NBER WORKING PAPER SERIES

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Working Paper 6656
http://www.nber.org/papers/w6656

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
July 1998

We would like to thank Carr Bettis, Louis Chan, Dave Ikenberry, Narasimhan Jegadeesh, Jason Karceski, Josh Lerner, Bing Liang, Elizabeth Lopez, Tim Loughran, Neil Pearson, Jay Ritter, Richard Roll, Andrei Shleifer, Ajai Singh, Sam Thomas, and seminar participants at Case Western Reserve University, Korea Advanced Institute of Science and Technology, Rice University, the 1997 NBER Corporate Finance Program Meeting, The Market Efficiency Debate: A Break from Tradition conference at UCLA, and University of Tennessee for useful comments. Partial computing support was provided by the National Center for Supercomputing Application, University of Illinois at Urbana-Champaign. Any opinions expressed are those of the author and not those of the National Bureau of Economic Research.

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## ABSTRACT

We document insider trading activities of all companies listed on the NYSE, Amex, and Nasdaq exchanges during the 1975-1995 period. Insider trading is common, and in more than half the sample firms, there is at least some insider activity in a given year. 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, insider purchases are more informative than insider sales.

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## Are Insiders' Trades Informative?

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 insider activity through systems such as Bloomberg. There are data vendors, such as CDA/Investnet, who use insider 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 insider activity is best summarized in a recent article in *Individual Investor*: "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 pilling 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."[1] 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), Rozeff and Zaman (1988) and Lin and Howe (1990)). A counter example is a more recent study by Eckbo and Smith (1998), that shows that insiders of the 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

[1] On page 54 in the February 1998 issue.

market to be too optimistic about the prospects of the 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 insider trading activity. 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 the 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 percent for the period from January 1985 to July 1997. The comparable rate of return for the S&P 500 during this period was 18.4 percent.

This article contributes to the existing literature by conducting a comprehensive examination of the information content of insider 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 market places. 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 an important objective of this paper.

Insider trading refers to transactions by top officers, directors, and large shareholders who own 10 percent or more of company's shares. Previous studies 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 insider activity is 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 and trade characteristics.

Next, we investigate whether insiders' aggregated activity can predict future market movements. There are indications that insiders can time the market. 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 exhibit negative autocorrelation for longer horizons (Poterba and Summers ( 1988)). Therefore, simple contrarian strategies have worked in the past and were useful in timing the market. Hence, in examining the ability of insiders to time the market, we make careful adjustments 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 insider activity and stock characteristics. Recent papers (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 paper 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 insider activity contributes to predicting stock returns. In many of the earlier papers on insider trading activity, authors were not particularly sensitive to issues related to return calculations. In addition, these papers 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 papers document instances where the market underreacts to managerial signals such as stock repurchases (Ikenberry, Lakonishok and Vermaelen (1995)), IPOs (Ritter (1991)), 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 papers are challenged by Fama (1997) who claims that the results are not robust, and sensitive to the benchmarks used in calculating abnormal returns. Our findings on insider trading will provide additional evidence on whether the market indeed underreacts to managerial decisions.

Our results show that insiders are active and that there is at least some insider trading in more than 50 percent of the stocks in a given year. On average, insider purchases (sales) per year amount to 0.6 percent (1.3 percent) 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 insider activity receives, we do not observe any major stock price changes around the time insiders trade or around the reporting dates. This is very surprising given the attention that insider activity receives. However, we find that insiders' trades are informative for longer investment horizons, suggesting that the market underreacts to insider trading.

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). Insiders are definitely contrarian investors but insiders as a whole can time the market better than can a simple contrarian strategy. When insiders are optimistic, markets on average perform well, and when they are pessimistic, markets do poorly, with an annual spread in returns exceeding 10 percent. The performance of aggregate insider activity depends on company size. Insiders are doing a better job in predicting aggregate movements of small companies than of large companies.

At the level of individual firms, insider activity also seems to predict stock returns. Without controlling for size and book-to-market effects, firms with extensive insider sales during the prior six months have stock return of 14.4 percent over the next 12 months, while firms with extensive insider purchases during the prior six-month have much higher return of 22.2 percent per year. However, the usefulness 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 paper is organized as follows: Section II describes the data and Section III presents some summary statistics. Section IV examines how the market reacts when insiders trade and when they report their transactions to the SEC. Section V analyzes the relation between aggregate insider trading and market returns. Section VI presents cross-sectional results on the performance of various portfolios based on insider trading information. Section VII summarizes the results and concludes the paper.

**II. 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 non-common shares (shares with CRSP shares 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 with stock prices less than $2 at the beginning of each 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's (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 within the tenth day of the calendar month after the trading month. The data are from Forms

3, 4, and 5 (see Appendix B for more detailed information about these forms).[2] From the reported insider transactions, we exclude transactions with less than 100 shares to focus on the more meaningful events. In addition, we use various filters to clean up our insider trading data. For example, we cross-checked the prices of insider trades against the data on CRSP. Suspicious numbers were discarded rather than fixed.

Using the identification of reporting insiders in the ORS data, insiders are classified into three groups. 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 percent of shares and are not in 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 a spouse, minor children, and other relatives of an insider should be reported as if the insider were trading the shares in his indirectly owned account.

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 though they hold more than 10 percent of shares of a company, as long as the shares are acquired by such institutions or persons without the purpose or effect of changing or influencing the control of the issuer. Most institutions listed above, including mutual funds, do not regularly report their transactions even though they are beneficial owners of more than 10 percent. However, from time to time some 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

[2] 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 five percent or more of the stock of a public corporation must file a Schedule 13D with the SEC within ten days of crossing the five percent 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 13D amendment. Amendments are no longer required once an investor's position drops below the five percent level. Those who own more than ten percent must file both Form 4 and a Form 13D amendment each time they trade.

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.[3] "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 the paper, we classify our sample firms into three size and three book-to-market equity ratio (B/M) groups. To form three size groups, we initially create ten size portfolios based on the market capitalization at the end of April of each year.[4] The cut-off points for the ten 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 book-to-market equity ratio (B/M) groups based on the B/M ratio at the end of April of each calendar year. We form ten B/M portfolios based on the B/M ratios of all the companies that are listed on the NYSE exchange and covered by the Compustat tapes. Throughout the paper, we exclude the firms with a negative B/M. 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-to-market equity.

## III. Summary Statistics

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

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 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. We use the closing market price, rather than the actual exercise price, since the exercise price is typically a small fraction of the closing price on the exercise date.

The results show that on average slightly more than 50 percent of companies in our sample have purchases and/or sales activities by managers in a given year. Among large companies, about three quarters of the companies report insider activity. In their attempt to diversify their holdings, insiders sell much more than they buy. Managers of all the firms in our sample on average have bought $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 worth of stocks through exercise/conversion of options, warrants, or convertible bonds. They have 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 average trading size of large shareholders is substantially larger than that of managers. The "Others" category is much less material.

In a typical company, insiders purchase shares worth 0.6 percent and sell shares worth 1.3 percent of their companies' market capitalization per year. Relative to market capitalization, insider activity is more pronounced for small companies than for large ones. Assuming a 50 percent annual turnover, insider sales account for 2 percent of trading in small stocks and around 0.5 percent in large stocks. Purchases account for roughly half of the selling activity. The market microstructure literature stresses the

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

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 big enough to materially impact trading costs is not the topic of this paper.

Overall, Table 1 shows that insiders send quite a lot of signals to investors. In most companies there is at least some insider activity. In large firms, there are on average close to 20 trades a year (five purchases, ten sales and five option exercises). How informative those trades are is the main motivation behind this paper.

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 holdings, 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 insider activity over our sample period. Management sales have 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 percent to 0.50 percent. 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 unexercised options.

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 had not needed to report their transactions in earlier years started to report because they feared 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 (see

Appendix C for more detailed description on recent regulatory changes.) 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.

## IV. 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 their Form 3, 4 or 5 with the SEC to report their transactions.[5] 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-day). We exclude those transactions that have no exact trading or reporting dates.

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

[5] 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 return around reporting period, we exclude those transactions with incomplete data but include transactions in calculating trading-period abnormal returns.

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 percent for small stocks and - 0.06 percent 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 one percent for small firms and nothing for large firms. Seyhun (1986) and Pascutti (1996) find similar results.

## V. Aggregate Insider Trading and Market Returns

### *A. Methodology*

Seyhun (1988, 1992) shows that aggregate insider trading significantly predicts future market movements. We reexamine Seyhun's finding by applying a different methodology and adding more recent data. 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 of 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.

Throughout the paper, 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 insider activity, we use a longer period. To check the sensitivity of the results, we calculate NPRs by using insider transactions during the prior three-, nine-, and 12-month periods. 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 then rank all the months from January 1976 to January 1995 by the NPRs. We assign the standardized rank of zero to the month with the lowest NPR and the rank of one to the month with the highest NPR. Using standardized rank measure makes it easier to interpret coefficients in our regression analysis.

We predict market returns for one-, three-, six-, and 12-month horizons. The results in Table 4 are for three and 12 months. In general, the predictive power improves for the 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.[6] When we use longer horizons, we end up with overlapping periods. Therefore, in

[6] 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.

calculating t-statistics, we use the Newey-West autocorrelation and heteroskedasticity consistent covariance estimates (see Newey and West (1987)).[7]

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

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

where $R^i_k$ is the return of portfolio i in month k, $R^f_k$ represents the monthly Treasury-bill rate in month k, $Rank^i_t$ represents the standardized NPR rank of portfolio i in month t, and $PR24^i_t$ 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 transactions. 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-reversions in returns for diversified portfolios.[8] 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.

In the top row of each cell, $\alpha_1$ is reported on the left and $\alpha_2$ is reported on the right. In parentheses, the corresponding Newey-West t-statistics are reported. T-statistics that ignore the autocorrelation in returns substantially overestimate significance levels.

*B. Regression Results*

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 trades by management, the coefficient is 0.14, suggesting a spread of 14 percent per year in market returns

[7] To avoid possible problems with the use of overlapping period returns, Seyhun (1992) 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.

[8] 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.

between the month with the highest NPR and the month with the lowest NPR (based on number of transactions), holding prior returns constant. However, even this economically significant coefficient is only marginally statistically significant 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 3.36.

Consistent with previous work, we also find that the $\alpha_2$ 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 *PR*24 in the regression, the $\alpha_1$ coefficient increases to 0.21 and the t-statistic increases to 2.93. For the sake of brevity, we do not present results without *PR*24.

Managers' trading is more informative than trading by large shareholders. Moreover, Table 4-A in Appendix A, in which we calculate the standardized ranks separately within each subperiod, shows that the predictive power of large shareholders' trades is not robust over time. In the last ten 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 could be the consequence of trades being less informative since large shareholders 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, ranks of insider trading based on the number of transactions are more informative than are ranks 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 abnormal return difference between the month with the highest NPR and the month with the lowest NPR is 32 percent for small companies and is statistically significant, while the corresponding difference for large companies is only seven percent 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 standardized NPR rank and subsequent one-year holding period return for each month from January 1976 to January 1995. Here, we calculate the NPR ranks based on the number of transactions by managers and large shareholders over the prior six-month period. In general, the standardized NPR ranks 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.[9] Since our NPR ranks 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.

*C. 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 post-formation 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

[9] Seyhun (1990) carefully examines insider trading behavior around the 1987 market crash and shows similar results.

500 index. We calculate the various returns for all insider trades and for managers and large shareholders separately.

In the first panel of Table 5, the NPR quintiles are based on the distribution of NPRs for the whole period, January 1976 to 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 at that time.

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 percent. 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 percent. Insiders were heavy buyers after poor performance of the market. The S&P 500 index results 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 strategy based on five-year ranking of NPRs of managers, we see a spread in EW returns of 14.8 percent per year, and 14.4 percent for S&P 500 index returns. Activities of large shareholders are also useful in predicting the market. However, the results in Table 4-A 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.

## VI. Insider Trades and Cross-sectional Variation in Stock Returns

### *A. 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 (1997)). 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 company's 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.[10] 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 comprise 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 insider 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[11] 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.

*B. NPR Decile Portfolio Performance and Characteristics*

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

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

Table 6 reports pre- and post-formation period returns of 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 eight percent between the lowest and the highest NPR deciles (14.4 percent compared to 22.2 percent). 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 post-formation year. The spread between the two extreme deciles is 2.3 percent. In the third post-formation 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 3.6 percent in the first post-formation 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 activity. 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 is simply 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 percent in the pre-formation year), whereas the lowest NPR portfolio (insiders are selling) exhibits an extraordinary past return (40.4 percent in the pre-formation 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 comprised of the smallest companies.

To better compare the performance of the various NPR deciles, for the post-formation 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 break-points described in Section II 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 VI.A.[12]

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 was 7.7 percent. In the first year, the spread between the two extreme portfolios is 4.8 percent after adjusting for size and B/M. 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 portfolio 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

[12] 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-MacBeth (1973) type regression in the next section.

observations is bigger, we see a mildly higher return for the positive NPR portfolio, 17.5 percent compared to 16.3 percent. However, this difference is not statistically significant.

*C. Returns for Size and B/M Groups*

Previous papers 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 this point, 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[13] 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 V.B. We also present the raw returns for the first post-formation year.

The results 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 four percent. Also, among mid-cap stocks, there is some indication that high NPR stocks outperform low NPR stocks, although the difference is smaller, 2.2. percent. In the largest size stocks, the HNPR portfolio does not outperform the LNPR portfolio. This might be due to the fact that large companies typically 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 post-formation period returns across different size and NPR groups.

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

Comparing across B/M groups does not turn up any major differences between the HNPR and LNPR portfolios. We see the single biggest spread in returns for small low B/M stocks. In this segment, which is comprised of small growth stocks, insiders tend to sell. However, when they buy, the abnormal returns are substantial, 7.2 percent. 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 comprised of "cheap" stocks. However, when they sell, we see a relatively large negative abnormal return of -3.7 percent. Moving to larger value stocks, which are more widely followed, insider sales do not seem to be informative.

Up to this point, discussion of this table has focused on returns in the first post-formation year. We observe no substantial spreads in abnormal returns in the second and third post-formation years. Consistent with the results shown in Table 6, the relatively high abnormal returns are associated with insider buying. The sales are generally not informative.

*D. 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, that 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 rate of return of 48.3 percent which is low when compared to 143.1 percent 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 three to twelve 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 percent in the past 12 months compared to only 13.6 percent 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))[14] 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 returns in the regressions are measured in percentages.

The basic measure of insider activity 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 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* is greater than or equal to 0.95, and the net dollar volume traded is in the top 25 percent 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 60 months, and those were the only trades for this company, we would not consider this signal as a strong buy. For a strong buy, we would like to see at least three different insiders being optimistic about the company. 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 would consider this case 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* is less than or equal to -0.95, and the absolute net dollar volume traded is in the top 25 percent among the firms in the same size group. On average, 0.5 (1.6) percent of the sample firms are classified as sending strong buy (sell) signals for a given year.

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,

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

and with dummy variables for strong signals,

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

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

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.[15]

The results in Table 8 show that all the control variables have signs consistent with previous studies. The two most significant variables are book-to-market and the momentum variable. The size and long-term return are generally not significant.

For the whole sample, the results of regression 1 show that the $\beta_5$ 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 percent per year, in the first post-formation 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 percent between a pure buyer and a pure seller. The NPR coefficient for the mid-cap and large-cap stocks is not material. The results are generally consistent with those in Table 7 where we also observe that insider 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 percent 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 returns of 7.27 percent. The extra return for mid- and large-cap stocks is 3.34 percent and 1.32 percent, respectively and is not statistically significant.

The results for sell signals are consistent with the prior evidence that suggested that selling by insiders did not predict low returns. The $\beta_7$ coefficients are positive for the sample as a whole and for the three size groups. However, the coefficients are not statistically significant.

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[15] T-statistics are calculated based on the standard errors of 229 coefficients adjusted for 11$^{th}$-order autocorrelation (i.e., $(\sigma/229)\times\sqrt{229+2\times228\times\rho_1+...+2\times218\times\rho_{11}}$, where $\sigma$ is the time-series standard deviation of the coefficient estimates and $\rho_n$ is the estimated $n$th-order simple autocorrelation coefficient).

*E. 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 insider activity is now much more readily available, at least to institutional investors. Therefore, in Figure 4, we explore whether the informativeness of insider 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 six out of 19 formation periods, and the spread in abnormal returns is negative in five out of 19 formation years. However, there is no indication that the predictability of insider activity 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.

## VII. Summary and Conclusion

There is a 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 paper, we conduct a comprehensive examination of the information content of insider trades and the market's response to those trades. We use the most extensive database available, which includes more than a 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 own stocks. The need to diversify results in a substantial increase in selling activity.

Surprisingly, in spite of the extensive coverage that insider activity receives, the market basically ignores this information when it is reported. Moreover, there is very little action around the time when insiders trade. The magnitude of the returns observed is typically below 0.5 percent. 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 insider activity 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 papers 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 percent. The performance of aggregate insider activity 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 percent. The spread in returns shrinks to 2.3 percent 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 activity is reduced to 4.8 percent 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 activity 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 in 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 in 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 paper suggest that the development of implementible investment strategies based on insider trading information is not straightforward. Most of the market capitalization is in large stocks, where insider activity seems 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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## Table 1
## Summary Statistics

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 (number of total inside transactions divided by number of years listed on 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 cut-off points at the beginning of each year, respectively.

| | 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% |

## Table 2

## Year by Year Summary Statistics

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. 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 | | | Large Shareholders | | | Fraction & # of firms | S&P 500 Return |
|---|---|---|---|---|---|---|---|---|
| | Purchase | Sales | Option | Purchase | Sales | Option | | |
| 1975 | $735 | $2,616 | $641 | $1,201 | $307 | $455 | 0.80 | 31.5% |
| | 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 | 19.1% |
| | 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 | -11.5% |
| | 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 | 1.0% |
| | 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 | 12.3% |
| | 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 | 25.8% |
| | 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 | -9.7% |
| | 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 | 14.8% |
| | 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 | 17.3% |
| | 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 | 1.4% |
| | 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 | 26.4% |
| | 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 | 14.6% |
| | 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 | 2.0% |
| | 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 | 12.4% |
| | 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 | 27.3% |
| | 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 | -6.6% |
| | 0.04% | 0.13% | 0.02% | 0.14% | 0.08% | 0.00% | (4,515) | |
| 1991 | $1,575 | $8,601 | $895 | $3,469 | $5,962 | $39 | 0.76 | 26.3% |
| | 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 | 4.5% |
| | 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 | 7.1% |
| | 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 | -1.5% |
| | 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 | 34.1% |
| | 0.05% | 0.50% | 0.08% | 0.06% | 0.31% | 0.00% | (5,911) | |

## Table 3
## Abnormal Returns around Trading and Reporting Dates for Insider Transactions

This table reports the 1975-1995 average abnormal 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 abnormal returns (as percentages) for purchasing transactions at the top. The abnormal 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 cut-off points, respectively. We form all deciles at the end of April of each year, and based 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.

| | All | | | Low B/M | | | Medium B/M | | | High B/M | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Manager | Large Sh | Others | Manager | Large Sh | Others | Manager | Large Sh | Others | Manager | Large Sh | 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) |

## Table 4
## Monthly Aggregate Insider Trading and Market Returns

This table reports the results of the regression:

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

where $R_t^f$ represents the monthly three-month Treasury-bill rate in month t, $R_t$ is the monthly return of each portfolio, $Rank_t^i$ represents the standardized net purchase ratio (NPR) rank of portfolio i in month t and $PR24_t^i$ represents the prior two-year holding-period return in month t. We measure a return of 20% as 0.2. We calculate NPRs for each portfolio for each month for the January 1976 to January 1995 period. The monthly ratios are then ranked across the whole sample period. The highest is set to one and the lowest to zero. 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 $\alpha_1$ on the left-hand side and $\alpha_2$ on the right-hand side. In parentheses, we report the t-statistic of $\alpha_1$ on the left-hand side and $\alpha_2$ on the right-hand side. We base t-statistics on the Newey-West autocorrelation and heteroskedasticity consistent standard errors. The numbers of lags we use in the estimation of Newey and West standard errors are three and 12 months for three- 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 cut-off points at the end of April of each year, respectively.

| Holding Period (# of months) | Number of Transactions | | | Dollar Volume | | |
|---|---|---|---|---|---|---|
| | Management | Large Shareholder | All | Management | Large Shareholder | All |
| **All Firms** | | | | | | |
| 3 | 0.01, -0.13 | 0.02, -0.14 | 0.01, -0.13 | -0.00, -0.14 | 0.03, -0.14 | -0.01, -0.15 |
| | (0.35, -3.06) | (0.75, -3.29) | (0.31, -3.11) | (-0.14, -3.14) | (1.09, -3.32) | (-0.42, -3.18) |
| 12 | 0.14, -0.26 | 0.11, -0.30 | 0.20, -0.20 | 0.01, -0.32 | 0.19, -0.33 | 0.06, -0.30 |
| | (1.93, -1.83) | (1.05, -2.44) | (2.33, -1.58) | (0.09, -2.55) | (2.02, -2.68) | (0.61, -2.53) |
| **Small Firms** | | | | | | |
| 3 | 0.05, -0.04 | 0.03, -0.05 | 0.06, -0.04 | 0.02, -0.05 | 0.02, -0.06 | -0.00, -0.05 |
| | (1.29, -1.30) | (0.95, -1.60) | (1.41, -1.24) | (0.46, -1.43) | (0.59, -1.68) | (-0.03, -1.50) |
| 12 | 0.32, -0.02 | 0.18, -0.08 | 0.35, 0.00 | 0.08, -0.07 | 0.10, -0.09 | 0.08, -0.07 |
| | (3.29, -0.14) | (1.11, -0.62) | (3.11, 0.04) | (0.57, -0.55) | (0.79, -0.73) | (0.60, -0.56) |
| **Medium Firms** | | | | | | |
| 3 | 0.01, -0.14 | 0.05, -0.15 | 0.01, -0.14 | 0.05, -0.15 | 0.06, -0.16 | 0.05, -0.16 |
| | (0.31, -3.25) | (1.72, -3.49) | (0.45, -3.34) | (2.06, -3.57) | (1.89, -3.64) | (1.60, -3.62) |
| 12 | 0.14, -0.26 | 0.16, -0.32 | 0.20, -0.22 | 0.20, -0.33 | 0.19, -0.36 | 0.20, -0.35 |
| | (1.74, -1.97) | (1.58, -2.75) | (2.23, -1.90) | (2.37, -2.71) | (1.95, -2.98) | (2.13, -2.93) |
| **Large Firms** | | | | | | |
| 3 | -0.01, -0.16 | 0.00, -0.15 | -0.01, -0.17 | -0.01, -0.16 | -0.03, -0.17 | -0.01, -0.16 |
| | (-0.45, -3.08) | (0.18, -2.93) | (-0.51, -3.09) | (-0.38, -3.14) | (-1.27, -3.21) | (-0.42, -3.04) |
| 12 | 0.07, -0.34 | 0.09, -0.33 | 0.07, -0.33 | -0.03, -0.39 | 0.00, -0.38 | 0.05, -0.35 |
| | (0.74, -2.82) | (1.27, -2.71) | (0.76, -2.80) | (-0.38, -3.29) | (0.07, -3.09) | (0.61, -2.68) |

## Table 5
## Summary Statistics for the Net Purchases Ratio Quintiles of Monthly Aggregate Insider Trading

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 cut-off 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 cut-off 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.

| | 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% | 12.3% | 34.7% | 24.5% | -0.48 | 12.3% | 11.4% | 33.7% | 24.2% | -0.02 | 12.6% | 8.8% | 23.2% | 12.2% |
| 2 | -0.20 | 4.1% | 1.8% | 20.2% | 13.8% | -0.31 | 8.0% | 3.7% | 22.5% | 14.9% | 0.37 | 9.3% | 9.9% | 23.9% | 21.5% |
| 3 | -0.12 | 17.1% | 5.2% | 23.0% | 10.4% | -0.21 | 22.9% | 11.3% | 15.3% | 5.1% | 0.55 | 16.0% | 8.8% | 13.3% | 9.3% |
| 4 | -0.04 | 29.7% | 15.7% | 10.0% | 0.3% | -0.15 | 20.2% | 8.7% | 15.2% | 3.5% | 0.65 | 19.4% | 7.6% | 16.5% | 4.3% |
| Highest | 0.13 | 22.1% | 15.6% | 2.9% | 1.8% | 0.05 | 22.4% | 15.4% | 4.0% | 3.0% | 0.75 | 28.4% | 15.5% | 13.4% | 3.2% |
| | Using the prior five-year rankings | | | | | | | | | | | | | | |
| Lowest | -0.33 | 8.1% | 5.4% | 33.8% | 21.1% | -0.45 | 5.8% | 2.5% | 38.1% | 23.0% | 0.14 | 13.7% | 10.2% | 27.4% | 17.9% |
| 2 | -0.20 | 16.6% | 11.9% | 20.9% | 13.3% | -0.34 | 17.4% | 15.1% | 20.4% | 14.7% | 0.36 | 11.7% | 12.7% | 16.5% | 13.8% |
| 3 | -0.16 | 15.9% | 11.8% | 12.7% | 12.4% | -0.25 | 17.1% | 12.8% | 14.7% | 10.4% | 0.39 | 10.0% | 8.1% | 9.2% | 11.5% |
| 4 | -0.06 | 14.3% | 13.7% | 5.6% | 6.4% | -0.17 | 14.2% | 11.7% | 7.7% | 6.9% | 0.61 | 11.2% | 7.8% | 12.7% | 9.9% |
| Highest | 0.12 | 21.2% | 16.5% | -0.9% | 1.0% | 0.04 | 20.6% | 16.9% | -1.7% | 2.1% | 0.74 | 26.6% | 18.4% | 3.0% | -1.6% |

## Table 6
## Performance of Portfolios Based on Insider Trading

We form ten 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 10th of each year. "Insiders" include only managers. In the formation of the ten 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 compose 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 six-month and 12-month holding- period returns, respectively. Similarly, "-6m", "-12m", "-24m" and "-36m" represent prior six-, 12-, 24-, and 36-month holding-period returns, respectively. "+2y" and "+3y" represent annual returns in the second and third post-formation years, respectively. Reported returns are equally-weighted average returns of firms in each decile. "AR+1y" 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 1995 dollars), and "Avg #" is the average number of firms in each portfolio.

| | 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+1y | -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 | | | | | | | |
| +12 m | 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% |
| -12 m | 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 |

## Table 7

## NPR Portfolio Performance in Different Size and B/M Groups

We form ten 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, 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 10th of each year. "Insiders" include only managers. In forming the ten portfolios, we use only those firms with at least one insider transaction during the previous six-month period. We compose 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 cut-off 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. "1y" is the equally-weighted average one-year holding-period returns in the first post-formation year. "AR1," "AR2," and "AR3" are the average annual abnormal returns in the first, second, and third post-formation 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.

| | | Lowest BM | | | | Middle BM | | | | Highest BM | | | | Total | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | LNPR | MNPR | HNPR | No | LNPR | MNPR | HNPR | No | LNPR | MNPR | HNPR | No | LNPR | MNPR | HNPR | No |
| Small | 1y | 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 | 1y | 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 | 1y | 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% | 1.2% | 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 | 1y | 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 |

## Table 8
## OLS Regression (Fama-MacBeth type)

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

$R_i$ 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 percent 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 percent 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: $s.e. = (\sigma / 229) \times \sqrt{229 + 2 \times 228 \times \rho_1 + 2 \times 227 \times \rho_2 + ... + 2 \times 218 \times \rho_{11}}$, where $\sigma$ is the time-series standard deviation of the coefficient estimates and $\rho_n$ is the estimated $n$th-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 cut-off points.

| | | $\alpha$ | $\beta_1$ | $\beta_2$ | $\beta_3$ | $\beta_4$ | $\beta_5$ | $\beta_6$ | $\beta_7$ |
|---|---|---|---|---|---|---|---|---|---|
| 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) |

**Figure 1. Monthly Standardized Aggregate Net Purchase Ratio Rank and Average Annual Return.** This figure presents a time series of standardized 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. We base our standardized NPR ranks on the number of transactions by managers and large shareholders over the prior six-month period. The standardized rank of the month with the highest NPR is set to one and that of the month with the lowest NPR is set to zero. Returns are equally-weighted returns over the 12-month period of all sample firms.

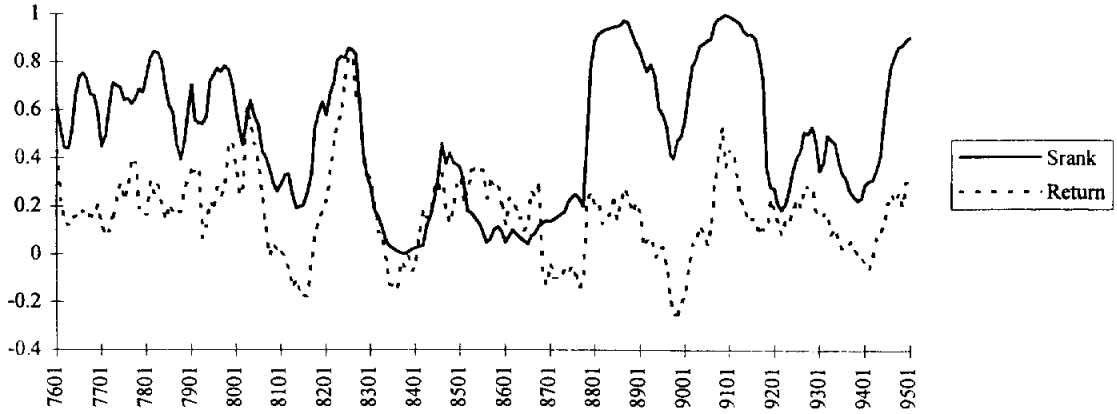


**Figure 2. Prior- and Post-Annual Return of Net Purchase Ratio Deciles.** We form ten portfolios at the end of April of each year, basing them on the insider transactions of each company during the prior six-month period, which are reported before April 10th of each year. "Insiders" include only managers. We use only those firms with at least one manager transaction during the previous six-month period in forming the ten 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.

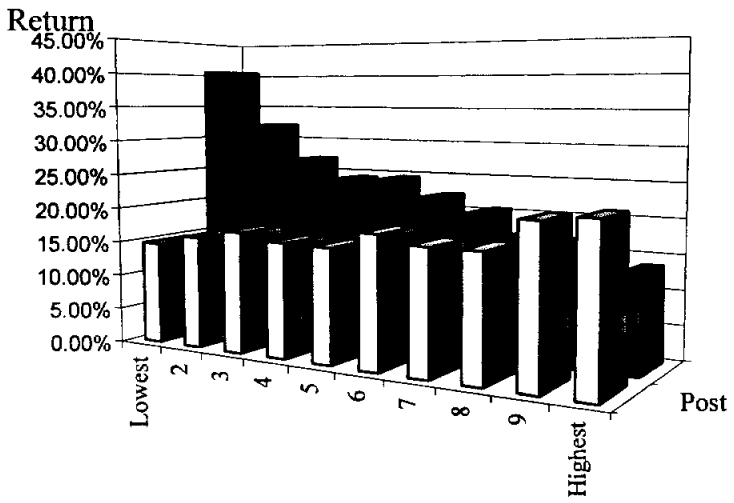


**Figure 3. Relation Between Annual Returns and Insider Transactions for Different Size Groups.** We form ten portfolios at the end of April of each year based on the net purchase ratio (NPR) of each company. We calculate NPR, the number of purchases minus the number of sales divided by the total number 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 10th 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 ten 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 cut-off 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.

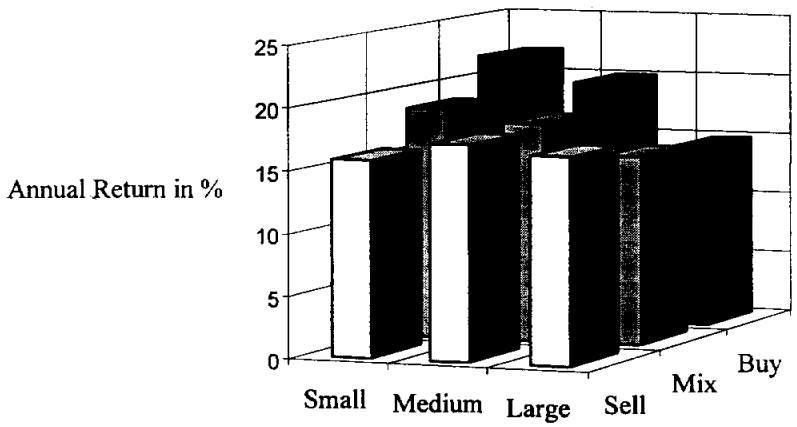
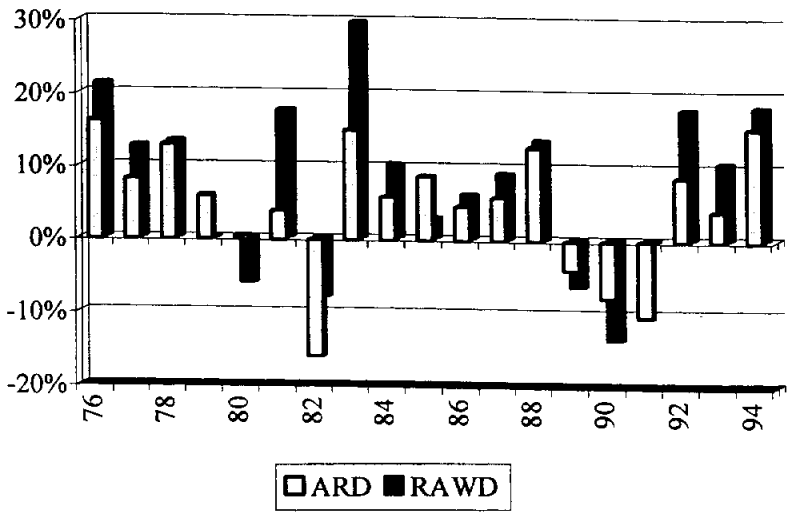


**Figure 4. Average Annual Return Differences between the Highest and Lowest Net Purchase Ratio Deciles over 1976-1994 Period.** We form ten portfolios at the end of April of each year. The portfolios are based on insider transactions of each company during the prior six-month period, which are reported before April 10th 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 ten 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.



## Appendix A. Aggregate Insider Trading for Two Subperiods

### Table 4-A

This table reports the results of the regression

$$\prod_{k=t}^{t+11}(1+R_k^i)-\prod_{k=t}^{t+11}(1+R_k^f)=\alpha_0+\alpha_1\times RANK_t^i+\alpha_2\times PR24_t^i$$

where $R_t^f$ represents the monthly three-month Treasury-bill rate in month t, $R_t$ is the monthly return of each portfolio, $Rank_t^i$ represents the standardized net purchase ratio (NPR) rank of portfolio i in month t and $PR24_t^i$ represents the prior two-year holding period return in month t. We calculate NPRs for each portfolio for each month during 1976-1995 period and rank these ratios across each subperiod. The highest is set to one and the lowest is set to zero. 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 by managers, by large shareholders, and by both managers and large shareholders of all companies in the portfolio i during the prior six-month period. At the top of each cell we report $\alpha_1$ on the left-hand side and $\alpha_2$ on the right-hand side. In the parentheses, we report the t-statistic of $\alpha_1$ on the left-hand side and $\alpha_2$ on the right-hand side. We base t-statistics on the Newey-West autocorrelation and heteroskedasticity consistent standard errors. The number of lags we use in the estimation of Newey and West standard errors is 12. 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 cut-off points at the end of April of each year, respectively.

| | 1976-1985 | | | 1986-1995 | | |
|---|---|---|---|---|---|---|
| | Management | Large Shareholder | All | Management | Large Shareholder | All |
| All | 0.40, -0.58 | 0.16, -0.49 | 0.40, -0.49 | 0.33, 0.05 | -0.22, -0.40 | 0.24, 0.03 |
| | (4.08, -5.18) | (1.32, -3.36) | (4.96, -5.10) | (2.72, 0.38) | (-2.36, -2.54) | (1.89, 0.15) |
| Small | 0.83, -0.46 | 0.34, -0.23 | 0.74, -0.34 | 0.38, 0.18 | -0.56, -0.56 | 0.23, 0.09 |
| | (6.57, -3.98) | (1.71, -1.86) | (8.32, -4.11) | (2.75, 1.32) | (-3.78, -2.58) | (1.84, 0.54) |
| Medium | 0.44, -0.61 | 0.19, -0.48 | 0.40, -0.53 | 0.30, 0.01 | -0.08, -0.27 | 0.16, -0.09 |
| | (4.27, -6.42) | (1.65, -3.12) | (4.32, -6.30) | (2.38, 0.10) | (-1.05, -1.95) | (1.50, -0.48) |
| Large | 0.11, -0.53 | 0.15, -0.50 | 0.13, -0.51 | 0.13, -0.16 | 0.06, -0.22 | 0.13, -0.14 |
| | (0.78, -2.81) | (1.53, -3.52) | (0.91, -2.73) | (1.33, -1.23) | (0.93, -1.52) | (1.36, -1.06) |

## Appendix B. Descriptions of Forms related to Insider Trading Report

The following information is from the CDA/Investnet's web site http://www.cda.com/investnet/aboutcda/secrules.html.

**Form 3:** Called the *Initial Statement of Ownership*, this must be filed by the insider within ten days of attaining insider status. The insider must file a Form 3 even if he or she owns no shares.

**Form 4:** This is the most common insider filing. Anytime an executive changes their position (through either an open market buy/sell or option exercise) or has been granted options, the individual must file this form.

**Form 5:** This is an annual filing. Insiders are required to file a Form 5 within 90 days of their company's fiscal year-end. This filing contains transaction activity (commonly called "exempt transactions") not required on a Form 4. Exempt Transactions include gifts, plan acquisitions, transfers between trusts, dispositions by divorce decree, and a host of "other" types of acquisitions and dispositions of shares.

**Form 144:** This form must be filed by insiders whenever they plan to sell restricted (or unregistered) shares. This type of stock (frequently called "founders stock") is not traded on the open market until it has been filed for as an "Intent to Sell" under Rule 144. Contrary to the "Intent" title, 144 sellers typically submit these filings on the day of the sale of the securities. Chances are, the data covering the same sale will show up in the regular insider filings (Form 4) on the 10th of the month following the sale. Because of this beware of counting the same sale twice! Although there is some overlap, not all insiders file 144's when they sell stock. Not all 144 filers are insiders either. Because of this, both data sets are valuable.

**Form 13D:** This form is covered under the Williams Act. It covers the moves of persons or entities who hold 5% or more of the outstanding shares of a class of a company's securities. Once an entity reaches 5% a 13D must be filed within 10 days. The filing includes the names of any individuals involved in the investment group. They also must describe their most recent buys or sells and their purpose for the action (for investment purposes....to obtain control of the company etc.). Any subsequent acquisitions or dispositions of shares cause a requirement for a 13D amendment which updates the details of the original filing. Amendments are no longer required should an entity's position drop below the 5% level. Typically, the people or entities involved as 5% holders are outsiders.

## Appendix C. Recent Regulatory Changes regarding Insider Trading

By enacting a series of regulatory changes, the U. S. Congress and the SEC have taken a tougher stance in enforcing Section 10(b) of the Securities and Exchange Act of 1934, which prohibits an insider (in fact, anyone) from trading on material inside, non-public, information. Before the U. S. Congress passed the Insider Trading Sanctions Act (ITSA) in 1984, drastically increasing the penalties for violating the reporting requirement, many believed that investors could trade on inside information with little fear of enforcement. ITSA allowed the SEC to seek a civil penalty up to three times the insider's profit gained or loss avoided and raised the maximum criminal penalty from $10,000 to $100,000. In 1988, the Insider Trading and Securities Fraud Enforcement Act (ITSFEA) raised the maximum criminal penalty to $1 million and the maximum prison sentence to ten years from five years and made top management possibly liable for any employee's illegal insider trading. In addition, the Securities Enforcement Remedies and Penny Stock Reform Act of 1990 (SERPSRA), which became effective in May 1991, allowed penalties and fines against insiders and their corporations for delinquent filings of insider transactions (Lason and Pitt (1990)).