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INSIDERS' ACTIVITY AND INSIDE INFORMATION:
A MULTIVARIATE ANALYSIS

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I. INTRODUCTION

The Securities and Exchange Commission and the New York Stock Exchange are concerned with the full disclosure of the information that insiders normally would be expected to possess about their company, including any facts that would materially affect the market's valuation of the firm's worth if they were publicly known. At present, the regulatory agencies have limited their activities to the collection and dissemination of historical information and facts. The expectations of insiders as to future operating results are banned from most required reports. It is therefore left to the astute investor or security analyst to ferret out these expectations and convert such information into earnings and market-price effects.

The average insider has been shown in various studies by Pratt and DeVere [3], Jaffe [4], and Finnerty [2] to perform better than the market. His above-average performance can be attributed to his access to inside information whose characteristics are of interest to all market participants, especially the regulatory bodies. Of the entire set of possible inside information, this study will limit itself to readily quantifiable financial and accounting information. It is important to determine if insiders' estimates of future financial and accounting data play any role in the above-average profits that they earn. If any relationships can be defined between insiders' profits and estimates of future operating results, a case can be made for the disclosure of insiders' forecasts.

The primary purpose of this study is to develop a factor analysis/multiple discriminant analysis model to indicate the existence of any relation between insiders' trading and subsequent financial and accounting results. Section II presents the data base and methodology used in the study, Section III the results of the analysis, and Section IV the implications and conclusions derived from these results.

II. DATA BASE AND METHODOLOGY

The data base is composed of company data and data on individual insiders' transactions. All of the NYSE firms whose financial and accounting information are on the COMPUSTAT Tapes for the 1967-72 period were used in composing the company information file. The file comprised 1,043 separate companies, after those firms which had substantial gaps or errors in their data were eliminated from it, and a cross-sectional sample of these 1,043 firms was then manipulated into 49 variables. The basic types of variable and the calculation procedures, modeled after those used by Pinches and Mingo [7] with some exceptions and variations, were: 1) standard financial ratios and accounting information for 1972; 2) five-year means for these ratios; 3) coefficients of variation for these ratios; and 4) others. Table 1 lists the 49 original variables along with any mathematical manipulations that were performed on the raw data.

The individual transaction file for insiders was made up from the SEC's Official Summary of Stock Transactions for NYSE firms for the entire year of 1971. This file identifies the company and individual insider and gives the number of shares traded, the number of shares held at the end of the month, the date of the transaction, and a buy-or-sell code. A total of 854 companies are included in this file. Data for individual insiders were used to place the companies into one of two classes, a buying or a selling group. Six periods

Table 1

FINANCIAL AND ACCOUNTING VARIABLES AND DATA MANIPULATIONS	
VARIABLES	DATA MANIPULATIONS
* 1. Total Asset Size	\log_{10}
* 2. Sales	\log_{10} (if non-zero, add .75)
* 3. Average Number of Common Shares Outstanding	\log_{10}
* 4. Dividend per Share	
5. Coefficient of Variation of R&D Expenses/Sales for 1968-72	
* 6. Net Working Capital	\log_{10}
* 7. Number of Employees	\log_{10}
* 8. Coefficient of Variation of Capital Expenditures for 1968-72	
9. Cost of Goods Sold/Sales	\log_{10}
10. Labor Expenses/Sales	\log_{10}
11. Selling and Administrative Expenses/Sales	\log_{10}
12. Five Year Mean of Operating Income/Rentals/Rentals	\log_{10} (zero rentals replaced with 100, if non-zero, add 1)
*13. Earnings per Share as Reported	
*14. Earnings per Share Fully Diluted	
15. Five-Year Mean of Inventory Gain	\log_{10}
*16. Net Worth/Total Assets	
*17. Net Working Capital/Sales	
*18. Consecutive Dividends in Last Twenty Years	\log_{10}
*19. Sales/Total Assets	
*20. Net Income/Net Worth	
*21. Market Value of Equity/Long Term Debt	\log_{10} (if non-zero, add 1)
*22. Coefficient of Variation of Net Income 1968-72	
*23. Five-Year Mean of Long Term Debt/Net Worth	\log_{10}
*24. Five-Year Mean of Net Income/Total Assets	
*25. Five-Year Mean of Total Assets	\log_{10}
*26. Five-Year Mean of Times Interest Earned/1.	\log_{10}
*27. Five-Year Mean of Long Term Debt/Total Assets	
*28. Five-Year Mean of Sales/Total Assets	
29. Coefficient of Variation of Closing Market Price Changes 1968-72	
30. Coefficient of Variation of Earnings per Share	
31. Five-Year Mean of Percentage Change in Sales	
*32. Long-Term Debt/Net Worth	
33. Five-Year Mean Price/Earnings	
*34. Price Earnings	\log_{10} (zero P/E replaced with 100)
*35. Coefficient of Variation of Current Ratio 1968-72	
36. Coefficient of Variation of Inventory Turnover 1968-72	
*37. Coefficient of Variation of Net Income/Average Common Equity 1968-72	
*38. Five-Year Mean Dividend Yield	
*39. Five-Year Mean of Earnings per Share/Average Equity Price	
40. Deferred Taxes/Investment Credit	\log_{10}
*41. Sales/Net Worth	
*42. Coefficient of Variation Net Income/Total Assets 1968-72	
*43. Coefficient of Variation Times Interest Earned 1968-72	
44. Five-Year Mean Dividend Payout Ratio	
*45. Number of Shares Traded/Number of Shares Outstanding per Year	
46. Coefficient of Variation Price Range/Average Equity Price	
47. Non-Recurring Income or Expense	\log_{10} (if zero, replaced with 100)
48. Net Plant/Gross Plant	\log_{10}
49. Company COMPUSTAT ID	

*Variables to which data set should be reduced.

during 1971 were selected: January 1971, January to December 1971, April to December 1971, July to December 1971, October to December 1971, and December 1971. An a priori grouping of insiders into either the buying or the selling group for each period was computed by the following index of insiders' activity,

$X_{j,t}$:

$$X_{j,t} = \sum_{M_j} \frac{S_{i,j,t} - B_{i,j,t}}{H_{i,j,t}} \quad (1)$$

where:

M_j is the number of insiders trading in company j.

$S_{i,j,t}$ is the number of shares sold by the ith insider of the jth company during time t.

$B_{i,j,t}$ is the number of shares bought by the ith insider of the jth company during time t.

$H_{i,j,t}$ is the number of shares held by the ith insider of the jth company at the end of time t.

Inclusion in the buying or selling categories for a particular period was determined by the following criteria:

$$X_{j,t} \geq .00 = \text{Buy (Group 1)} \quad (2)$$

$$X_{j,t} < .00 = \text{Sell (Group 2)} \quad (3)$$

An initial data reduction was performed on the normalized and standardized company data by means of correlogram analysis. This is a heuristic that is applied to the correlation matrix of the original data set to identify the most closely related variables. By eliminating the unimportant independent variables, one can assure a reduction in the number of factors identified by the factor analyses. As a rule of thumb any variable whose correlation coefficient with

any other variable is greater than .4000 is retained in the sample.

This procedure not only reduces the number of variables, but also gives a preliminary indication of the variables that are closely related to each other. The variables that are most closely related will form the individual factors of the factor analysis. Familiarity with the preliminary factors makes the selection of the proper rotation procedure somewhat easier, because the types of factors that should be present have been identified. The results of the correlogram analysis indicate that the original data set should be reduced to those 32 variables marked with an asterisk in Table 1.

III. RESULTS OF ANALYSIS

By identifying phenomena that vary uniformly with each other, factor analysis determines a minimum of independent patterns that explain most of the variation in the original data set. The basic reason for doing this analysis is to get the most information possible from the fewest independent relationships inherent in the original data. The interpreted output, as well as the rescaled rotated factor scores from the factor analysis, served as an input to the Multiple Discriminant Analysis (MDA). This output will meet all of the requirements needed to satisfy the input criteria of the MDA.

The factor analysis technique of rotation of principal-components was used to summarize and reduce the 32 variables into six identifiable sets of linear combinations comprising the original variables. The identified factors were: 1) size, 2) financial leverage, 3) earnings, 4) operating leverage, 5) capital intensiveness, and 6) dividends. These six factors explained 67.4 percent of the total variance of the original sample. Table 2 gives the factor loadings of the rotated matrix for those variables whose factor loadings were greater than .55.

The second set of inputs to the MDA consisted of the categorical variables generated from the insiders' trading file. This categorical variable has two divisions, buying or selling. The MDA was used to classify a firm into one of these two mutually exclusive groups on the basis of certain properties or characteristics of the firm as these were embodied in the financial profile generated from the factor analysis. A discriminant function based on the company's 1972 profile was determined, which was then used to assign companies to a specific group during the five periods of 1971. The weighting factor coefficients for the linear discriminant function for each factor gives an indication of the relative importance of these variables in assigning group membership. The larger the absolute value for these coefficients, the more important the variable. These weighting coefficients are presented in Table 3.

Another way of evaluating the difference between insiders' buying and selling activities is to evaluate the differences between the means of the six factors by a univariate T-test. For each factor the null hypothesis tested is that the means of the two groups are equal. The results of these tests are presented in Table 4.

The major difference between the methods used to compile Table 3 and Table 4 is that Table 3 was constructed by considering all of the variables and their relationships simultaneously, whereas in Table 4 only one factor was considered at a time. Since both tables indicate the importance of the same variables, similar statements can be made about the interpretation of either table.

The buying group's average size factor is less than the selling group's, and there is less than one chance in 100,000 that the mean size of the groups is the same. The selling group's factors relating to earnings and dividends have lower means than those of the buying group and are significantly different.

TABLE 2

FACTOR LOADINGS FOR THE ROTATED FACTOR MATRIX

Variable	Factor Identification	Factor Loadings					
		1	2	3	4	5	6
	SIZE						
Total Assets		.93					
Sales		.94					
Average Number of Shares Outstanding		.81					
Net Working Capital		.67					
Number of Employees		.83					
Five-Year Mean of Total Assets		.88					
	FINANCIAL LEVERAGE						
Net Worth/Total Assets			-1.66				
Market Value of Equity/Long-Term Debt			-.88				
Five-Year Mean Long-Term Debt/Net Worth			.84				
Five-Year Mean Net Income/Total Assets			-.67				
Five-Year Mean of Times Interest Earned			-.74				
Five-Year Mean Long-Term Debt/Total Assets			.73				
	EARNINGS						
Earnings per Share as Reported				.80			
Earnings per Share Fully Diluted				.80			
Five-Year Mean E.P.S./Average Equity Price				.56			
Coefficient of Variation Net Income/Total Assets				-.63			
	OPERATING LEVERAGE						
Sales/Total Assets					-.95		
Five-Year Mean Sales/Total Assets					-.94		
	CAPITAL INTENSIVENESS						
Long-Term Debt/Net Worth						-.87	
Sales/Net Worth						-.87	
	DIVIDENDS						
Dividend per Share							.57
Consecutive Dividends in last 20 years							.55
Five-Year Mean Dividend Yield							.80
Five-Year Mean Dividend Payout Ratio							.55

Table 3

WEIGHTING COEFFICIENTS OF THE LINEAR DISCRIMINANT FUNCTION FOR EACH STRATUM

Factor	January to December 1972	
	Buy	Sell
Size	-.1287	.2552
Financial Leverage	.0722	-.0235
Earnings q	.2400	-.0710
Operating Leverage	-.0918	-.0043
Capital Intensiveness	-.0187	-.0044
Dividends	.3346	-.2291

Table 4

UNIVARIATE TESTS FOR DIFFERENCES BETWEEN FACTOR MEANS

<u>Factor</u>	
Size	
T-Statistic	-4.165
Significance	.0000
Financial Leverage	
T-Statistic	1.353
Significance	.1763
Earnings	
T-Statistic	2.242
Significance	.0252
Operating Leverage	
T-Statistic	-1.417
Significance	.1566
Capital Intensiveness	
T-Statistic	-2.076
Significance	.8355
Dividend	
T-Statistic	3.976
Significance	.0001

To summarize: larger size, smaller earnings, and smaller dividends characterized the companies whose securities the insiders were selling, while smaller size, larger earnings, and larger dividends are characteristic of the companies in which the insiders were investing.

To assess the strength of the relation between future financial and accounting information and insiders' trading, a classification matrix was generated for each of the periods. The greater the model's ability to classify an insider's transaction as a purchase or sale on the basis of future performance, the greater the indication that insiders rely on their expectations of future values of these variables when they are deciding to trade. Table 5 gives the two-way classification matrix for each period. By adding the percentages along the diagonal, one can determine the percentage of correctly classified firms.

From Table 5 it is apparent that the model predicts the buyers and sellers better for December 1971 than for January 1971, an indication that the closer to the profile year, the stronger the relation between insiders' transactions and future operating results. This result is probably due to the insider's lessened uncertainty about the near future and may indicate that insiders considers their companies' short-term performance when they are deciding to buy or sell their companies' stock.

IV. IMPLICATIONS AND CONCLUSIONS

It is an established fact that inside information is used by the officers and directors in determining what price they are willing to accept or pay for the shares of their own corporations. Such information comprises everything the insider knows which is not publicly available. In this study a subset of all inside information, consisting of future accounting and financial information, was used as a proxy for insiders' expectations. The insider assesses the under-

valuation or overvaluation of his corporation's securities by the market according to the way he expects a particular piece of information to affect the future market price of those securities. Since the average insider has shown that he can consistently predict future price movements, any knowledge of the specific types of information he uses would be extremely useful in increasing the efficiency of the market, if disclosure of such information or expectations were required.

The factor-analysis/multiple-discriminant model indicates not only that insiders do rely on future financial and accounting information but that, in their decisions to buy or sell, the relative magnitudes of the information is also important. Insiders who have decided to buy are purchasing the securities of companies distinguished by smaller size, larger earnings, and larger dividends compared to those companies whose securities the average insiders are selling. The point is that in individual situations certain insiders may be basing their decisions to buy or sell on other information in the insiders' information set. However, the average insider's actions are certainly related to the profile variables by more than mere chance. The systematic identification of the characteristics of the buying and selling groups is an important first step in identifying and quantifying the information set which insiders use and which allows them to perform better than the market.

Table 5
PERFORMANCE OF CLASSIFICATION MATRIX FOR INSIDER'S BUYING & SELLING*

Jan.-Dec. 1971		Jan. 1971		Apr.-Dec. 1971		July-Dec. 1971		Oct.-Dec. 1971		Dec. 1971	
Actual Number of Firms	Model Classification	Model Classification		Actual Number of Firms	Model Classification	Model Classification		Actual Number of Firms	Model Classification	Model Classification	
		Buy	Sell			Buy	Sell			Buy	Sell
215	282	186	214	281	538	248	491	187	395	89	215
25.2%	33.0%	46.5%	53.5%	34.4%	65.6%	33.7%	66.4%	32.2%	67.8%	29.4%	70.6%
Buy	Correct	Correct	Error	Buy	Error	Correct	Error	Buy	Error	Correct	Error
84	128	47	37	157	97	169	98	150	91	60	30
21.0%	15.0%	11.8%	9.3%	19.2%	11.8%	22.9%	13.3%	41.4%	15.6%	19.6%	9.8%
Sell	Error	Error	Correct	Sell	Correct	Error	Correct	Sell	Correct	Error	Correct
639	154	139	117	472	441	79	393	341	304	214	185
74.8%	18.0%	34.8%	44.3%	63.9%	53.8%	10.8%	53.1%	58.6%	52.2%	70.6%	60.8%
Total companies	854	400	819	739	582	304	634	304	304	304	304
Total percentage of companies correctly classified	71.8	56.1	73.0	76.0	78.0	81.4	81.4	81.4	81.4	81.4	81.4

*The assignments of the companies for the various time periods were determined by the linear discriminant function generated for the Jan. to Dec. 1971 period.

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