −2.51)
Small firms						
3	0.09, −0.04	0.04, −0.05	0.10, −0.04	−0.01, −0.05	0.04, −0.06	−0.00, −0.05
	(1.44, −1.32)	(1.18, −1.63)	(1.72, −1.32)	(−0.33, −1.61)	(1.44, −1.85)	(−0.15, −1.60)
12	0.40, −0.03	0.15, −0.08	0.41, −0.03	0.01, −0.08	0.06, −0.09	0.01, −0.08
	(3.32, −0.28)	(1.02, −0.64)	(3.30, −0.29)	(0.24, −0.63)	(0.58, −0.68)	(0.17, −0.63)
Medium firms						
3	0.04, −0.14	0.03, −0.15	0.05, −0.14	0.13, −0.15	0.05, −0.17	0.10, −0.16
	(0.93, −3.17)	(1.22, −3.45)	(1.06, −3.27)	(1.66, −3.54)	(1.82, −3.74)	(1.95, −3.80)
12	0.22, −0.26	0.09, −0.32	0.24, −0.26	0.33, −0.31	0.15, −0.36	0.28, −0.35
	(1.91, −2.03)	(1.29, −2.72)	(2.01, −2.11)	(1.82, −2.58)	(2.22, −3.08)	(2.50, −3.03)
Large firms						
3	0.00, −0.16	0.02, −0.15	−0.01, −0.16	0.00, −0.16	−0.01, −0.16	−0.01, −0.16
	(0.03, −2.98)	(0.69, −2.81)	(−0.31, −3.05)	(0.06, −3.02)	(−1.25, −3.14)	(−0.59, −3.09)
12	0.07, −0.36	0.07, −0.34	0.07, −0.36	0.05, −0.37	−0.01, −0.38	0.03, −0.37
	(0.82, −2.97)	(1.11, −2.89)	(0.72, −2.97)	(0.47, −3.10)	(−0.31, −3.17)	(0.47, −2.99)

This table reports the results of the regression

$$\prod_{k=t}^{t+T}(1+R_k^i) - \prod_{k=t}^{t+T}(1+R_k^f) = \alpha_0 + \alpha_1 \times NPR_t^i + \alpha_2 \times PR24_t^i,$$

where R_t^f represents the monthly three-month Treasury bill rate in month t, R_t is the monthly return of each portfolio, NPR_t^i represents the net purchase ratio (NPR) of portfolio i in month t and $PR24_t^i$ represents the prior two-year holding-period return in month t. The portfolios are equally weighted and the dependent variable is not measured in percentage. We calculate NPRs for each portfolio for each month for the January 1976–January 1995 period. Each month, we calculate the NPR by dividing the net number of purchases (i.e., number of purchases minus number of sales) by the total number of insider transactions (or the net dollar volume by the total dollar volume) by managers, by large shareholders, and by both managers and large shareholders of all companies in portfolio i during the prior six-month period. At the top of each cell, we report α_1 on the left-hand side and α_2 on the right-hand side. In parentheses, we report the t-statistic of α_1 on the left-hand side and α_2 on the right-hand side. We base t-statistics on the Newey–West period returns, respectively. The numbers of lags we use in the estimation of Newey and West standard errors are 3 and 12 months for 3- and 12-month holding period returns, respectively. Small, medium, and large firms are firms in the bottom three, the next four, and the last three size deciles, based on NYSE firms' decile cutoff points at the end of April of each year, respectively.

reversions in returns for diversified portfolios. [10] Therefore, it is possible that insiders can predict the market simply because they are contrarian. Whether they are better at predicting the market than a simple contrarian strategy is a question we try to address. The results are reported in Table 4. Using a different measure based on the number of transactions by officers, directors, and large shareholders without adjusting for the contrarian nature of insiders, Seyhun (1992, 1998) finds that aggregate insider trading predicts future market returns.

4.2 Regression results

In Table 4, in the top row of each cell, α_1 is reported on the left and α_2 is reported on the right. In parentheses, the corresponding Newey–West t-statistics are reported. Our results show that aggregate insider trading predicts market returns for a 12-month holding horizon. (Note that the returns are equally weighted.) For example, when the NPR measure is based on the number of transactions by management, the coefficient is 0.22, suggesting a spread of 11% per year in market returns between the month with the NPR in the top 10 percentile (0.06) and the month with the NPR in the bottom 10 percentile (−0.46), holding prior returns constant. However, even this economically significant coefficient is only marginally statistically significant (t-statistic is 2.09) after adjusting for the autocorrelation induced by our use of overlapping time periods. Without adjusting for autocorrelation, the coefficient is highly significant and the t-statistic is 3.54.

Consistent with previous work, we also find that the α_2 coefficients are negative, which implies that high market returns are followed by low returns and vice versa. In examining whether insiders can predict market movement, previous studies of insider trading did not adjust for a simple contrarian strategy. Without such an adjustment, the importance of insider trading in predicting market returns is substantially overstated. For example, when the NPR measure is based on the number of trades by managers, without the variable $PR24$ in the regression, the α_1 coefficient increases to 0.31 and the t-statistic increases to 3.46. For the sake of brevity, we do not present results without $PR24$.

Managers' trading is more informative than trading by large shareholders. Moreover, in unreported regression results for two subperiods, 1976–1985 and 1986–1995, it is shown that the predictive power of large shareholders' trades is not robust over time. In the last 10 years, information from large shareholders' trades would have been counterproductive in timing the market. The weaker predictive power of large shareholders is probably a result of large shareholders being removed from the decision-making process of the firm. In addition, the weaker result for the second subperiod

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[10] During our sample period we find that the prior two-year holding period returns of portfolios best explain the returns in the first post formation year. We also check the robustness of the regression results by using the prior three-year returns in the regression and find similar results.

could be the consequence of trades being less informative since large share-holders became more sensitive to possible legal complications and therefore, less informed parties started to report their transactions.

Insider trading activity seems to have little explanatory power when it comes to predicting market returns over a short horizon such as three months. In addition, NPRs based on the number of transactions are more informative than are NPRs based on the dollar volume of trading, which might be influenced by a few huge transactions.

Aggregate insider trading activity is more informative in predicting returns of smaller companies relative to large companies. For example, for management trades, the post-one-year holding period return difference between the month with the NPR in the top 10 percentile (0.16) and the month with the NPR in the bottom 10 percentile (-0.32) is 19% for small companies and is statistically significant. The corresponding difference for large companies is only 5% (NPR in the top 10 percentile is -0.68 and NPR in the bottom 10 percentile is -0.03) and is not statistically significant. This result suggests that managers in smaller firms possess more valuable information about the fortunes of their companies than do the managers of larger firms. Moreover, managers in smaller firms might have more freedom to exploit this information. In general, previous studies have documented that larger stocks are more efficiently priced than smaller stocks.

Figure 1 shows the time series of the NPR and subsequent one-year holding period return for each month from January 1976 to January 1995. Here we calculate the NPRs based on the number of transactions by managers and large shareholders over the prior six-month period. In general, the NPRs and the returns move quite closely. Low NPRs are recorded in the period prior to the market crash in October 1987. Managers apparently felt that stock prices were too high, and became heavy sellers. Right after or during the crash, insiders reversed their actions and became heavy buyers.[11] Since our NPRs are based on transactions during the prior six-month period, the effect of these large purchases started to show up in 1988. Ex post, the heavy selling before the crash and the heavy buying after the crash turned out to be the right decisions.

4.3 Summary statistics for NPR quintiles

Table 5 provides various statistics for NPR quintiles. These include returns for a 12-month holding period prior to the formation month and a 12-month postformation holding period. We present returns for an equally weighted (EW) portfolio of all the firms used to calculate the NPRs and for the S&P 500 index including dividends. We calculate the various returns for all insiders' trades and for managers and large shareholders separately.

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[11] Seyhun (1990) carefully examines insider trading behavior around the 1987 market crash and shows similar results.
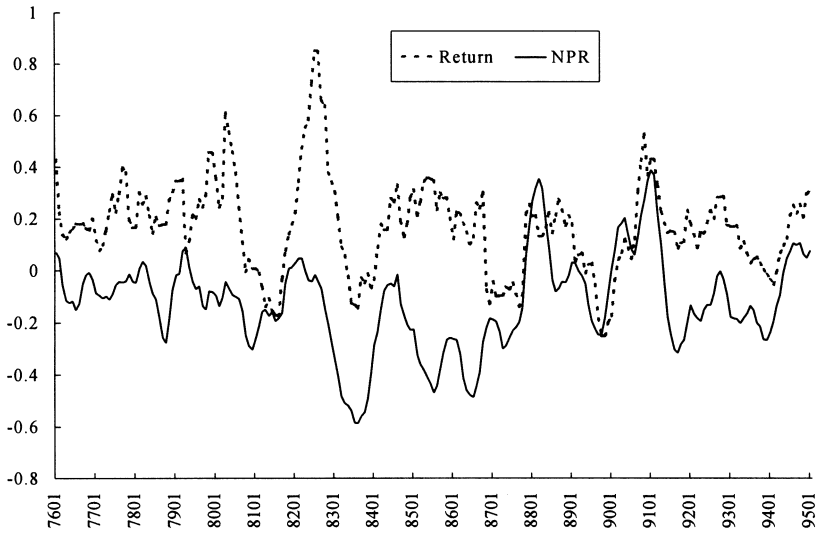
Figure 1
Monthly net purchase ratio (NPR) rank and average annual return
This figure presents a time series of net purchase ratio (NPR) rank and one-year holding period returns for each month from January 1976 to January 1995. NPR is the number of purchases minus the number of sales divided by the total number of transactions by managers and large shareholders over the prior six-month period. Returns are equally weighted returns over the 12-month period of all sample firms.

In the first panel of Table 5, the NPR quintiles are based on the distribution of NPRs for the whole period, January 1976–January 1995. However, such a test is not predictive. Therefore, in the second panel, we form NPR quintiles based on the distribution of NPRs in the prior 60 months. This test is predictive, since the information used was available to investors.

The results reveal that insiders are contrarian. In the lowest NPR quintile, when insiders were heavy sellers, the prior 12-month return on an equally weighted portfolio was 34.7%. Insiders do not tend to buy after large increases in the market. On the other hand, the corresponding return in the highest NPR quintile was only 2.9%. Insiders were heavy buyers after poor performance of the market. The S&P 500 results also show the same contrarian attitude by insiders. Examining managers and large shareholders separately shows that managers are more contrarian than large shareholders. As discussed earlier, large shareholders are not such a clearly defined group; their trades can be motivated by a broad set of considerations.

Consistent with prior results, insiders' activities seem to predict the return on the market. For example, if we use an implementible market-timing strategy based on the five-year ranking of NPRs of managers, we see a spread between extreme quintiles in future EW returns of 14.8% per year, and 13.8% for the S&P 500 returns. Here we find cutoffs during the previous 60 months and classify the current month based on which of these quintiles it falls into,

Table 5
Summary statistics for the net purchases ratio (NPR) quintiles of monthly aggregate insider trading

| | All | | | | | Managers | | | | | Large shareholders | | | | |
| | | Post 12 | | Prior 12 | | | Post 12 | | Prior 12 | | | Post 12 | | Prior 12 | |
Quintiles	NPR	EW	S&P	EW	S&P	NPR	EW	S&P	EW	S&P	NPR	EW	S&P	EW	S&P
Using the whole sample period rankings															
Lowest	−0.38	12.7%	16.7%	34.7%	30.1%	−0.48	12.3%	16.0%	33.7%	30.0%	−0.02	12.6%	12.1%	23.2%	15.9%
2	−0.20	4.1%	5.6%	20.2%	18.3%	−0.31	8.0%	8.3%	22.5%	19.9%	0.37	9.3%	14.0%	23.9%	26.5%
3	−0.12	17.1%	9.9%	23.0%	15.2%	−0.21	22.9%	16.1%	15.3%	9.5%	0.55	16.0%	13.2%	13.3%	13.8%
4	−0.04	29.7%	21.0%	10.0%	4.8%	−0.15	20.2%	13.5%	15.2%	7.9%	0.65	19.4%	12.7%	16.5%	9.1%
Highest	0.13	22.1%	20.1%	2.9%	5.7%	0.05	22.4%	19.5%	4.0%	6.6%	0.75	28.4%	21.4%	13.4%	8.5%
Using the prior five-year rankings															
Lowest	−0.33	8.1%	10.6%	33.8%	26.6%	−0.45	5.8%	7.2%	38.1%	29.5%	0.14	13.7%	14.2%	27.4%	22.7%
2	−0.20	16.6%	15.8%	20.9%	17.6%	−0.34	17.4%	19.1%	20.4%	19.2%	0.36	11.7%	16.7%	16.5%	18.1%
3	−0.16	15.9%	15.8%	12.7%	16.6%	−0.25	17.1%	17.1%	14.7%	14.8%	0.39	10.0%	11.8%	9.2%	15.4%
4	−0.06	14.3%	17.9%	5.6%	10.4%	−0.17	14.2%	15.9%	7.7%	10.8%	0.61	11.2%	12.8%	12.7%	13.6%
Highest	0.12	21.2%	21.1%	−0.9%	4.8%	0.04	20.6%	21.0%	−1.7%	5.6%	0.74	26.6%	27.1%	3.0%	−0.8%

The table reports the average before-and-after annual returns of the months in different quintiles based on the net purchase ratio (NPR). We define the NPR of each month as the aggregate number of purchases minus the aggregate number of sales divided by the aggregate number of purchases plus the aggregate number of sales, based on the insider trading at all the companies in our sample during the prior six-month period. In the first panel, we form the quintiles of the months from January 1976 to January 1995 by using the cutoff points based on the NPRs during January 1976–January 1995 period. In the second panel, we form the quintiles of the months during January 1981–January 1995 using the cutoff points based on the NPRs of 60 months prior to the formation date. All transactions are counted by management only, by large shareholders only, and by both managers and large shareholders. "EW" represents the equally weighted average return of the firms used in the calculation of the NPR, and "S&P" represents the S&P 500 index return including dividends.

for predicting the future market return. Activities of large shareholders are also useful in predicting the market. However, the results in Table 4 suggest that large shareholders did not perform well in the second subperiod. As discussed earlier, it is possible that the filing clientele in this group changed, and became less informed over time.

5. Insiders' Trades and Cross-Sectional Variation in Stock Returns

5.1 Portfolio formation

The previous section suggests that aggregate insider trading might be useful in timing the market. However, this does not imply that insiders can predict cross-sectional variations in stock returns. In general, investors prefer to invest in stocks that they are familiar with [see Huberman (1999)]. Insiders are definitely active in trading their own stocks. Hence, it is possible that when insiders time the market, they simply make adjustments in holdings of their companies' shares. This section focuses directly on insiders' ability to predict cross-sectional variations in stock returns. Starting in 1976, at the end of April for each year, we form NPR decile portfolios based on insider transactions during a six-month period prior to the formation date. We use only those insider transactions reported before the formation date. For the transactions reported between April 1991 and October 1992, we assume that all transactions are reported on the tenth date of the reporting month, which is the latest date allowed for reporting.[12] We form a separate portfolio of the firms that have no insider trading during the six-month period. We also form two other portfolios, "Positive" and "Negative," which are composed of firms with positive and negative NPRs, respectively.

We calculate the NPR of each firm by dividing the number of purchases minus the number of sales by the total number of insiders' transactions during the prior six-month period. Whenever two companies have the same NPR, the firm with larger net purchase dollar volume as a percentage of market capitalization has the higher rank. We calculate returns for different holding periods starting from the formation date of each year. If a firm is delisted before the end of the holding period, we splice the value-weighted CRSP index return[13] into the calculation of the annual holding period return, starting from the delisting date and continuing until the end of the holding period. We calculate the portfolio returns by equally weighting the returns of individual stocks. We rebalance the portfolios annually so that each stock starts with the same weight at the beginning of the period.

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[12] As indicated earlier, the ORS data provide the month in which transactions are reported, but not the exact reporting date during this period.

[13] We use NYSE/AMEX value-weighted index returns for the NYSE/AMEX listed firms and Nasdaq value-weighted index returns for the Nasdaq firms.

5.2 NPR decile portfolio performance and characteristics

Table 6 reports pre- and postformation period returns for each of the NPR deciles and some portfolio characteristics. We base NPR deciles on insider transactions during the prior six-month period. We report the results for managers in the first panel and those for large shareholders in the second panel.

We observe a positive relation between NPRs and stock returns. The difference in one-year holding period returns is about 8% between the lowest and the highest NPR deciles (14.4% compared to 22.2%).[14] This difference is of the same magnitude as the difference between extreme B/M deciles documented in Lakonishok, Shleifer, and Vishny (1994).

High NPR stocks continue to outperform low NPR stocks in the second postformation year. The spread between the two extreme deciles is 2.3%. In the third postformation year, we see no noticeable relation between NPRs and stock returns. These results are consistent with other studies that also found sluggish market adjustments, for example, to repurchase announcements. Although, when insiders buy for themselves, the outperformance in the first year seems to be higher than when they buy on behalf of their companies through open market share repurchases.

Comparing the positive with the negative NPRs, there is a spread of 3.5% in the first postformation year. However, there is no noticeable difference in returns of the first post-formation year between companies with negative NPRs and companies with no insider activities. This result suggests that buys are more informative than sales. There can be a variety of reasons for insiders to sell a stock, but the main reason to buy a stock has to be to make money.

The comparisons made so far are crude, since the various NPR portfolios have very different characteristics. Consistent with the results presented earlier, insiders are contrarian. The highest NPR portfolio (insiders are buying) is associated with poor past performance (13.6% in the preformation year), whereas the lowest NPR portfolio (insiders are selling) exhibits an extraordinary past return (40.4% in the preformation year). Figure 2 illustrates the relation between past and future returns for the NPR deciles.

The NPR portfolios have substantially different B/M and size characteristics. Previous studies [e.g., Lakonishok, Shleifer, and Vishny (1994)] found a negative correlation between B/M and long-term past performance. In line with this result, the high NPR portfolios tend to have substantially higher B/M than the low NPR portfolios. For example, the highest NPR portfolio has an average B/M of 1.08, whereas the B/M of the lowest NPR decile portfolio is 0.57. In addition, the extreme portfolios based on NPR tend to include much smaller stocks than the middle groups. The highest NPR portfolio is composed of the smallest companies.

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[14] Across all NPR deciles, the post-6-month returns are much lower than the post-12-month returns. This is because the deciles are formed at the end of April in each year. The post-six-month returns do not include returns in January, which were typically higher than returns in other months during our sample period.

Table 6
Performance of portfolios based on insider trading

	Lowest	2	3	4	5	6	7	8	9	Highest	No	Positive	Negative
Managers only													
+6m	1.2%	1.5%	3.5%	3.2%	3.4%	4.0%	4.2%	2.9%	5.0%	4.9%	2.2%	4.5%	2.2%
+12m	14.7%	16.1%	17.3%	16.3%	16.2%	18.6%	17.4%	17.4%	21.7%	22.4%	16.7%	20.1%	16.6%
+2y	17.9%	16.8%	17.1%	16.5%	17.8%	17.2%	16.7%	17.8%	19.4%	20.3%	17.4%	18.6%	17.4%
+3y	19.0%	16.1%	17.2%	17.3%	16.9%	17.8%	16.2%	17.2%	17.8%	18.8%	16.8%	17.1%	17.6%
AR+12m	−1.3%	−0.3%	1.1%	0.1%	−0.8%	0.3%	0.6%	−0.3%	2.9%	3.5%	−0.4%	2.0%	−0.1%
−6m	22.0%	20.6%	17.7%	17.2%	17.7%	16.2%	15.3%	16.3%	16.2%	15.6%	15.5%	15.8%	18.7%
−12m	40.4%	32.1%	27.0%	24.2%	24.4%	22.2%	20.3%	17.8%	17.4%	13.6%	15.6%	16.5%	29.0%
−24m	91.4%	71.7%	58.2%	48.3%	51.8%	48.4%	43.3%	40.9%	37.6%	28.9%	30.4%	36.4%	63.0%
−36m	143.1%	117.9%	95.5%	79.1%	82.2%	79.3%	71.2%	65.3%	61.0%	48.3%	48.8%	58.9%	100.4%
NPR	−1.0	−1.0	−1.0	−0.97	−0.70	−0.25	0.35	0.79	0.98	1.00	0.00	0.91	−0.91
Net $	−$5.26	−$1.27	−$0.68	−$0.59	−$0.71	−$0.53	−$0.30	$0.05	$0.06	$0.50	$0.00	$0.19	−$1.60
Net DR	−1.73%	−0.31%	−0.11%	−0.07%	−0.18%	−0.16%	−0.08%	0.04%	0.03%	0.53%	0.00%	0.17%	−0.44%
BM	0.57	0.64	0.71	0.71	0.73	0.78	0.83	0.90	0.97	1.08	1.07	0.96	0.68
Mkt Cap	$268	$424	$724	$1,825	$2,269	$2,116	$1,819	$1,113	$396	$104	$265	$783	$1,324
Avg #	188	188	188	188	188	188	188	188	188	193	2,733	699	1,079
Large shareholders only													
+12m	19.7%	13.9%	14.5%	14.5%	17.8%	17.9%	19.2%	18.1%	15.6%	13.5%	16.8%	17.5%	16.3%
−12m	36.7%	38.1%	31.7%	26.4%	23.8%	22.6%	18.0%	18.6%	18.0%	20.0%	18.5%	19.5%	31.7%
Avg #	17	17	17	17	17	17	17	17	17	18	4,377	96	76

We form 10 portfolios based on the net purchase ratio (NPR) of each company at the end of April of each year. We calculate NPR, the number of purchases minus the number of sales divided by the total number of transactions, at the end of April of each year based on the insider transactions that have occurred during the prior six-month period and have been reported to the SEC on or before April 10 of each year. "Insiders" include only managers. In the formation of the 10 portfolios, we use only those firms with at least one insider transaction during the previous six-month period. Whenever two companies have the same NPR, the company with larger Net DR, which is defined later, has a higher rank than the other company with low Net DR. We construct a separate portfolio called "No" comprising all the companies without any insider transactions during the prior six-month period. "Positive" represents the firms with positive NPRs and "Negative" represents the firms with negative NPRs. "+6m" and "+12m" represent post-6-month and 12-month holding- period returns, respectively. Similarly, "−6m", "−12m", "−24m" and "−36m" represent prior 6-, 12-, 24-, and 36-month holding period returns, respectively. "+2y" and "+3y" represent annual returns in the second and third postformation years, respectively. Reported returns are equally weighted average returns of firms in each decile. "AR+12m" is the average annual abnormal return, calculated by subtracting the equally weighted average annual return of firms in the same size and B/M quintiles as the corresponding firm. "NPR" is the average NPR. "Net $" is the average of (dollar volume of purchases minus dollar volume of sales) in 1995 $millions. "Net DR" is the average of (Net $/$ Market Capitalization), "BM" is the average book-to-market equity ratio, "Mkt Cap" is the average market capitalization in millions (in 1995 dollars), and "Avg #" is the average number of firms in each portfolio.
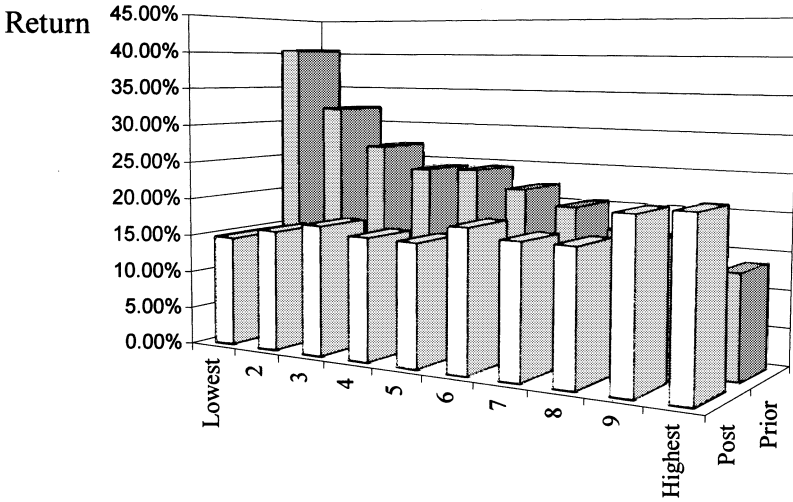
Figure 2
Prior- and post-annual return of net purchase ratio (NPR) deciles
We form 10 portfolios at the end of April of each year, basing them on the insider transactions of each company during the prior six-month period, which are reported before April 10 of each year. "Insiders" include only managers. We use only those firms with at least one manager transaction during the previous six-month period in forming the 10 portfolios based on the net purchase ratio (NPR). NPR is the number of purchases minus the number of sales divided by the total number of transactions. "Prior" refers to the average one-year holding period return ending on one day before the decile formation date. "Post" refers to the average one-year holding period return starting from the formation date of each decile.

To better compare the performance of the various NPR deciles, for the postformation year, we calculate abnormal returns utilizing size- and B/M-based benchmarks. For each April, we form quintile portfolios based on market capitalization and B/M. We use the same NYSE decile breakpoints described in Section 1 to form size and B/M quintiles. However, we divide the smallest size quintile into two groups, since there are so many firms in this quintile. Our procedure results in 30 reference portfolios. Within each of the portfolios, we weight each stock equally and calculate annual buy-and-hold returns. If a firm is delisted during the year, we apply the same procedure as in Section 5.1.[15]

The results in Table 6 show that even after adjusting for size and B/M, high NPR stocks outperform low NPR stocks. Before the adjustment, the spread in the first year was 7.7%. After adjusting for size and B/M, the spread decreased to 4.8%. This implies that previous studies [e.g., Seyhun (1998)] that did not adjust for size and B/M overestimated abnormal returns

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[15] As pointed out by Barber and Lyon (1997), this procedure might pose problems in statistically testing the abnormal performance. However, we use this procedure to understand the characteristics of NPR deciles, not to conduct a formal statistical test of abnormal performance. We conduct a statistical test using a Fama and MacBeth (1973) regression approach in the next section.

from the insider trading signal. As with the raw returns, the results seem to indicate that insider buys are more informative than insider sales.

The results for large shareholders appear in the second panel of Table 6. We observe no consistent pattern between NPRs and future returns for large shareholders. However, we should note that the number of observations in each of the decile portfolios is small, around 17. Therefore, it is difficult to sort out what is going on. When we compare the positive and negative NPRs for large shareholders, where the number of observations is larger, we see a mildly higher return for the positive-NPR portfolio, 17.5%, compared to 16.3%. However, this difference is not statistically significant.

5.3 Returns for size and B/M groups

Previous articles indicate that abnormal returns depend on company characteristics. For example, various trading strategies seem to work better in smaller stocks than in larger stocks [see Chopra, Lakonishok, and Ritter (1992), Fama and French (1993), and Loughran (1997)]. This finding is consistent with a more efficient market for larger stocks, which are under much greater scrutiny than are smaller stocks. If this is true, we would expect to find more dramatic results in smaller stocks.

To examine more closely the relationship between returns and firm characteristics, we calculate abnormal returns for a total of nine size and B/M groups. Within each of the nine groups, we present results for three NPR portfolios (the first three deciles, the next four deciles, and the last three deciles[16] form LNPR, MNPR, and HNPR, respectively) plus results for the firms without any insider trading (NO). The abnormal returns presented are based on the six by five size-B/M reference portfolios described in Section 5.2. We also present the raw returns for the first postformation year.

The results in Table 7 show that the superior performance of high NPR stocks is not uniform across the various groups. We observe the largest spread in returns between high and low NPR stocks for small stocks, where the spread is 4%. Also, among mid-cap stocks, there is some indication that high NPR stocks outperform low NPR stocks, although the difference is smaller, 2.2%. For the largest stocks, the HNPR portfolio does not outperform the LNPR portfolio. This might be because large companies put more efforts into discouraging any illegal insider trading by enforcing a very strict compliance policy. In addition, the results are generally consistent with other studies that also find that small stocks are less efficiently priced than large stocks. Figure 3 graphically presents the one-year postformation period returns across different size and NPR groups.

Comparing across B/M groups does not show any major differences between the HNPR and LNPR portfolios. We see the single biggest spread

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[16] NPR deciles are based on manager trading during the six-month period prior to the formation date. Section 4.1 describes the procedure in more detail.

Table 7
NPR portfolio performance in different size and B/M groups

		Lowest BM				Middle BM				Highest BM				Total			
		LNPR	MNPR	HNPR	No	LNPR	MNPR	HNPR	No	LNPR	MNPR	HNPR	No	LNPR	MNPR	HNPR	No
Small	12m	13.9%	16.2%	21.2%	11.6%	17.7%	18.8%	24.7%	18.0%	16.9%	20.6%	20.4%	21.2%	15.8%	18.7%	21.9%	17.2%
	AR1	0.6%	2.0%	7.2%	-1.2%	-1.0%	-0.1%	5.8%	-0.6%	-3.7%	0.2%	-0.3%	0.2%	-0.9%	0.6%	3.1%	-0.5%
	AR2	0.3%	1.3%	1.3%	-1.4%	2.2%	-1.0%	0.2%	1.2%	1.8%	-0.4%	-0.5%	0.4%	1.2%	-0.1%	0.1%	0.0%
	AR3	0.1%	-2.8%	-2.8%	-1.4%	2.0%	-0.6%	-0.1%	0.6%	2.0%	0.8%	2.3%	0.6%	1.1%	-0.7%	0.5%	-0.1%
	#	134	110	56	758	89	130	92	544	70	143	140	930	293	383	288	2,232
Mid	12m	16.1%	16.5%	17.2%	16.9%	18.7%	17.9%	18.4%	17.5%	21.6%	19.3%	24.2%	19.3%	17.3%	17.7%	19.9%	17.7%
	AR1	-2.1%	-0.2%	0.4%	0.5%	0.7%	-0.1%	0.2%	-0.7%	1.1%	-1.3%	3.4%	-0.9%	-1.0%	-0.4%	1.2%	-0.3%
	AR2	1.0%	1.9%	-0.2%	-1.2%	-1.7%	0.0%	-0.2%	-1.2%	1.4%	-1.8%	2.4%	-1.3%	1.2%	0.3%	0.6%	-1.2%
	AR3	1.2%	0.1%	-3.1%	-1.3%	2.4%	0.9%	-1.2%	-0.4%	5.1%	0.2%	1.0%	-1.5%	1.9%	0.4%	-1.0%	-1.0%
	#	111	89	43	146	47	93	78	140	17	50	55	92	175	232	176	378
Large	12m	16.5%	14.3%	13.1%	13.7%	16.6%	14.8%	14.5%	14.5%	17.5%	18.8%	17.6%	18.9%	16.6%	15.3%	14.8%	15.1%
	AR1	2.0%	0.0%	-1.6%	-1.0%	1.1%	-0.6%	-0.9%	-1.2%	0.3%	1.3%	-0.2%	1.1%	1.6%	0.0%	-0.9%	-0.6%
	AR2	-0.1%	0.2%	-1.0%	-0.6%	-0.4%	0.1%	0.1%	0.2%	3.6%	0.2%	-0.8%	0.8%	0.1%	0.2%	-0.4%	0.4%
	AR3	-0.5%	1.8%	-0.5%	0.4%	1.8%	-0.0%	-1.1%	-1.2%	-0.3%	3.0%	0.7%	0.1%	0.3%	1.3%	-0.5%	-0.3%
	#	59	59	29	49	33	55	53	47	9	23	25	27	101	137	107	123
Total	12m	15.2%	15.9%	18.0%	12.5%	17.8%	17.7%	20.1%	17.7%	17.8%	20.1%	21.0%	21.0%	16.4%	17.8%	20.0%	17.1%
	AR1	-0.1%	0.8%	2.9%	-0.9%	-0.1%	-0.2%	2.2%	-0.7%	-2.5%	0.0%	0.6%	0.1%	-0.5%	0.2%	1.8%	-0.5%
	AR2	0.5%	1.3%	0.3%	-1.3%	1.6%	-0.4%	0.0%	0.7%	1.9%	-0.7%	0.2%	0.3%	1.0%	0.1%	0.1%	-0.2%
	AR3	0.4%	-0.7%	-2.4%	-1.3%	2.1%	0.0%	-0.7%	0.3%	2.3%	0.9%	1.8%	0.4%	1.2%	0.0%	-0.1%	-0.2%
	#	304	258	128	953	169	278	223	731	96	216	220	1,049	569	752	571	2,733

We form 10 portfolios at the end of April of each year based on the net purchase ratio (NPR) of each company. We calculate NPR, the number of sales divided by the total number of transactions, at the end of April of each year based on the insider transactions that have occurred during the prior six-month period and have been reported to the SEC before or on April 10 of each year. "Insiders" include only managers. In forming the 10 portfolios, we use only those firms with at least one insider transaction during the previous six-month period. We construct a separate portfolio called "No" comprising all the companies without any insider transactions during the prior six-month period. "Sell" represents the first three deciles, "Mix" represents the next four deciles, and "Buy" represents the last three deciles, based on the net purchase ratio. "Lowest B/M (Small)", "Middle BM(Mid)", and "Highest BM (Large)" are composed of the lowest three B/M (size) deciles, the next four deciles, and the last three deciles, respectively. Size (B/M) deciles are based on the market capitalization (B/M) at the end of April of each year using the NYSE firms' decile cutoff points. We calculate B/M ratios at the end of April of each year by dividing the book equity value with at least four-month lag from the fiscal year-end by the market capitalization at the end of April. "12m" is the equally weighted average one-year holding-period returns in the first postformation year. "AR1," "AR2," and "AR3" are the average annual abnormal returns in the first, second, and third postformation years. We calculate abnormal returns by subtracting the equally weighted average annual return of firms in the same size and B/M quintiles as the corresponding firm. The average number of firms in each portfolio appears in the bottom of each cell.
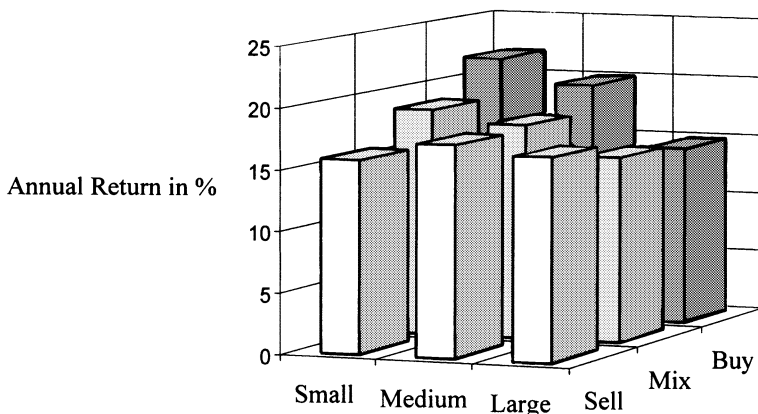
Figure 3
Relation between annual returns and insider transactions for different size groups
We form 10 portfolios at the end of April of each year based on the net purchase ratio (NPR) of each company. We calculate NPR, the number of purchases minus the number of sales divided by the total number of transactions, on May 1 of each year based on the insider transactions that have occurred during the prior six-month period and have been reported to the SEC on or before April 10 of each year. "Insiders" include only managers. We use only those firms with at least one insider transaction during the previous six-month period in the formation of the 10 portfolios. "Sell" represents the bottom three NPR deciles, "Mix" represents the next four deciles, and "Buy" represents the top three deciles, based on NPR. Bars designated small, medium, and large comprise the bottom three size deciles, the next four deciles, and the top three deciles, respectively. Size deciles are based on the market capitalization at the end of April of each year using the NYSE firms' decile cutoff points. We plot post-one-year holding period returns, which are the equally weighted average returns of the firms in each group, for different size and NPR groups.

in returns for small, low B/M stocks. In this segment, which is composed of small growth stocks, insiders tend to sell. However, when they buy, the abnormal returns are substantial, 7.2%. Insiders seem to know when to buy. Stocks in this group, which include a large number of technology stocks, are generally difficult to value. Moreover, since the companies are small, they are not widely followed by financial analysts. Not unexpectedly, the results show that in this segment of the market insiders do seem to have an edge. It is much less likely that insiders in a large technology stock, such as Microsoft, would have the same edge over other investors.

We observe an interesting pattern in returns among small, high B/M stocks (value stocks). Consistent with their contrarian nature, insiders tend to buy in this segment, which is usually composed of "cheap" stocks. However, when they sell, we see a relatively large negative abnormal return of −3.7%. Moving to larger value stocks, which are more widely followed, insider sales do not seem to be informative.

Consistent with the results shown in Table 6, the relatively high abnormal returns are associated with insider buying. The sales are generally not informative. In addition, the discussion so far focused on returns in the first postformation year. We observe no substantial spreads in abnormal returns in the second and third postformation years.

5.4 Regression analysis

So far we have presented abnormal returns after adjusting for size and B/M. However, there are still substantial differences in other characteristics of LNPR and HNPR which might explain the differences in abnormal returns. Insiders tend to buy stocks that have not performed well in the past. For example, Table 6 shows that stocks in the highest NPR decile had a three-year buy-and-hold return of 48.3%, which is low when compared to the buy-and-hold return of 143.1% for stocks in the lowest NPR decile. DeBondt and Thaler (1985) and others document that long-term past losers tend to outperform past winners. Therefore, we need to make an adjustment for differences in long-term returns.

The literature on price momentum [Jegadeesh and Titman (1993) and Chan, Jegadeesh, and Lakonishok (1996)] suggests that stocks that perform well (poorly) over an intermediate period, such as 3–12 months, tend to continue to perform well (poorly). Table 6 demonstrates very substantial differences in returns over the prior 12-month period. Stocks in the lowest NPR decile had a return of 40.4% in the past 12 months compared to only 13.6% for stocks in the highest NPR decile. Therefore, in trying to determine whether insiders can predict cross-sectional returns, we might need to adjust for B/M, size, and intermediate- and long-term past performance. However, a four-way classification would result in a very small number of observations in many of the portfolios.

To circumvent this problem, we use the Fama and MacBeth (1973) cross-sectional regressions as another approach to examine the ability of insiders to predict cross-sectional returns. This approach also enables us to assess whether insiders' ability to predict returns is statistically significant. For every month from January 1976 to January 1995, we run a cross-sectional regression in which the dependent variable (R_i) is the returns on stock i over the next 12 months. The explanatory variables include insider trading activity measures as well as control variables. The control variables are $LBMR_i$ (ln (B/M)), $LSIZE_i$ (ln (market cap in millions of dollars))[17] and two variables to capture past returns. We measure the intermediate-term past return by $PR12_i$ (return in the prior 12 months) and the long-term past return by $PR36_i$ (return from month -48 to month -12). All the returns in the regressions are measured in percentages.

The basic measure of insider activities is NPR_i based on manager activity over the past six-month period. This variable has a maximum value of one when insiders are only buying, and a minimum value of minus one when insiders are only selling. In addition, in the context of the regression analysis, we explore the impact of insiders' strong buy and sell signals. According to our basic measure, NPR will be one even if just a single insider buys a relatively small amount and no other insider trades. Purchases by many

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[17] The market capitalization and B/M ratio are calculated at the end of the month preceding the formation.

insiders who commit relatively large sums of money should constitute a stronger signal. To follow this logic, we define two dummy variables to capture strong buy and sell signals.

The dummy variable for a strong buy signal (DPL_i) takes a value of one if at least three different insiders are trading, $NPR \geq 0.95$, and the net dollar volume traded is in the top 25% among the firms in the same size group. Our data enables us to identify who is the insider behind the trade. If the same insider has bought three times within the last 6 months, and those were the only trades for this company, we do not consider this signal to be a strong buy. For a strong buy, we require at least three different insiders buying their companies' shares. However, we did not require the NPR to be one for a strong signal. In a case in which we have 20 insider buys and just one sale, we consider the signal to be a strong buy. The last requirement for a strong buy signal is a relatively substantial monetary commitment. The more capital insiders are committing, the more significant the transaction should be. A strong sell signal is defined in a similar way. The variable DSL_i takes a value of one if at least three different insiders are selling, $NPR \leq -0.95$, and the absolute net dollar volume traded is in the top 25% among the firms in the same size group.

Previous results suggest that the ability of insiders to predict returns is greater for smaller stocks than for larger stocks. Therefore, we run separate regressions for three size groups. We run regressions without dummy variables for strong signals,

$$R_i = \alpha_1 + \beta_1 LBMR_i + \beta_2 LSIZE_i \qquad (1)$$
$$+ \beta_3 PR12_i + \beta_4 PR36_i + \beta_5 NPR_i,$$

and with dummy variables for strong signals,

$$R_i = \alpha_1 + \beta_1 LBMR_i + \beta_2 LSIZE_i + \beta_3 PR12_i \qquad (2)$$
$$+ \beta_4 PR36_i + \beta_5 NPR_i + \beta_6 DPL_i + \beta_7 DSL_i.$$

The numbers presented in Table 8 are the average coefficients from the 229 regressions. The corresponding t-statistics take into account the autocorrelation in returns caused primarily by the use of overlapping period returns.[18]

The results show that all the control variables have signs consistent with previous studies. The two most significant variables are the book-to-market and momentum variables. The size and long-term return are generally not significant.

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[18] t-Statistics are calculated based on the standard errors of 229 coefficients adjusted for 11th-order autocorrelation [i.e.,$(\sigma/229) \times \sqrt{229 + 2 \times 228 \times \rho_1 + \ldots + 2 \times 218 \times \rho_{11}}$, where σ is the time-series standard deviation of the coefficient estimates and ρ_n is the estimated nth-order simple autocorrelation coefficient].

Table 8
OLS regression (Fama–MacBeth type)

		α	β_1	β_2	β_3	β_4	β_5	β_6	β_7
All	1	25.09	4.06	−1.09	0.06	−0.01	0.76		
		(3.74)	(2.28)	(−1.22)	(3.67)	(−1.14)	(1.45)		
	2	25.12	4.06	−1.11	0.06	−0.01	0.77	4.82	2.81
		(3.74)	(2.28)	(−1.24)	(3.62)	(−1.17)	(1.55)	(2.60)	(1.40)
Small	1	27.32	4.06	−1.87	0.06	−0.01	1.64		
		(4.03)	(2.12)	(−1.96)	(3.50)	(−0.98)	(3.32)		
	2	27.37	4.05	−1.89	0.06	−0.01	1.56	7.27	1.09
		(4.03)	(2.12)	(−1.98)	(3.48)	(−0.99)	(3.25)	(3.10)	(0.38)
Medium	1	20.68	3.12	−0.56	0.10	−0.00	0.41		
		(2.62)	(1.80)	(−0.49)	(4.24)	(−0.97)	(0.68)		
	2	20.8	3.13	−0.06	0.10	−0.00	0.36	3.34	0.95
		(2.65)	(1.82)	(−0.52)	(4.19)	(−1.03)	(0.65)	(1.26)	(0.53)
Large	1	23.94	1.95	−1.15	0.09	−0.00	−0.30		
		(3.75)	(1.14)	(−1.46)	(4.02)	(−0.52)	(−0.65)		
	2	23.90	1.99	−1.14	0.09	−0.00	−0.27	1.32	2.10
		(3.78)	(1.15)	(−1.46)	(3.99)	(−0.57)	(−0.59)	(0.56)	(1.33)

This table reports the results of the following regressions:

$$R_i = \alpha_1 + \beta_1 LBMR_i + \beta_2 LSIZE_i + \beta_3 PR12_i + \beta_4 PR36_i + \beta_5 NPR_i + \beta_6 DPL_i + \beta_7 DSL_i.$$

R_i represents annual returns as a percentage, $LBMR_i$ represents ln (BE/ME), $LSIZE_i$ represents ln (market cap in $millions), $PR12_i$ represents the prior 12-month return as a percentage, $PR36_i$ represents the prior 36-month return as a percentage, NPR_i represents a net purchase ratio based on managers' transactions over the prior six-month period (i.e., number of purchase minus number of sales divided by number of purchase plus number of sales), DPL_i represents a dummy variable for a strong purchases signal (equals one if NPR is greater than or equal to 0.95, the number of different insiders who traded is greater than or equal to three, and the net dollar volume is in the top 25% range among the firms that are in the same size group and that satisfy the previous two criteria, otherwise zero), and DSL_i represents a dummy variable for a strong sales signal (equals one if NPR is less than or equal to −0.95, the number of different insiders who traded is greater than or equal to three, and the net dollar volume is in the bottom 25% range among the firms that are in the same size group and that satisfy the previous two criteria, otherwise zero). At the beginning of each month, we calculate the market capitalization and B/M ratio for the end of the previous month. Numbers in each cell are the averages from the cross-sectional regressions over 229 months from January 1976 to January 1995 (*t*-statistics are in the bottom). We calculate *t*-statistics based on the standard errors of 229 coefficients adjusted for 11th-order autocorrelation in the following way: $s.e. = (\sigma/299) \times \sqrt{299 + 2 \times 228 \times \rho_1 + 2 \times 227 \times \rho_2 + \ldots + 2 \times 218 \times \rho_{11}}$, where σ is the time-series standard deviation of the coefficient estimates and ρ_n is the estimated nth-order simple autocorrelation coefficient. Small, medium, and large firms are the firms in the bottom three size deciles, in the next four deciles, and in the top three deciles, respectively. Size deciles are based on the market capitalization at the end of April of each year, using the NYSE firms' decile cutoff points.

For the whole sample, the results of regression 1 show that the β_5 coefficient is 0.76 and that it is marginally significant. The coefficient implies that after controlling for other variables, the difference in returns between pure buyers ($NPR = +1$) and pure sellers ($NPR = −1$) is 1.52% per year, in the first postformation year. When we run the same regression for the three size groups, we observe a significant coefficient for the smallest companies ($\beta_5 = 1.64$), suggesting a spread of 3.28% between a pure buyer and a pure seller. The NPR coefficients for the mid-cap and large-cap stocks are not material. The results are generally consistent with those in Table 7 where we also observe that insiders' trades in small stocks seem to be more informative.

Results from regression 2 provide new insights into the importance of insider trading activity. A strong purchase signal (variable *DPL*) is associated with marginally significant excess return of 4.82% per year for the total sample. However, the result is primarily driven by the smaller stocks where a strong purchase signal is associated with an extra return of 7.27%. The extra

returns for mid- and large-cap stocks are 3.34% and 1.32%, respectively, and is not statistically significant.

The results for sell signals are consistent with the prior evidence which suggested that selling by insiders did not predict low returns. The β_7 coefficients are positive for the sample as a whole and for the three size groups. However, the coefficients are not statistically significant. Apparently insider selling that is motivated by private information is dominated by portfolio rebalancing for diversification purposes. It should be noted that many of the smaller growth firms in the sample are recent IPOs where managers have substantial "paper" wealth in their company.

5.5 Consistency of results

Insider trading activity has increased substantially over time. The activity has become much more regulated and the SEC has taken a tougher stance in enforcing insider trading regulations. In addition, information on insiders' activities is now much more readily available, at least to institutional investors. Therefore, in Figure 4, we explore whether the informativeness of insiders' trades has changed over time.

We provide annual differences in abnormal returns and raw returns between the highest and lowest NPR deciles. The spread in raw returns is negative in 6 of 19 formation periods, and the spread in abnormal returns is negative in 5 of 19 formation years. However, there is no indication that the predictability of insider activities has decreased over the study period. This result is consistent with other anomalies, such as revisions in analyst forecasts, which also have received much attention over the years but still seem to exist in the more recent years.

6. Summary and Conclusion

There is substantial demand for insider trading information. The perception of investors seems to be that insiders are better informed about the affairs of their companies, and hence there should be a way for outsiders to benefit from knowing what insiders are doing. In this article we conduct a comprehensive examination of the information content of insiders' trades and the market's response to those trades. We use the most extensive database available, which includes more than one million trades covering the period from 1975 to 1995. We observe changes in insider trading activity over time. Increasingly companies tie executive compensation to performance through stock options and other means. As a result of this trend, over time a higher percentage of manager wealth is in their companies' stocks. The need to diversify results in a substantial increase in selling activity.

Surprisingly, in spite of the extensive coverage that insiders' activities receive, the market basically ignores this information when it is reported. Moreover, there is very little action around the time when insiders trade. The
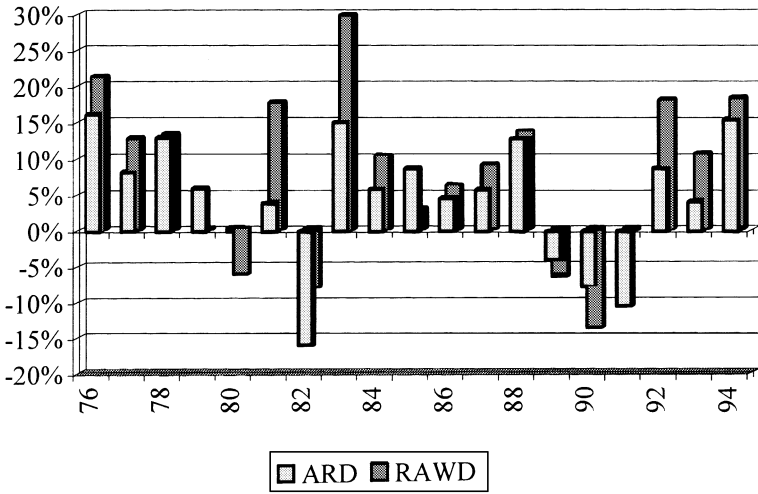
Figure 4
Average annual return differences between the highest and lowest net purchase ratio (NPR) deciles over the 1976–1994 period
We form 10 portfolios at the end of April of each year. The portfolios are based on insider transactions of each company during the prior six-month period, which are reported before April 10 of each year. "Insiders" include only managers. We use only those firms with at least one manager transaction during the previous six-month period in the formation of the 10 portfolios, based on the net purchase ratio (NPR). NPR is the number of purchases minus the number of sales divided by the total number of transactions. For each year, we calculate the annual return differences by subtracting the lowest NPR decile portfolio's post-annual return from the highest NPR decile portfolio's post-annual return. ARD represents the differences in size and-B/M-adjusted abnormal returns, and RAWD represents the differences in raw returns.

magnitude of the returns observed is typically less than 0.5%. Whether the market is right in ignoring this information or this information has potential benefits for investors with longer horizons is the main purpose of this study.

We investigate the usefulness of insiders' activities in timing the market and in predicting cross-sectional variations in stock returns. We find that valuable information is initially ignored by the market. Our results are in line with other articles that document instances of market underreaction to managerial signals.

Aggregate insider trading appears to predict market movements. Insiders' ability to time the market is partially explained by our finding that insiders act as contrarian investors during our sample period, and that simple contrarian strategies have been useful in market timing. However, even after adjusting for the predictive power of simple contrarian strategies, insider trading information is still beneficial. When insiders are optimistic (buying) markets on average do well, and when they are pessimistic (selling) markets do poorly, with an annual spread in returns exceeding 10%. The performance

of aggregate insider activities is related to firm size. Insiders have a relative advantage in timing an index of small stocks than an index of large stocks.

Insider trading activity seems to be useful in predicting cross-sectional stock returns. For example, companies with extensive insider purchases over the past six months outperform companies with extensive sales by 7.8%. The spread in returns shrinks to 2.3% in the second year, and in the third year there is no noticeable relation between the activity of insiders and stock returns. This distinct pattern of returns makes it unlikely that a risk story can explain our findings. It is hard to imagine that companies with extensive insider purchases are substantially riskier in the first year following the trading than they are in the second year.

The stocks that insiders buy and the stocks they sell are different. Insiders tend to buy stocks with poor past performance and those that are cheap according to measures such as B/M. They tend to sell "glamour" stocks that performed well in the past. In addition, insiders' extensive buying, based on our measure, is typically in small-cap stocks. After adjusting for B/M and size, the spread in returns between the two extreme portfolios based on insider activities is reduced to 4.8% in the first year.

Insiders have many reasons to sell shares but the main reason to buy shares is to make money. Our results support this view. Only insider purchases appear to be useful, while sales are not associated with low returns.

Consistent with the results of other related studies, the usefulness of insider activities is not uniform across all the market-cap groups. Insider trading is a stronger indicator in small-cap stocks, a segment of the market that is often perceived to be less efficient. We observe that the largest spread in returns between stocks that insiders buy and sell is for small-growth stocks. Insiders in general are heavy sellers of such stocks, and indeed, those stocks are associated with relatively low returns. However, when they buy such stocks, insiders know what they are doing. In addition, insiders generally invest in small-value stocks, an asset class associated with high returns. However, when they sell, they seem to know what is going on. The only material negative abnormal return that we observe is in this group.

We also explore the informativeness of strong buy and sell signals. A strong signal occurs when at least three different insiders are trading sizable amounts. Strong buy signals indeed produce high returns. However, for large companies, even strong buy signals convey almost no information. Strong sell signals remain useless in predicting stock returns.

Overall, the results in our article suggest that the development of implementable investment strategies based on insider trading information is not straightforward. Most of the market capitalization is in large stocks, where insider activities seem to have limited value. Trading in small stocks is costly. Therefore, it is not difficult to see how some of the implementations of strategies based on insider trading activity resulted in poor investment performance.

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