Division of Research
Graduate School of Business Administration
The University of Michigan

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INSIDERS AND MARKET EFFICIENCY

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by

Joseph E. Finnerty

The University of Michigan

I. INTRODUCTION

The strong-form of the efficient market hypothesis is concerned with whether all available public and private information is fully reflected in a security's market price. In terms of market participants, the strong-form states that no individual has higher expected trading profits than others just because he has monopolistic access to information. A test of the strong-form is to determine whether insiders earn better-than-average profits from their market transactions. To ascertain if the market is truly efficient will involve determining how well insiders fare relative to the market in general.

Some work has already been done in evaluating rates of return earned by insiders trading for their own accounts. Jaffe (2, 3), Pratt and DeVere (7), Rogoff (8), and Glass (1) give an indication that indeed insiders do earn above-average profits. However, no precise price per share or date of insider trades were reported to the S.E.C. prior to 1965, and therefore these studies all have major shortcomings as to available data. Furthermore, the last three studies include no explicit adjustment for risk, and, an additional problem, all of the studies skim off the cream of the crop in their sample selection: by selecting their samples on the basis of "intensive" insider trading criteria they could be expected to identify those insiders whose performance will be superior to that of the average insider. This bias, while not affecting their results relative to the semi-strong-form, invalidates their findings for a test of the strong-form. The present study, on the other hand, by selecting the entire population of insiders, will be able to evaluate the performance of the average insider.

Section II presents an explanation of the methodology used to evaluate insider performance, while Section III lists and evaluates the results. The final section presents implications and conclusions.

II. DATA AND METHODOLOGY

This study will cover the time period from January 1969 to December 1972. Data from the S.E.C.'s Official Summary of Stock Transactions was gathered for NYSE firms into a computer file. This file contains the company identification, an individual insider identification, the date of the transaction, the number of shares traded, the end-of-the-month holding of the insider, a buy-or-sell code, the closing price on the day of the trade, and an adjustment for stock splits or dividends. In total, over 30,000 individual transactions were included in the data file; 9,602 were buy transactions and 21,487 were sell transactions.

Any common stock acquired by the exercise of options or through compensation plans was excluded from the insider sample. The major rationale for this exclusion was that it is difficult to get price information associated with the exercise of options and to determine the worth of the shares received as compensation. Any bias introduced by this omission would tend to understate the returns earned by the insiders because of the bargain price associated with these types of transaction. Gifts and private sales were also excluded because of the lack of a market-determined price. Late reports were included in their proper transaction month as if they had been reported normally. Since the major concern of this study is with the strong-form of market efficiency no biases are introduced by including late reports in their proper month.

Using a methodology developed by Jensen (4), the risk premium of an individual security above the market return, which is defined as the differential return, will be evaluated in the following regression:

$$\bar{R}_{i,t} - R_{f,t} = \alpha_i + B_i (\bar{R}_{m,t} - R_{f,t}) + \bar{u}_{i,t} \qquad (1)$$

where:

$\bar{R}_{i,t}$ is the rate of return of an individual portfolio for month t.

$R_{f,t}$ is the risk-free rate of interest for month t. The yield to maturity of a three-month Treasury Bill that has one month left to maturity was used as a proxy.

$\bar{R}_{m,t}$ is the rate of return on the market portfolio for month t. Fisher's Weighted Market Index (8) was used.

α_i is the intercept of the regression line and can be interpreted as the amount of differential return earned by an average insider portfolio above the return from a market portfolio of compatible volatility.

B_i is the slope of the regression line and can be interpreted as the volatility associated with the market portfolio and the average insider portfolio.

$\bar{u}_{i,t}$ is the random error, which is uniformly distributed above and below the regression line, with an expected value equal to zero and it is independent of the risk-free adjusted returns of the portfolios.

Since it is the differential return (α_i) that is of interest, the constant term of the regression equation was treated as a free independent variable. This insured that the output of the regression package used would provide the standard error, the T-statistic, and the significance level for the α term. These statistics were used in the analysis-of-results section. The finding of an α significantly different from zero indicates an average insider performance which is above or below the theoretically expected performance.

A major assumption underlying the use of the regression methodology is the linearity of the relationship between the risk-adjusted rates of return for the insider portfolio and the risk-adjusted rates of return for the market. Jensen (4) states this as follows:

> . . . the realized returns on any security or portfolio can be expressed as a linear function of its systematic risk, the realized returns on the market portfolio, the risk free rate and a random error, $\bar{e}_{jt}$, which has an expected value of zero. The term R_{Ft} can be subtracted from both sides of the equation (6), and since its coefficient is unity the result is

$$R_{jt} - R_{Ft} = \beta_j \left[R_{Mt} - R_{Ft}\right] + \bar{e}_{jt} \qquad (7)$$

The left hand side of (7) is the risk premium earned on the jth portfolio. As long as the asset pricing model is valid this premium is equal to $\beta_j \left[R_{Mt} - R_{Ft}\right]$ plus the random error term $\bar{e}_{jt}$.

A graphic presentation of the regression equation is given in Figure 1.

The regression equation (1) subtracts R_f from the market and the individual portfolio return; it can be viewed as a translation along the X and Y axes of the graph, so as to relocate the zero coordinate as shown by the dotted lines. The intercept of the regression equation is measuring the average differential return of the portfolio, above its theoretical value. By the use of this statistical methodology, statistical statements about the significance of the differential returns can be made.

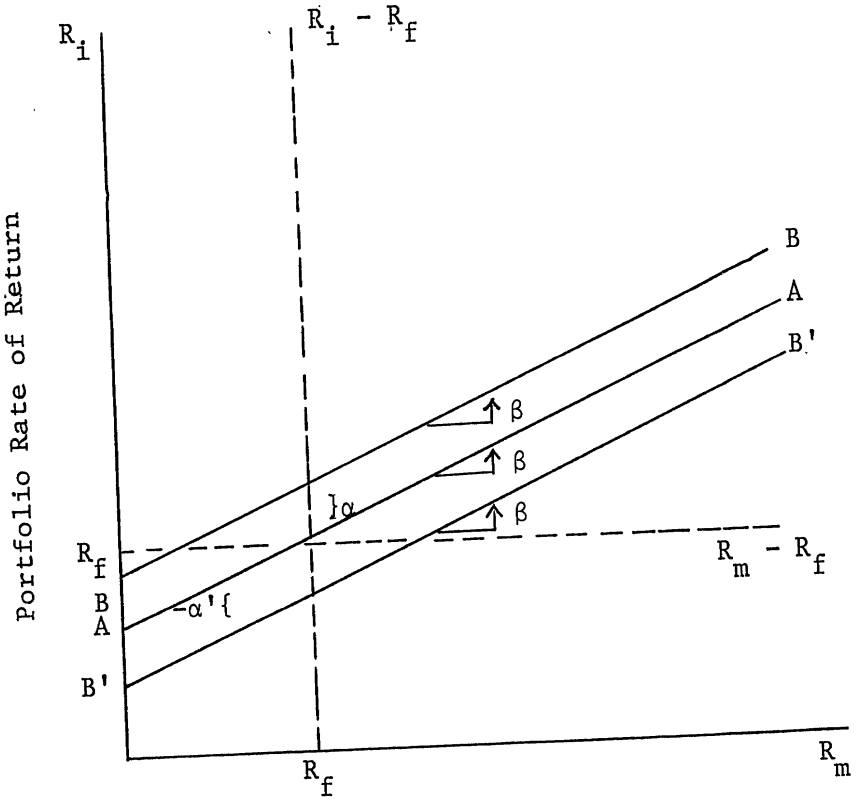

Fig. 1. Graph of risk-adjusted differential return.

In Figure 1, the theoretical expected return for a given portfolio composed of the securities of all of the selling or all of the buying insiders is shown by line AA. Since each of these portfolios contains a substantial number of entries, in excess of 300 securities for any given month, the Capital Asset Pricing Model (CAPM) predicts that the (α) or intercept term is zero. This is caused by the positive α's of some of the individual securities in the portfolio being offset by the negative α's of other securities in the portfolio. Wagner and Lau (10) have demonstrated that as the number of randomly selected securities in a portfolio increases, the intercept (α) approaches zero. Since they are dealing with portfolios of 20, 100, and 200 securities, the buy and sell portfolios of this study, each of which has over 300 securities, can be expected to have a theoretical zero intercept.

In interpreting line AA, for any return on a market portfolio (R_m), the return on the individual buy or sell portfolio is linearly related by the measure of systematic risk of the portfolio with the market (B). The α term, or measure of unsystematic risk, has been in theory diversified away, so line AA passes through the ($R_i - R_f$) and ($R_m - R_f$) coordinates at the zero point. The individual portfolio's actual performance is represented by the lines BB or B'B'. In theory, the Capital Asset Pricing Model predicts that the difference between the actual return and the theoretical return of a large diversified portfolio will be normally distributed about line AA with an expected deviation of zero. For line BB the differences between actual and expected returns have a positive bias above zero. This bias is measured by the α, or intercept term, which is defined as the differential return. For line B'B' the differential return α' is negative, or the portfolio did not perform as well as theoretically expected.

Since the composition of the buy or sell portfolios was not randomly chosen, any significantly positive or negative intercept can be interpreted as the identification of groups of securities which systematically perform differently from the market.

The construction of the insider buy portfolios was accomplished by aggregating the securities of the companies of all of the insider buy transactions into a portfolio, where each security is weighted by the number of times that individual insiders bought that particular security in a given month. The sell portfolio was constructed in a similar manner. The holding periods for each portfolio ranged from one to twelve months and were compiled so that all of the months in the insider trading file were used as beginning months. Hence for January 1969, all insiders who bought or sold stock in that month had the security of their company placed in a buy or sell portfolio. Then for each initial month, holding period performances were calculated for various time periods up to and including twelve months. Similar portfolios were generated for each initial month up to December 1971. This procedure produced thirty-six data points for each holding period, for each of the buy or sell portfolios. Figure 2 depicts the construction of the data set which was used as input for the regressions.

For the one-month holding period portfolios ($R_{1,1}, \ldots R_{36,1}$), in Figure 2, which is in effect the month in which the transaction took place, a monthly equivalent rate of return was calculated for each transaction in the following manner:

$$Re = (1. + R)^{D/HP} - 1. \qquad (2)$$

where:

Re is the equivalent monthly return.

BUY PORTFOLIOS

Beginning Month	Duration of Holding Periods (in Months) 1	2	3	4	5	6	7	8	9	10	11	12
January, 1969	$R_{1,1}$	$R_{1,2}$	$R_{1,3}$	$R_{1,4}$	$R_{1,5}$	$R_{1,6}$	$R_{1,7}$	$R_{1,8}$	$R_{1,9}$	$R_{1,10}$	$R_{1,11}$	$R_{1,12}$
February, 1969	$R_{2,1}$	$R_{2,2}$										$R_{2,12}$
.	.	.										.
.	.	.										.
.	.	.										.
December, 1971	$R_{36,1}$	$R_{36,2}$			...							$R_{36,12}$

SELL PORTFOLIOS

Beginning Month	1	2	3	4	5	6	7	8	9	10	11	12
January, 1969	$R_{1,1}$				...							$R_{1,12}$
.	.											.
.	.											.
.	.											.
December, 1971	$R_{36,1}$				...							$R_{36,12}$

Fig. 2. Portfolio and holding period construction.

R is the actual return or $\frac{\text{end of the month price-transaction price}}{\text{transaction price}}$.

D is the number of days in the particular month .

HP is the number of days between transaction date and the end of the month.

The monthly equivalent return was calculated so that individual portfolio returns over various time periods could be compared to monthly market returns.

The returns for the holding periods greater than one month were generated by the following algorithm:

$$R_{B/S,h} = \left[(1. + Re)\prod_{i=2}^{j} (1. + RCD_{I,t})\right] - 1.0 \qquad (3)$$

for j=2 to 12

where:

$R_{B/S,h}$ is the holding period return for the buy or sell portfolios for the proper beginning month.

Re is the monthly equivalent return.

$RCD_{I,t}$ is the aggregate jth monthly rate of return with dividends from the University of Chicago CRSP Tape for all of the firms bought or sold in the beginning month.

j is the number of months in the holding period.

Specifically, each holding period return was computed by taking the first month's equivalent return and compounding it by the returns in the following months. Applying equation (3) to the sell portfolio returns generated with January 1969, as the first month for a two-month holding period yields:

$$R_{1,2} = (1. + Re_{Jan})\ (1. + RCD_{Feb,2}) - 1. \qquad (4)$$

where:

$RCD_{Feb,2}$ is the geometric returns of the February 1969 returns of all of the firms that were sold during January 1969. All of the returns for the buy and sell portfolios in Figure 2 for a given holding period, starting in a given month, were calculated in a similar fashion.

From Figure 2 it can be seen that there are thirty-six data points for each holding period, and there are twelve holding periods for each buy and sell portfolio. Therefore, for each portfolio twelve regressions were run, and each regression had thirty-six returns in its data set.

III. EVALUATION OF RESULTS

The results of the regressions are presented in Table 1. Each portfolio has a monthly return, an intercept value, the standard error associated with that value, a T-statistic, and level of significance for each holding period.

For the intercept of the buy portfolios, the value of α is always positive and significantly different from zero. This implies that insiders earn above-average returns when they are buying the securities of their own corporation. The market fell substantially during 1969 and the first half of 1970 and then recovered during the latter half of 1970 and the first half of 1971, followed by another drop during the last half of 1971; the excess returns of the individual insiders, therefore, may not have been positive, but rather it may be that the insiders' investments did not fall as much as did the market.

All of the sell portfolios have negative differential returns which are significantly different from zero. This indicates that the securities that the insiders were selling fell more than the general market did during the period. These results bear out the assertion that insiders, because of their access to privileged information, can outperform the market in their stock selections.

From the monthly differential returns for the buy portfolio most of the above-average return is realized in the first five months.

TABLE 1

MONTHLY AND CUMULATIVE DIFFERENTIAL RETURNS

Holding Period	BUY PORTFOLIO Monthly (in Percentage)	α Cum.	Standard Error	T-Statistic	Significance	SELL PORTFOLIO Monthly (in Percentage)	α Cum.	Standard Error	T-Statistic	Significance
1	6.6	.0660	.0277	2.384	.0228	-- .9	-.0090	.0042	-2.373	.0308
2	17.9	.257	.053	4.087	.0003	-14.6	-.167	.064	-3.882	.0020
3	- 2.5	.226	.043	4.546	.0011	- 5.4	-.230	.045	-5.059	.0000
4	9.3	.340	.063	5.378	.0000	- 9.5	-.348	.058	-6.006	.0000
5	5.1	.409	.069	5.928	.0000	- 5.2	-.419	.063	-6.653	.0000
6	- 3.7	.357	.061	5.833	.0000	+ 3.4	-.372	.055	-6.698	.0000
7	- 2.0	.331	.051	6.476	.0000	+ 1.3	-.355	.045	-7.759	.0000
8	2.6	.366	.049	7.371	.0000	- 2.6	-.391	.041	-8.874	.0000
9	1.9	.393	.059	7.164	.0000	- 2.0	-.419	.048	-8.653	.0000
10	3.7	.444	.055	8.043	.0000	- 3.5	-.469	.048	-9.622	.0000
11	.2	.447	.044	9.994	.0000	0.0	-.469	.039	-11.758	.0000
12	- 1.9	.475	.040	11.887	.0000	- 1.7	-.495	.035	-13.825	.0000

Note: These results are based on several assumptions about the random error term ( ). Various tests were performed to indicate the validity of these assumptions in this case. Assumptions are:

A. The μ's expected value is zero. A histogram of the residual values indicated a distribution about zero.
B. The μ's are uncorrelated with the other variables. A scatter plot of the residuals versus the predicted values of the corresponding dependent variables indicated no apparent relationship.
C. The μ's are not serially correlated. The first order autocorrelation of residuals was not significantly different from zero.
D. There were no identifiable changes in the variance of the residuals.

The second month has the greatest amount of above-average return, which may indicate that the information on which the insider based his buying has become public knowledge and has been discounted by the market; or this pattern may indicate that the insiders' accumulation of the stock has become known and the public has reacted by purchasing those stocks. Whichever the case, it is clear that after the insider acts, the market reacts in the short term.

The monthly differentials for the sell portfolios present a similar picture, with most of the below-average performance taking place in the first five months. Of particular interest is the very small differential in the first month. It would appear that initially, as the insiders are selling, either the information on which they base their selling is not immediately released or the fact that insiders are selling is not immediately discounted by the market.

IV. IMPLICATIONS AND CONCLUSIONS

It is apparent from these results that insiders are able to identify profitable as well as unprofitable situations in their own companies in the short run. Comparing the magnitude and sign of these results with Pratt and DeVere's (7) study indicates that there is agreement as to the direction of the insider returns, but Pratt and DeVere's results are much smaller both on a cumulative and a monthly basis. In addition, their monthly results show no fluctuation from gains to losses but rather are always positive. In trying to explain this difference, we find that three factors are apparent. The first involves Pratt and DeVere's selections of companies for the sample. Since they have only included companies with three or more insiders acting in the same manner, they have omitted a large portion of the insider population. By excluding those

firms with only one or two insiders trading, it appears that they have overlooked some profitable performers. Secondly, their study begins on the last day of the month of the insider transaction; they have in effect ignored the returns earned by the insiders in the first month, and, as we found for the buy portfolios, this amount is substantial. Finally, they have not explicitly included the impact of the market's movement in their study. The returns that they find are not really compatible with the results of this study, in the sense that the returns of this study are measured relative to the market, while their returns are measured relative to zero. Therefore, it appears, the conclusions reached by Pratt and DeVere and by this study are in agreement as to the existence of excessive profits; they disagree only as to the magnitude of those profits.

In comparing the results of this study with Jaffe's work (2, 3), again we find that the existence of above-average insider profit is agreed upon but the magnitudes are difficult to compare, because Jaffe lumps the buy and the sell transactions together into one statistic. This approach makes it impossible to observe anything about the relative sizes of his measure of above-average returns vis à vis the returns found for the separate insider buy or sell portfolios. Jaffe's results indicate the short-run nature of insider above-average performance, but a limitation in his work may stem from his use of a unanimity principle in his sample selection, which excludes a large portion of the insiders who are trading their own stock. Again, with Jaffe as with Pratt and DeVere, there is agreement that insiders can outperform the market; only the question of by how much remains open.

To sum up the findings of this study and their agreement with Pratt and DeVere and Jaffe, one point is clear: Insiders are able to

outperform the market. This observation leads to the conclusion that the market is not strong-form efficient. Insiders can and do identify profitable as well as unprofitable situations within their corporations.

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