Division of Research
Graduate School of Business Administration

Revised August 1986

THE INFORMATION CONTENT OF INSIDE TRADING

Working Paper #454

H. Nejat Seyhun
University of Michigan

Abstract

This study investigates the information content of aggregate insider trading by using approximately 60,000 open market sales and purchases by insiders from January 1975 to October 1981. Aggregate insider trading activity is used to address two issues regarding market efficiency. The first test examines whether the publicly available information about aggregate insider trading activity can provide analysts with a market timing ability, as claimed by some market analysts. The second test attempts to distinguish between two competing explanations for the seasonal pattern of security returns by examining the seasonal pattern of aggregate insider trading activity.

Acknowledgments: Helpful comments from Clifford Ball, Michael Bradley, Stanley Kon, and Jay Ritter are appreciated.

I. Introduction

This study investigates the information content of aggregate trading by corporate insiders[1] in their own firms. It is hypothesized that information related trading by corporate insiders is in response to all factors that affect security returns (i.e. firm specific, industry wide, or economy-wide factors) and therefore, analysis of insider trading can potentially uncover the effects of economy-wide factors not currently reflected in security prices. Previous insider trading studies by Seyhun (1986), Finnerty (1976), Jaffe (1974), and Lorie and Niederhoffer (1968) among others, show that corporate insiders identify the mispricings in their own firms and trade on the basis of their observations. If the mispricing observed by insiders in their own firms is strictly due to firm-specific information, then no relation between insider trading and changes in economy-wide activity would be expected. However, if part of the mispricing observed by insiders in their own firms is caused by unanticipated changes in economy-wide activity, which is not yet fully reflected in security prices, then a positive relation between aggregate insider trading activity and the changes in economy-wide activity would be expected. Since stock prices incorporate the anticipated changes in future real activity, in turn a positive relation between aggregate insider trading and the return to the stock market would be expected.

This study uses the information content of aggregate insider trading to address two issues regarding market efficiency. The first test examines whether publicly available information about the aggregate insider trading activity can provide analysts with market timing ability, as claimed by some

---

[1] The Securities and Exchange Act of 1934 defines insiders as officers, directors, and shareholders of 10% or more of any equity class of securities.

market analysts.[2] Ability to time market movements using publicly available information would contradict the efficient markets hypothesis. Second, the seasonal pattern of aggregate insider trading is examined to test the implications of two potential explanations for the January effect. January effect refers to the unusually high, positive return in small firms during the end of December and first week of January. The reasons for the existence of seasonality in stock returns is not yet well understood, and hence, the January effect has become a paradox for models of equilibrium expected stock returns and the efficient markets hypothesis.

The paper is organized as follows: The testable implications of the relation between aggregate insider trading, future changes in real activity, and seasonal pattern of security returns is discussed in section 2. Section 3 contains the data sources and sample characteristics of the data. The empirical results of the study are in section 4 and the conclusions and implications are in Section 5.

II. Aggregate Insider Trading and Economy-Wide Factors

To illustrate the relation between aggregate insider trading and the economy-wide factors, an example is useful. Suppose that an insider in a given firm expects the future cash flows to his firm to improve due to increased sale orders, and purchases his firm's stock. Also suppose that the reason for the increased sales orders is a general increase in economy-wide

---

[2] Some market analysts espouse the view that aggregate insider trading is a reliable forecaster for the future direction of the stock market. They maintain that an aggregate insider purchase to sale ratio greater than one-half is a good signal for the market, while a ratio less than one-half is a bad signal for the market. For references to this view in the financial press, see, "The Insider Story", Newsweek, February 7, 1983, p. 11, "The Insider Track on Stocks", Money, December 1983, and "Heard on the Street", The Wall Street Journal, November 27, 1981, p. 37. Aggregate insider trading information is provided on a weekly basis in The Insiders' Chronicle.

activity. Subsequently, when the increase in economy-wide activity is recognized by the market, the prices of most securities will rise. Since the insider has purchased stock prior to the increase to the stock market, his stock purchase will have "forecasted" the positive return to the stock market. Consequently, there will be a positive relation between the insider's transaction and the returns to the stock market. If the reason for the increased sales orders had been a strictly firm-specific improvement, then no relation between insiders' transactions and returns to the stock market would be expected.

The potential relation between insiders' transactions and stock market returns does not require that insiders know whether the increase in sales orders is due to firm-specific, industry-wide, or economy-wide factors. All that is necessary is that insiders observe an unanticipated change in the cash flows to their firms and trade on the basis of their observations. It is most likely that multiple factors affect the prospects of the firm simultaneously and insiders will not be able to distinguish and separate the effects of each of these factors.

Previous studies by Treynor and Mazuy (1966), Hendricksson and Merton (1981), Kon (1983), and Henricksson (1984), among others, investigate the ability of mutual fund managers to forecast the price movements in the stock market.[3] If the mutual fund managers can successfully forecast the price movements in the stock market, then they are expected to increase their relative investments in stocks prior to an increase in the stock market and decrease their relative investments in stocks prior to a decrease in the stock market. The findings of the previous market timing studies generally show that the mutual fund managers cannot forecast the market movements in advance.

---

[3] Also see Fama (1972) for a discussion of market timing ability.

This study examines whether the publicly available information about the aggregate insider trading activity can provide the market analysts with market timing ability. Even if insiders can observe the effects of economy-wide factors not fully reflected in their security prices and trade on the basis of their observations, market analysts need not be able to use the aggregate insider trading information to profitably time the stock market. It is also necessary that security prices in aggregate not reflect the implications of the changes in economy-wide activity until after the insider trading information becomes publicly available. Otherwise, by the time market analysts obtain the aggregate insider trading information, security prices will have fully adjusted to the changes in economy-wide activity and there will be no market-timing ability.

As a second application, this study examines aggregate insider trading activity to provide a new insight into the nature of the seasonal pattern of security returns reported by Rozeff and Kinney (1976), Keim (1983) and others.[4] For the period from 1963 to 1979, Keim (1983) documents unexpectedly large, positive returns to small firms during the first week of January. This study examines two potential explanations for the January effect. One explanation is that the positive returns in January for the small firms represent compensation for increased risk. Along this line, Glosten and Milgrom (1985) conjecture that the positive return in January may represent compensation for the increased risk of trading against informed traders at the turn of the year. Presumably, the informed traders are more likely to possess nonpublic information at the turn of the year, and thereby impose greater

---

[4] Banz (1981) and Reinganum (1981) document the relation between firm size and the average stock returns. See also the special issue of the Journal of Financial Economics, 1983, volume 12, entitled, Symposium on Size and Stock Returns and Other Empirical Regularities for other papers. Schwert (1983) provides an introduction and overview of the papers in this issue.

losses on all opposing traders either by buying or selling stock. Increased trading by informed traders is expected to increase the bid-ask spread in the security. Hence, net of the bid-ask spread, the profit opportunity to buying stock in December and selling in January is eliminated. A testable implication of the risk premium hypothesis is that insiders would be more likely to buy or sell stock at the turn of the year than at other times.

A second potential explanation for the January effect is that the positive excess return at the turn of the year arises due to price pressure from predictable seasonal changes in demand for different securities. For instance, tax loss selling or payment of annual bonuses at year end result in an increase in cash for individual investors. Presumably, investors take most of their tax losses in December and then wait until January to buy the stock of other small firms with the proceeds of the sales. The increase in demand (albeit predictable) for small firms at the turn of the year results in an increase in the stock prices of small firms.[5] This price pressure hypothesis is tested by examining the aggregate insider trading activity in small firms. Since, insiders are adept at identifying profit opportunities in their own firms as documented by the previous insider trading studies, it is expected that insiders in small firms ought to be aware of the seasonal pattern of returns for their own firms' stocks. If insiders regard the January effect as a profit opportunity, then they are expected to increase their stock purchases, or at least decrease their stock sales in December to take advantage of the large positive return in January. Hence, examination of the aggregate insider trading activity is expected to distinguish between these

---

[5] Studies by Branch (1977), Reinganum (1983), Givoly and Ovadia (1983), and Rozeff (1985) provide evidence consistent with tax loss selling. In contrast, Brown, Keim, Kleidon, and Marsh (1983) conclude that coincidence of January effect with the end of the tax year in the U.S. is a casual not a causal association.

two competing potential explanations for the unusually high, positive returns to small firms in January.

III- Data and Sample Characteristics

3.1- Data

The insider trading data for this study come from a computer tape compiled by the Securities and Exchange Commission. The tape contains more than 1.5 million transactions by insiders in all publicly held firms from January 1975 to October 1981, for a total of 82 calendar months. This study analyzes a sample of insider transactions in 790 firms on the daily returns file of the Center for Research in Security Prices (CRSP).[6] Of the 790 firms, 21 did not report any insider trading between 1975 and 1981. Hence, the actual number of firms analyzed is 769.

Only open market sales and purchases by insiders during 1975 to 1981 are analyzed in this study. All other types of insiders' transactions, such as private sales and purchases, exercises of options, shares acquired through a plan, etc. are excluded, since it is expected that insiders' open market sales and purchases are more likely to represent actions taken as a result of special insider information.[7] The distribution of insiders' open market sales and purchases by firm size are shown in Table 1. Firm group 1 consists of firms with a market value of equity less than $25 million, group 2; between

---

[6] All 190 firms listed on option exchanges on January 1, 1977 are included in the sample. The remaining 600 firms are selected using stratified random sampling based on the value of equity on January 1, 1977. This accounts for the heavier representation of the larger firms in the sample. The sample of firms analyzed in this study are identical to those in Seyhun (1986) which contains further characterization of the sample.

[7] Numerous consistency checks on dates, prices, and shares were performed to eliminate approximately 1000 transactions containing apparent data errors out of about 60,000 transactions.

$25 million and $50 million, group 3; between $50 million and $250 million, group 4; between $250 million and $1 billion, and group 5; greater than $1 billion. While chosen randomly, this classification ensures that each size group contains more than 3000 insider transactions, while maintaining a large diversity of firm sizes from less than $25 million to more than $1 billion. The total sample contains 59,148 open market sales and purchases with a total dollar value of $11.1 billion. Of these, 24,371 are open market purchase transactions with a total dollar value of $6.8 billion and 34,777 are open market sale transactions with a total dollar value of $4.3 billion.

3.2 Statistical properties of aggregate trading by insiders

To determine the relation between insider trading and stock market returns, a measure of standardized aggregate insider trading is constructed. To the extent that some insider trading takes place for reasons other than profiting from information or for firm-specific reasons only, aggregation cancels out the idiosyncratic components of insiders' transactions and reinforces the common response to economy-wide factors, thereby increasing the predictive power of the tests. Let,

$$(1) \qquad NE_{i,t} = \sum_{j=1}^{J_{it}} H_{t,j} \qquad t=1,82, \text{ from January 1975 to October 1981.}$$

where J_{it} denotes the total number of transactions in firm i, month t, and H equals one if purchase, or minus one if sale. Define,

$$(2) \qquad SANEk_t = \sum_{i=1}^{I_k} (NE_{i,t} - NE_i) / s(NE_i) \qquad k=1,5, \text{ and all firms.}$$

where I_k equals the total number of firms in group k.

Table 1

Distribution of the number of open market sales and purchases, the total dollar value of sales and purchases (in $ million), and the number of firms grouped by the average month end market value of firms' stock between January 1975 and October 1981.

	The Average Market Value of Stock					
	Less Than $25 million (Group 1)	Between $25 and $50 million (Group 2)	Between $50 and $250 million (Group 3)	Between $250 million $1 billion (Group 4)	More Than $1 billion (Group 5)	All Firms
Number of Firms	104	68	173	267	157	769
Number of Sales	1,339	1,325	5,891	14,811	11,411	34,777
Number of Purchases	2,802	1,685	4,661	8,456	6,767	24,371
Dollar value of sales	$51.3	$56.2	$550.0	$1431.7	$2235.7	$4324.7
Dollar value of purchases	$100.3	$126.2	$736.5	$1558.0	$4254.3	$6775.3
Total number of trades	4,141	3,010	10,552	23,267	18,178	59,148

Also,

$$(3) \qquad NE_i = \left[\sum_{t=1}^{82} NE_{i,t} \; / \; 82 \right] \qquad \text{and,}$$

$$(4) \qquad s(NE_i) = \left[\sum_{t=1}^{82} (NE_{i,t} - NE_i)^2 \; / \; 81 \right]^{1/2}$$

The net number of transactions by executives[8] in firm i, month t denoted as $NE_{i,t}$, is the difference between the number of purchases minus number of sales in each calendar month. Standardized aggregate net number of transactions by executives in firm size group k, month t, $SANEk_t$, is computed by subtracting the mean and dividing by the sample standard deviation of net number of transactions over the 82 calendar months between January 1975 and October 1981, then summing across firms for each firm size group. Standardization ensures that each firm gets approximately the same weight in the aggregate insider trading measure, thereby guarding against the possibility that a few firms receive undue weight in the results. While only the results for the net number of transactions for executives are reported, the tests are also replicated using the net dollar volume of trading and the net proportion of the firm traded, computed similarly as the net number of transactions.

The statistical properties of the standardized, aggregate net number of transactions by executives, SANE, are shown in Table 2. The differences in standard deviations across firm size groups simply reflect the different number of firms in each group. The cross-sectional correlation coefficients of the standardized aggregate net number of transactions are generally significantly positive, which indicates that executives in different firms

---

[8] The results for large shareholders are reported separately, since Seyhun (1986) finds that large shareholders' transactions contain less special information than executives' transactions.

tend to buy or sell the stock of their firms at the same time. This is consistent with the interpretation that the executives in different firms react to the same source of economy-wide information at the same time, or that similar seasonal pattern of trading occurs among insiders of different firms.

Table 2 also indicates that cross-sectional correlations of executives' transactions among firms of similar size are generally higher. Hence, it appears that insiders in similar size firms are more likely to buy or sell stock at the same time than insiders in different size firms. This finding suggests that firm size is a significant factor in determining the timing of insider trading activity. Consequently, separate examination of executives' transactions in different size firms is expected to uncover additional information about the aggregate insider trading activity.

Table 2 also shows the time series properties of the standardized, aggregate net number of transactions by executives. All six series have significantly positive first-order serial correlation coefficients, while the higher order serial correlation coefficients are insignificant. Hence, the standardized aggregate net number of transactions by executives appear as first-order moving-average processes which is taken into account in the empirical tests presented in the next section.

Table 2

Statistical properties of the standardized aggregate net number of transactions by executives from January 1975 to October 1981. The t-statistics are shown in parentheses.[a]

Variable	Standard Deviation	Cross-Sectional Correlation Coefficients SANE2	SANE3	SANE4	SANE5	SANE	Serial Correlation Coef. R1	R2	R3
SANE1	11.9	.17 (1.5)	.34 (3.2)	.20 (1.8)	.02 (0.2)	.33 (3.0)	.18 (1.6)	.05 (0.0)	.00 (0.0)
SANE2	9.0	-	.45 (4.5)	.37 (3.5)	.21 (2.0)	.47 (4.3)	.25 (2.2)	.23 (2.1)	.02 (0.2)
SANE3	23.9	-	-	.76 (10.3)	.55 (5.9)	.86 (7.8)	.20 (1.8)	.06 (0.5)	.03 (0.3)
SANE4	42.5	-	-	-	.78 (11.2)	.95 (8.6)	.36 (3.3)	.07 (0.6)	.04 (0.4)
SANE5	27.6	-	-	-	-	.83 (7.5)	.36 (3.3)	.13 (1.2)	.14 (1.3)
SANE	92.0	-	-	-	-	-	.35 (3.2)	.05 (0.5)	.03 (0.3)

[a] SANE1-SANE5 and SANE denote the standardized, aggregate net number of transactions by executives in firm size groups 1 through 5, and all firms, respectively. See equations (1)-(4) for computation of SANE. The mean of SANE is zero by definition. Firms in group 1 have an average equity from 1975 to 1981 less than $25 million, group 2, between $25 and $50 million, group 3, between $50 and $250 million, group 4, between $250 million and $1 billion, and group 5, more than $1 billion. The serial correlation coefficient of order 1-3 are denoted by R1-R3. Higher order serial correlation coefficients are not statistically significant and therefore, are not shown. There are 82 monthly observations for each series.

IV- Empirical Results

4.1- Aggregate insider trading and stock market returns

The evidence presented in this section examines the relation between aggregate insider trading and returns to the stock market by using regression analysis. The dependent variable in the regressions is the difference between monthly return to the equally-weighted portfolio or the value-weighted portfolio of New York Stock Exchange and American Stock Exchange stocks and the one month Treasury Bill returns. This difference represents the excess return to the market portfolio. The independent variables are the contemporaneous and lagged terms of the standardized, aggregate net number of transactions by executives computed from equation (2).

If all insider trading occurs due to firm specific reasons, then no relation between aggregate insider trading and market returns would be expected. If insiders recognize the effects of changes in economy-wide factors in their own firms at the same time other market participants do and trade on the basis of their observations, then the relation between aggregate insider trading and the excess market returns is expected to be positive and contemporaneous. Finally, if insiders recognize the effects of changes in economy wide activity before other market participants, then a positive relation between current insider trading and the future excess returns to the stock market is expected.

The results are shown in Table 3. In model (1), the independent variables are the two monthly lagged terms of standardized, aggregate net number of executives' transactions (SANE). The estimated coefficient for $SANE_{t-1}$ is insignificant, while the estimated coefficient for $SANE_{t-2}$ is positive and significant at the 1% level. This regression suggests that an increase in current aggregate insiders' purchases is associated with an increase in future excess return to the market portfolio two months later.

Table 3

Regression of the excess monthly return to the equally weighted and the value weighted market indices, RME and RMV, against the contemporaneous and the lagged values of the monthly standardized aggregate net number of transactions by executives, SANE, from January 1975 to October 1981. Excess market return is defined as the actual return to the market portfolio minus the return on the contemporaneous one month Treasury Bill. The t-statistics of estimated coefficients are shown in parentheses. All estimated coefficients are multiplied by 1000.

Number	Model	Durbin Watson
(1)	$RME_t = \underset{(2.1)}{12.8} + \underset{(0.0)}{0.002}\ SANE_{t-1} + \underset{(2.62)b}{0.18}\ SANE_{t-2}$	1.84
(2)	$RME_t = \underset{(2.9)}{13.1} - \underset{(-7.48)b}{0.39}\ SANE_t + \underset{(2.82)b}{0.02}\ SANE_{t-1} + \underset{(2.76)b}{0.15}\ SANE_{t-2}$	2.35
(3)	$RMV_t = \underset{(1.1)}{4.8} + \underset{(0.5)}{0.03}\ SANE_{t-1} + \underset{(1.83)a}{0.10}\ SANE_{t-2}$	2.02
(4)	$RMV_t = \underset{(1.3)}{5.0} - \underset{(-7.1)b}{0.31}\ SANE_t + \underset{(3.22)b}{0.015}\ SANE_{t-1} + \underset{(1.71)a}{0.08}\ SANE_{t-2}$	2.55

a Significant at the 10% level.
b Significant at the 1% level.

Model (2) includes the contemporaneous term, $SANE_t$ as well as the lagged terms, $SANE_{t-1}$ and $SANE_{t-2}$. In model (2), the estimated coefficient for $SANE_t$ is significantly negative, while both of the estimated coefficients for $SANE_{t-1}$ and $SANE_{t-2}$ are significantly positive. As table 1 shows, $SANE_t$ is serially positively correlated, hence, $SANE_t$ and $SANE_{t-1}$ tend to proxy for each other. Since the estimated coefficient of $SANE_t$ is negative while the estimated coefficient of $SANE_{t-1}$ is positive, omitting the contemporaneous term, $SANE_t$ reduces the significance of the estimated coefficients of $SANE_{t-1}$. In models (3) and (4) the excess return to the equally weighted market index is replaced by the excess return to the value weighted market index. The results are qualitatively similar to models (1) and (2).

Various tests are conducted to examine the sensitivity of the results to the definition of the aggregate insider trading activity. First, tests are replicated using the aggregate net number of insiders trading, aggregate net dollar volume of trading, and aggregate net proportion of the firm traded, both standardized and unstandardized as independent variables. Results of these tests are also similar to the results shown in Table 3. Hence, the findings are not sensitive to a particular definition of the insider trading activity. The tests are also replicated using weekly measures of insider trading activity. Weekly tests also provide similar results as the monthly tests. Specifically, the lagged weekly coefficients of SANE are significantly positive, and the contemporaneous and leading weekly coefficients of SANE are significantly negative. The relation between aggregate insider trading activity and subsequent market returns is examined separately, by aggregating insiders' transactions by the size of firms' equity. Aggregate insider trading in a given firm size is positively correlated even more strongly with the subsequent return to the portfolio of firms included in each group. Finally, using as the dependent variable the return to the market portfolio

instead of the excess return to market portfolio does not affect the magnitude or the significance of the estimated coefficients.

Additional tests are conducted to examine the sensitivity of the results to statistical methodology. In table 3, the Durbin Watson statistics indicate small, first order serial correlation of the residuals. Applying Cochran-Orcutt transformations to the regressions or estimating transfer function models for residuals do not change the results.[9] The regressions are also tested for the effects of outliers. Successively deleting the three observations with the highest Cook influence statistic does not alter the significance of the results.[10] Hence, the results in table 3 are not due to a few outliers. Finally, the Kolmogorov statistics for the residuals indicate that normality cannot be rejected.

The results in table (3) suggest that changes in aggregate insider trading activity occur at least two months before the changes in excess returns to market portfolio as claimed by market analysts. A plausible interpretation of this evidence is that some insiders observe the effects of unanticipated changes in economy-wide activity in their firms' cash flows before other market participants recognize the changes in economy-wide activity. Consequently, insiders trade their firms' stock based on their assessment of their own firms' future prospects. Within two months following insiders' transactions, the changes in economy-wide activity are recognized by most market participants and security prices adjust. Since insiders' transactions precede the change in stock market return, insiders' transactions

---

[9] See Box and Jenkins (1970) for identifying and estimating autoregressive moving average time series models.

[10] For a discussion of Cook influence statistic, see Cook and Weisberg (1980).

appear to 'forecast' the market returns during the next two months. In contrast, the significantly negative contemporaneous coefficient of the standardized aggregate insider trading indicates that insiders reverse the direction of their transactions after the realization of the stock price movements: Insiders tend to sell stock at the same time or following increases in the return to the market portfolio and purchase stock at the same time or following decreases in the return to the market portfolio.

4.2- Market Efficiency

The evidence provided in this section attempts to determine if the relation between insiders' transactions and the subsequent excess return to the market portfolio can be used to construct profitable trading rules. In each calendar month, only the insider transactions reported to the Securities and Exchange Commission (SEC) or those published in the Official Summary are used to construct an aggregate insider trading variable. The date insiders' reports are received by the SEC represents the earliest date an outsider can obtain information about insiders' transactions. However, insiders' transactions are published in other publications prior to the Official Summary. Consequently, the publication date of the Official Summary is intended as the widest dissemination date of insider trading information.[11]

Table 4 shows the relation between the returns to the equally weighted market index and the standardized aggregate net number of executives'

---

[11] Since the actual publication dates of the Official Summary are unavailable, the date the Official-Summary is received by the Rush-Rhees Library of the University of Rochester are used. The latter dates are likely to overstate the publication dates by a week to ten days due to delays in postal delivery. In addition to the Official Summary (of Security Transactions and Holdings), private newsletters such as Insiders, The Insider Report, Insider Indicator, Consensus of Insiders, and Insiders' Chronicle publish insider trading information.

transactions computed from insiders' reports filed with the SEC, SANER. Model 1 indicates that the coefficient of $SANER_{t-1}$ is significantly positive at the 1% level, while the coefficient of $SANER_{t-2}$ is insignificant. The coefficient of $SANER_t$ is also insignificant as shown in model (2). Hence, the evidence shown in models (1) and (2) suggests that reported aggregate insider trading activity also contains information about the return to the market portfolio one month later.

The relation between the returns to the equally weighted market index and the standardized aggregate insider transactions computed from published reports, SANEP are shown in models (3) and (4) of table 4. The coefficients of $SANEP_{t-2}$ are positive and marginally significant, while the coefficients of $SANEP_t$ and $SANEP_{t-1}$ are insignificant.[12] Hence, by the time insiders' transactions are published in the Official Summary, the predictive information content of aggregate insider trading activity are mostly eroded, although not completely eliminated.

To provide an economic significance of the strength of market timing ability that can be extracted from publicly available insiders' transactions, the following strategy is examined. In each calendar month, the standardized aggregate net number of transactions from all reported and published transactions are computed. If the standardized aggregate net number of transactions is negative, then the market return for the subsequent calendar month is predicted to be lower than average. Otherwise, the market return for the subsequent month is predicted to be higher than average. Using reported transactions, this rule yields 37 low and 44 high stock market return predictions during the period from January 1975 to October 1981. The average

---

[12] The tests shown in table 4 are repeated using as the dependent variable the excess returns to the value weighted market index. The results are similar.

Table 4

Regression of the excess monthly return to the equally weighted market index, RME, against the contemporaneous and the lagged values of the monthly standardized aggregate net number of transactions by executives, reported in each month, SANER, and published in each month, SANEP, from January 1975 to October 1981. Excess market return is defined as the actual return to the market portfolio minus the return on the contemporaneous one month Treasury Bill. The t-statistics of estimated coefficients are shown in parentheses. All estimated coefficients are multiplied by 1000.

Number	Model	Durbin Watson
(1)	$RME_t = \underset{(2.2)}{13.0} + \underset{(2.84)c}{0.24}\ SANER_{t-1} - \underset{(-0.5)}{0.04}\ SANER_{t-2}$	1.76
(2)	$RME_t = \underset{(2.2)}{12.9} - \underset{(-0.78)}{0.07}\ SANER_t + \underset{(2.87)c}{0.28}\ SANER_{t-1} - \underset{(-0.65)}{0.06}\ SANER_{t-2}$	1.88
(3)	$RME_t = \underset{(2.1)}{12.4} + \underset{(0.2)}{0.001}\ SANEP_{t-1} + \underset{(2.01)b}{0.13}\ SANEP_{t-2}$	1.86
(4)	$RME_t = \underset{(2.1)}{12.6} + \underset{(1.1)}{0.07}\ SANEP_t + \underset{(0.1)}{0.007}\ SANEP_{t-1} + \underset{(1.86)a}{0.13}\ SANEP_{t-2}$	1.89

---

a Significant at the 10% level.
b Significant at the 5% level.
c Significant at the 1% level.

excess return on the equally weighted market index for low predicted months is in fact 2.8% lower than the high predicted months. This value has a t-statistic of 2.39, which is significant at the 5% level. Using the published transactions, the rule predicts 36 low and 45 high market returns. The average excess return on the equally weighted market index for the low predicted months is 1.3% lower that the high predicted months. This value has a t-statistic of 1.1, which is not significant. This rule does not provide a strict test of market efficiency since information about the mean and standard deviation of insider trading activity over the 82 month sample period is assumed to be known to the trader. Furthermore, trading costs of buying and selling securities are ignored. Consequently, the magnitude of the excess returns that can be obtained by using the publicly available information about the aggregate insider trading to time the market would be reduced even further.

In summary, the evidence presented in this section indicates that aggregate insider trading activity does contain information about the future returns to the stock market, which suggests that insiders can observe the effects of economy-wide information not fully reflected in their security prices. Evidence also suggests that security price adjustment between the time insiders report their transactions to the SEC and the publication of insiders' transactions rules out market timing ability based on published information. By the time insiders' transactions are published, the implications of aggregate insider trading activity are already incorporated in stock prices. While the evidence is inconsistent with the strong form of the efficient markets hypothesis, nevertheless, published information cannot be used to forecast the future returns to the stock market.

4.3 Aggregate Insider Trading Activity and January Effect

Tests presented in this section examine the seasonal distribution of insiders' transactions to test the price pressure and the risk premium hypotheses for the unusually high, positive return to small firms in January. The price pressure hypothesis states that the January effect arises from price pressure arising from seasonal changes in the demand for stocks of small firms and therefore represents a market inefficiency. The risk premium hypothesis states that the January effect represents compensation for higher risk of trading against informed traders in January.

First, the seasonal pattern of returns documented by Keim (1983) are replicated for the sample of 769 firms included in this study. It is necessary that firms included in this study must also exhibit seasonality of stock returns to have the potential of explaining the January effect. Second, the relation between seasonality of insiders' transactions and the seasonality of security returns is examined.

Table 5 shows the seasonal pattern of the monthly returns from January 1975 to October 1981 for the 769 firms included in this study. In models (1) through (5), the dependent variable is the total monthly return to the equally-weighted portfolio of firms in each of the five firm size groups. The independent variable is a dummy variable that takes a value of 1 for the month of January and 0 for other months. Model (1) shows that the returns to small firms (group 1) in January have been on average 12.9% higher than other months. This value is statistically significant and is twenty-five times higher than the average return for months other than January. The returns for the month of January decline with increasing firm size. For large firms, (group 5) the return in January is only 1.6% higher than other months, which is not statistically distinguishable from zero. This evidence suggests that the firms included in this study display a similar pattern of seasonality as

Table 5

Regression of the monthly return to the equally weighted portfolio of firms grouped by size of equity, RE1-RE5, against a dummy variable that takes the value of one in January and zero otherwise. Sample period is from January 1975 to December 1981. The t-statistics for estimated coefficients are shown in parentheses.c

Model number	Dependent Variable		Intercept		January Dummy	$\bar{R}^2$
(1)	RE1	=	0.005 (0.6)	+	0.129 (4.3)b	0.177
(2)	RE2	=	0.013 (1.8)	+	0.081 (3.2)b	0.099
(3)	RE3	=	0.014 (2.0)	+	0.066 (2.7)b	0.071
(4)	RE4	=	0.012 (2.1)	+	0.040 (2.0)a	0.036
(5)	RE5	=	0.010 (2.0)	+	0.016 (1.0)	-0.001

a Significant at the 5% level.
b Significant at the 1% level.
c Group 1 has average size of equity less than $25 million, group 2,between $25 and $50 million, group 3, between $50 and $250 million, group 4, between $250 million and $1 billion, and group 5, greater than $1 billion.

has been documented by Keim (1983) and others, and therefore, examination of the seasonal behavior of aggregate insider trading activity is warranted.

The seasonal distribution of aggregate insider trading activity is examined using regression analysis in table 6, models (1) through (5).[13] The dependent variable is the standardized net number of transactions by executives (SANE) for firm sizes one through five. The independent variables are dummy variables that take the value of one for the months of December and January respectively, and zero for other months. Models (1) through (3) show that for small and medium sized firms insider trading activity at year end is not statistically different than at other months, while models (4) and (5) show that insiders in larger firms tend to decrease their purchases and increase their sales in December. Hence, it appears that insiders in small firms are not concerned with the significant, positive return in January. Hence, the evidence presented in table 6 is inconsistent with the joint hypothesis that insiders in small firms are aware of the seasonal pattern of returns in their own firms and regard the positive return in January as a profit opportunity.[14]

The evidence in table 5 also does not indicate any selling activity in December followed by purchasing activity in January for small firms. This finding suggests that year end tax loss selling is not a dominant motive for

---

[13] Only the open market sales and purchase transactions are included in the construction of SANE. Hence, transactions which might have an inherent seasonal component, such as acquisitions due to compensation plans, exercises of options, or conversion of securities etc., are excluded.

[14] The seasonal characteristics of insider trading activity are also examined using both the standardized and unstandardized net dollar volume and the proportion of the firm traded by insiders. Using net number of transactions without standardization indicates an increase in purchase activity in small firms in December. However, other measures of insider trading activity do not indicate a net purchase activity in December.

Table 6

Nonlinear regression of the monthly standardized aggregate net number of transactions by executives in five firm size groups, SANE1-SANE5 and the monthly standardized aggregate absolute value of net number of transactions by executives, SAANE-SAANE5, against dummy variables that take the value one in December and January, respectively and zero otherwise. The sample period is from January 1975 to October 1981. The t-statistics for estimated coefficients are shown in parentheses.c

No	Dependent Variable	Intercept	December Dummy	January Dummy	Error Model	Autocorrelation of residuals r1	r2	r3
(1)	SANE1	-0.85 (-0.5)	6.34 (1.36)	5.01 (1.02)	AR(1)	.00	.00	-.03
(2)	SANE2	-0.03 (-0.1)	-3.08 (-0.84)	3.94 (1.15)	AR(1)	-.05	.18	-.04
(3)	SANE3	-0.03 (0.0)	2.96 (0.29)	-0.58 (-0.06)	MA(1)	.07	.05	.04
(4)	SANE4	3.18 (0.5)	-40.07 (-2.47)a	1.18 (0.08)	MA(1)	.04	.13	.04
(5)	SANE5	2.34 (0.6)	-21.47 (-1.98)a	-9.02 (-0.89)	MA(1)	.02	.14	.18
(6)	SAANE1	-1.51 (-0.8)	16.27 (3.46)b	3.87 (0.89)	AR(1)	.00	-.04	.14
(7)	SAANE2	-1.25 (-0.9)	14.15 (3.72)b	2.52 (0.71)	AR(1)	.00	.06	-.12
(8)	SAANE3	-2.34 (-0.8)	20.43 (2.37)a	8.18 (1.02)	MA(1)	.03	.19	.09
(9)	SAANE4	-5.97 (-1.0)	59.35 (4.19)b	14.15 (0.65)	MA(1)	-.01	.09	.12
(10)	SAANE5	-3.59 (-0.9)	35.89 (3.31)b	8.24 (0.82)	MA(3)	-.04	.00	.13

a Significant at the 5% level.
b Significant at the 1% level.
c Firm size 1 contains firms with average size of equity less than $25 million; size 2, between $25 and $50 million; size 3, between $50 and $250 million; size 4, between $250 million and $1 billion; size 5, greater than $1 billion. For error models, AR(k) denotes a k'th order autoregressive process, and MA(k) denotes a k'th order moving average process. The regressions are estimated using the ARIMA procedure in SAS.

insider trading in small firms. Furthermore, lack of net purchase activity in January suggests that payment of annual bonuses at year end does not lead to significantly increased purchases in January. In fact, insiders in small firms exhibit none of the seasonal changes in demand for stock attributed to individual investors.[15]

Models (6) through (10) examine the insider trading activity in December and January without regard to the direction of transactions. As a measure of trading, absolute value of the net number of transactions for each firm is taken, before standardizing and summing across firms. This measure, denoted as SAANE, captures the seasonal changes in insider trading activity in each firm without netting out purchases in one firm against sales in another firm. The results show that the month of December brings about increased insider trading in all firms, not just the small firms. A plausible interpretation of this evidence is that tax related trading in December leads to substantially higher trading in all firms.[16]

In contrast with December, January is not characterized by increased insider trading activity. On average, the level of insider trading activity in January is not distinguishable from the level of insider trading activity during any other month excluding December. Hence, for an uninformed trader the expected losses to corporate insiders would be no higher in January than

---

[15] Examination of the aggregate insider trading activity over the twelve calendar months does not reveal any other significant seasonality.

[16] The information content of aggregate insider trading is also examined after controlling for any seasonalities in insider trading. To separate out these affects, the relation between aggregate insider trading and stock market returns are also examined by excluding the insiders' transactions for the month of December. The results are similar to those in table 3 and are not shown. Hence, the information content of aggregate insider trading is not due to a turn of the year seasonality of insiders' transactions.

in other months.

While not shown, further examination of the insider trading activity by calendar weeks shows that most of the increased insider trading activity in the month of December occurs during the third week of December. Furthermore, the first week of January is not characterized by increased level of insider trading. Hence, it appears that the timing of the increased level of insider trading does not correspond with the timing of higher returns to small firms.

Assuming that the overall trading by all informed investors and trading by corporate insiders tend to occur at the same time, the evidence presented in table 6 is inconsistent with both the price pressure and the risk premium hypotheses. Evidence indicates that the corporate insiders in small firms do not engage in net stock purchases in December, followed by net stock sales in January. This evidence is inconsistent with the price pressure hypothesis and suggests that the January effect does not represent an abnormal profit opportunity. Furthermore, evidence also indicates that the unusually large, positive returns in small firms in January do not represent compensation for the increased risk of trading against informed traders, since trading by corporate insiders in January is not especially higher. This evidence leaves open the possibility that the January effect can be a risk premium for some other type of risk which has a seasonal component.

V- Conclusions and Implications

The evidence presented in this study shows that net aggregate insider trading activity in a given month is significantly positively correlated with the return to the market portfolio during the subsequent two months. In aggregate, insiders increase their net stock purchases prior to increases to the stock market and decrease their net stock purchases prior to decreases to the stock market. A plausible interpretation of this evidence is that part of the mispricing observed by insiders in their own firms' securities is caused by unanticipated changes in economy-wide activity. For instance, insiders purchase their own firms' stock based on their assessment of favorable prospects for their firm which are partially caused by an unanticipated increase in economy-wide activity. Subsequently, when the increase in economy-wide activity is generally recognized, stock prices rise. Since insiders have purchased their firms' stock prior to the rise in the return to the market portfolio, insiders' purchases appear to 'forecast' the rise in the stock market.

The overall evidence supports the proposition that prompt security price reaction to economy-wide information rules out any potential market timing ability. Two findings support this conclusion. First, the implications of changes in aggregate insider trading activity are not fully incorporated in the security prices at the time insiders report their transactions to the SEC. Evidence shows that higher than average stock market returns follow the calendar months in which insiders in aggregate report higher than average net stock purchases. Similarly, lower than average stock market returns follow the calendar months in which insiders in aggregate report higher than average increases in net stock sales. However, there is no relation between the stock market returns and the aggregate insider trading activity following the

publication of insiders' transactions in the Official Summary. This evidence suggests that sufficient stock price reaction occurs between the time insiders report their transactions to the SEC and the publication of the insiders' transactions which rules out any profitable market timing strategies using published insider trading information.

Examination of the seasonal pattern of aggregate insider trading activity indicates that neither the price pressure hypothesis nor the risk premium hypothesis for the January effect are supported by the data. First, the evidence indicates that corporate insiders do not regard the January effect as a potential profit opportunity, since insiders in small firms do not increase their net stock purchases in December. Second, the evidence indicates that the January effect does not represent a risk premium for the increased risk of trading against the informed traders, since the level of insider trading activity at the turn of the year is not significantly higher than other months with the exception of December.

Extrapolating from the findings of this study, net aggregate insider trading activity can be a useful component of the leading indicators of future economic activity. To be useful, the aggregate insider trading information must be gathered as soon as insiders report their transactions to the Securities and Exchange Commission. Early gathering of insider trading information is necessary since the security prices already reflect the implications of insider trading information for stock market returns following the publication of the insider trading information.

BIBLIOGRAPHY

Banz, R. W., 1981, The Relationship Between Return and Market Value of Common Stocks, Journal of Financial Economics, 9, 3-18.

Box, G. E. P. and G. M. Jenkins, 1970, Time Series Analysis, Forecasting and Control, Holden-Day Inc., San Francisco.

Branch, B., 1977, A Tax Loss Trading Rule, Journal of Business, 50, 198-207.

Brown, P., D. B. Keim, A. W. Kleidon, and T. A. Marsh, 1983, Stock Return Seasonalities and the Tax Loss Selling Hypothesis: Analysis of the Arguments and Australian Evidence, Journal of Financial Economics, 12, 105-127.

Cook, R. D. and S. Weisberg, 1980, Characterizations of an Empirical Influence Function for Detecting Influential Cases in Regression, Technometrics, 22.

Fama, E., 1972, Components of Investment Performance, Journal of Finance, 27, 551-567.

Finnerty, J. E., 1976, Insiders and Market Efficiency, Journal of Finance, 31,1141-1148.

Givoly, D. and A. Ovadia, 1983, Year-End Tax-Induced Sales and Stock Market Seasonality, Journal of Finance, 38, 171-186.

Glosten, L. R. and P. R. Milgrom, 1985, Bid, Ask, and Transactions Prices in a Specialist Market with Heterogeneously Informed Traders, Journal of Financial Economics, 14, 71-100.

Henricksson, R., 1984, Market Timing and Mutual Fund Performance: An Empirical Investigation, Journal of Business, 57, 73-96.

Henricksson R. and Merton, R., 1981, On Market Timing and Investment Performance, II, Statistical Procedures for Evaluating Forecasting Skills, Journal of Business, 54, 513-533.

Jaffe, J., 1974, Special Information and Insider Trading, Journal of Business, 47, 410-428.

Keim, D. B., 1983, Size-related Anomalies and Stock Return Seasonality; Further Empirical Evidence, Journal of Financial Economics, 12, 13-32.

Kon S., 1983, The Market Timing performance of Mutual Fund Managers, Journal of Business, 56, p. 323-347.

Lorie, J. H. and V. Niederhoffer, 1968, Predictive and Statistical Properties of Insider Trading, Journal of Law and Economics, 11, 35-51.

Reinganum, M. R., 1981, Misspecification of Capital asset Pricing: Empirical Anomalies based on Earnings Yields and Market Values, Journal of Financial Economics, 9, 19-46.

Reinganum, M. R., 1983, The Anomalous Stock Market Behavior of Small Firms in January: Empirical Tests for Tax-Loss Selling Effects, Journal of Financial Economics, 12, 89-104.

Rozeff, M. S. and W. R. Kinney, 1976, Capital Market Seasonality; The Case of Stock Returns, Journal of Financial Economics, 3, 379-402.

Rozeff, M. S., 1985, The December Effect in Stock Returns and the Tax-Loss Selling Hypothesis, unpublished University of Iowa working paper.

Schwert, G. W., 1983, Size and Stock Returns, and Other Empirical Regularities, Journal of Financial Economics, 12, 3-12.

Seyhun, H. N., 1986, Insiders' Profits, Costs of Trading, and Market Efficiency, Journal of Financial Economics 16, no 2, 189-212.

Treynor, J. and Mazuy, F., 1966, Can Mutual Funds Out-Guess the Market, Harvard Business Review, 44, 131-136.