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INSIDERS AND MARKET EFFICIENCY

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I. INTRODUCTION

THE STRONG-FORM of the efficient market hypothesis assumes all available public and private information is fully relected in a security's market price. The strong-form, in terms of market participants, also assumes that no individual can have higher expected trading profits than others because of monopolistic access to information. One possible 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 do relative to the market in general. To date, some work has already been done in evaluating rates of return earned by insiders trading for their own accounts. Jaffe [3,4], Pratt and DeVere [8], Rogoff [9], and Glass [2] have calculated rates of return earned by insiders trading for their own accounts and their work lends some support to the hypothesis that insiders do, in fact, earn above average profits. A major shortcoming of these studies centers on data availability, as no precise price per share or date of insider trades were reported to the S.E.C. prior to 1965. Further, except for Jaffe, the studies do not incorporate an explicit adjustment for risk. An additional problem with all of the studies is the skimming of the cream of the crop in their sample selection. That is the selection of samples based on "intensive" insider trading criteria, i.e., the samples are biased in favor of whose performance would more than likely be superior to the average insider. This bias, while not affecting their results relative to the semi-strong-form, invalidates the findings for a test of the strong-form. By testing the entire population of insiders, this study evaluates the performance of the "average" insider.

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

II. DATA AND METHODOLOGY

The time period for this study runs from January, 1969 to December, 1972. The data are from the S.E.C.'s Official Summary of Stock Transactions for NYSE firms. The data file contains identification of the company and the individual insider, date of the transaction, number of shares traded, end of the month holding of the insider, buy or sell code, and closing price on the day of the trade. Data are adjusted for stock splits or dividends. For the total period, there are recorded over 30,000 individual transactions: 9,602 buy transactions and 21,487 sell transaction.

Common stock acquired by the exercise of options or through compensation plans was excluded from the insider sample, because of the difficulty in getting

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price information associated with the exercise of options and in determining 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 prices generally associated with these transactions. 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. Since the major concern of this study is with the stong-form of market efficiency, no bias is introduced by including late reports in their proper month.

An insider buy portfolio and an insider sell portfolio are formed for each month of the time period. The buy (sell) portfolio for the ith month is comprised of the securities of those companies for which any insider engaged in a buy (sell) transaction during that ith month. Each security is weighted in the portfolio for the ith month by the number of times insiders bought that particular security in the ith month. Thirty-six such buy (sell) portfolios are formed, starting with January 1969 and ending with December 1971. Portfolio returns for each of the thirty-six buy (sell) portfolios are computed for the portfolio formation month and for each of the eleven subsequent months. In general, $R_{i,t}$ refers to the rate of return t months after formation on an insider buy (sell) portfolio formed in month i where $t=0,1,\ldots,11$ and $i=1,2,\ldots,36$. (Month $i=1$ corresponds to January 1969 and month $i=36$ corresponds to December 1971.)

Figure 1 depicts the construction of the data set used as input for the regressions. The one month holding period portfolios ($R_{1,1},\ldots,R_{36,1}$), in Figure 1 are in effect the respective month in which transaction took place. A monthly equivalent rate of return was calculated for each transaction in the following manner:

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

where: Re = the equivalent monthly return

R = the actual return or *end of month price-transaction price/transaction price*

D = the number of days in the particular month.

HP = 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.

From Figure 1 it can be seen that there are thirty-six data points for each data period, and there are twelve data 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.

Using a methodology developed by Jensen [5], the risk premium of an individual security above the market return, which is defined as the differential return, was evaluated in the following regression:

$$\tilde{R}_{i,t}-R_{f,t}=a_i+B_i\left(\tilde{R}_{m,t}-R_{f,t}\right)+\tilde{u}_{i,t} \tag{2}$$

BUY PORTFOLIOS Beginning Month	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	$R_{36,1}$				...							$R_{36,12}$

Data periods measured in months

FIGURE 1 Portfolio and data period construction

where $\tilde{R}_{i,t}$ = the rate of return of an individual portfolio for month t.

$R_{f,t}$ = 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.

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

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

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

Since it is the differential return (a_i) that is of interest, the constant term of the regression equation was treated as a free independent variable, thereby assuring that the output of the regression package would provide the standard error, the T-statistic, and the significance level for the intercept term. These statistics are discussed in the analysis section. A constant term significantly different from zero indicates that the average insider performance was 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 [5] 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, $\tilde{e}_{jt}$, 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

$$\tilde{R}_{jt} - R_{Ft} = B_j(\tilde{R}_{Mt} - R_{Ft}) + \tilde{e}_{jt} \tag{7}$$

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 $B_j(\tilde{R}_{Mt} - R_{Ft})$ plus the random error term $\tilde{e}_{jt}$. (4)

A graphic presentation of the regression equation is given in Figure 2. The regression equation (2) subtracts R_f from the market and the individual portfolio return so as to relocate the zero coordinate as shown by the solid lines. The intercept of the regression equation measures the average differential return of the portfolio, from its theoretical value. By using this statistical methodology, statistical statements about the significance of differential returns can be made.

In Figure 2, the theoretical expected return for a given portfolio comprised of the securities of all of the selling or all of 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 an intercept term of zero, i.e., the positive a's of some of the individual securities in the portfolio offset the negative a'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 (a) approaches zero. Since they are dealing with portfolios of 20, 100, and 200 securities, the much larger buy and sell portfolios of this study 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 portfolfo with the market (B). The a term or measure of unsystematic risk is in theory diversified away, and so line AA passes through the $(R_i - R_f)$ and $(R_m - R_f)$ coordinates at the zero point. The performance of individual portfolios is represented by the lines BB and $B'B$. 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 diviation of zero. For line BB the differences between actual and expected returns have a positive bias above zero, and this bias is measured by the a or intercept term, which is defined as the differential return. For line $B'B$ the differential return a' is indicating that the portfolio did not perform as well as theoretically expected.

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

In comparing the methodology used in this study with the residual analysis used by Jaffe [3] it can be shown that under certain assumptions they should yield similar results. From equation 2 we can get;

$$a_i = R_{i,t} - R_{f,t} - B(R_{m,t} - R_{f,t}) \tag{3}$$

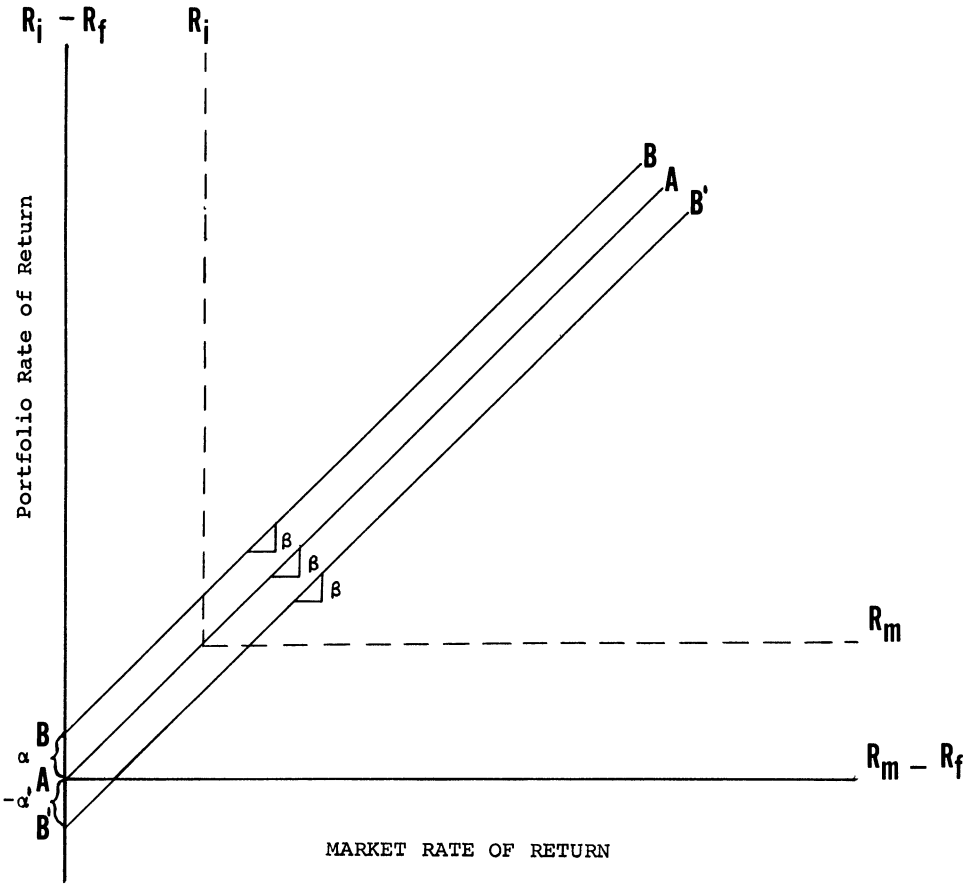

FIGURE 2 Graph of Risk Adjusted Differential Return

The residual analysis calculates an estimated residual for each month by the following:

$$u_t = R_{i,t} - (a_i + B_i R_{m,t}) \tag{4}$$

where $R_{i,t}$ = the actual rate of return earned on the portfolio.

a, B = the least square estimates of the relationship between the portfolio return and the market.

Since one can expect the B term to equal one and the a term to equal zero for portfolios with a large number of securities equation 3 and 4 can be rewritten as:

$$a_i = R_{i,t} - R_{f,t} - 1(R_{m,t} - R_{f,t}) \tag{3a}$$

$$u_t = R_{i,t} - (0 + 1R_{m,t}) \tag{4a}$$

Since $a_i = R_{i,t} - R_{m,t}$ and $u_t = R_{i,t} - R_{m,t}$ we see that $a_i = u_t$.

III. Evaluation of Results

The results of the regressions are presented in Table 1. For each portfolio for each holding period the following data are presented the excess return, *T*-statistic, and level of significance.

The intercept term of the buy portfolios is always positive and significantly different than zero, at the 10% significance level. This implies that insiders earn above average returns when they buy securities of their respective corporations. Since 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, to be followed by another drop during the last half of 1971, the returns of the individual insiders may not have been positive. The point is that their investments were doing better than the market.

All of the sell portfolios have negative differential returns which are significantly different than zero at the 10% level, except the returns for the fifth and seventh months. The results indicate that the securities the insiders were selling fell more than the general market decline of the period. These results for both the buy and sell portfolios bear out the fact that insiders, because probably 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 returns, are realized in the first six months. The first month has the greatest amount of above average return this may indicate either that the information on which the insiders act soon becomes public knowledge and is discounted by the market quite quickly or that the knowledge that insiders have been accumulating certain stocks prompts the public to acquire the same stocks and thereby bid up the prices. Whichever the case, it is clear that after the insider acts, the short-term effect is to have the market follow.

The monthly differentials for the sell portfolios present a different picture, with most of the below average performance taking place uniformly throughout the subsequent months. Of particular interest is the relatively small differentials compared to the buy portfolio in the first three months. It would appear that initially as the insiders are selling, either the information they are selling on is not immediately released, or the fact that insiders are selling is not immediately discounted by the market.

IV. Implications and Conclusions

From the results it is apparent that in the short-run insiders are able to identify profitable as well as unprofitable situations in their own companies. A comparison of the magnitude and sign of these results with Pratt and DeVere's [8] study indicates agreement as to the direction of the insider returns. In evaluating the difference between Pratt and DeVere's study and this study, three factors are apparent. The first involves Pratt and DeVere's selections of companies for the sample. Since they included only companies with three or more insiders acting in the same manner, they 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, by starting their analysis on

TABLE 1[a]

MONTHLY DIFFERENTIAL RETURNS

Month From Trade	Buy Portfolio Monthly Excess Return	Standard Error	*T*-Statistic	Significance	Sell Portfolio Monthly Excess Return	Standard Error	*T*-Statistic	Significance
0	.0368	.0128	2.875	.0420	−.0090	.0042	−2.143	.0403
1	.0101	.0053	1.905	.0731	−.0045	.0012	−3.750	.0007
2	.0085	.0026	3.230	.0042	−.0043	.0012	−3.583	.0009
3	.0037	.0012	2.972	.0054	−.0042	.0012	−3.500	.0009
4	.0053	.0013	4.252	.0002	−.0047	.0011	−4.272	.0003
5	.0026	.0011	2.440	.0200	−.0033	.0018	−1.277	.1581
6	.0049	.0013	3.832	.0005	−.0031	.0014	−2.214	.0438
7	.0016	.0012	1.433	.1010	−.0026	.0019	−1.368	.1173
8	.0018	.0011	1.606	.0951	−.0037	.0011	−3.363	.0019
9	.0021	.0012	1.808	.0675	−.0034	.0015	−2.266	.0468
10	.0040	.0012	3.369	.0019	−.0028	.0010	−2.833	.0421
11	.0020	.0012	1.750	.0891	−.0026	.0012	−2.166	.0398

[a] These results are based on several assumptions about the random error term (u). Various tests were performed to indicate the validity of these assumptions in this case.

A. The u's expected value is zero. A histogram of the residual values indicated a distribution about zero.

B. The u'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 u's are not serially correlated. The first order autocorrelation of residuals was not significantly different from zero.

D. There was no identifiable changes in the variance of the residuals.

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. As noted above, the first month was very important for the buy portfolios. And finally, by not explicitly including the impact of the market's movement in their study, the returns that they report are not really compatible with the results reported in this study. The returns of this study are measured relative to the market, while their returns are measured relative to zero. In summary, the conclusions reached by Pratt and DeVere and this study agree as to the existence of excess return, and only disagree as to the means of measuring them.

In comparing the results of this study with Jaffe's work [3,4], again the existence of above average insider returns is agreed upon. One difficulty in comparison is due to Jaffe's lumping together of both the buy and the sell transactions into one statistic. Therefore, nothing can be said about the relative sizes of his measure of above average returns vis-a-vis the returns found for the separate insider buy or sell portfolios. In addition, Jaffe's results indicate the short run nature of insider above average performance. Perhaps this difference between the two studies may be explained by the fact that Jaffe excluded from his sample a large portion of the insider who are trading their own stock. By limiting his study to the two hundred largest companies on the CRSP Type, he omitted from consideration smaller companies whose insiders may have a better appreciation of the value of insider information. See Finnerty [1] for a further discussion of the characteristic of the firms that insiders normally trade. Again, with Jaffe as with Pratt and DeVere, there is agreement that insiders can outperform the market: There remains the issue as to sample selection. An additional dimension, introduced by Jaffe [3,4] is the evaluation of the regulatory process for controling insider trading. This study suggests that additional regulation, even after Cady, Roberts, and Texas Gulf Sulphus, has not deterred insiders.

To sum up the findings of this study, it corroborates those of and DeVere and Jaffe: Insiders are able to outperform the market. Insiders can and do identify profitable as well as unprofitable situations within their corporations. This finding tends to refute the strong-form of the efficient market hypothesis.

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