by Marc R. Reinganum

The Anatomy of a Stock Market Winner

An examination of 222 firms whose stocks at least doubled in price during one year of the 1970–83 period reveals several distinct features shared by the majority of companies. For example, investment advisers on average more than doubled their claims in these winners while stock prices were advancing. Also, the firms' pretax profit margins rose by about 2 per cent during the period of rapid price appreciation, while their growth rates based on five years of quarterly earnings data advanced from an average of 23 per cent to 38.2 per cent. Indeed, changes in earnings growth rates and profit margins probably fueled the price advances.

Of perhaps greater interest are the shared features that revealed themselves prior to the rapid price appreciation. The winners, for example, generally sold at a price less than their book value prior to their substantial price advances. Their quarterly earnings accelerated in the quarters preceding the price rise, and their relative-strength ranks, while already high, increased further.

Nine characteristics common to the 222 stock market winners were used to form the basis of a trading strategy that was applied to 2,057 NYSE and AMEX firms over the 1970–83 period. The trading strategy significantly outperformed the S&P 500 index. After one year, the average holding-period return of the selected firms equaled 30.6 per cent, versus 6.9 per cent for the S&P 500. By the end of two years, the sample firms' average holding-period return was 65.4 per cent, versus 14.7 per cent for the index. These return differentials amount to excess returns for the trading strategy of 23.7 and 50.7 per cent after one and two years, respectively. Thesc results cannot be explained by the firms' historical betas or stock market capitalizations.

MOST ACADEMIC RESEARCH during the 1960s and early 1970s supported the hypothesis that capital markets are efficient, hence that investors cannot systematically outperform naive investment strategies such as buying and holding a market index. Technical and fundamental research based on publicly available information would improve investment performance only marginally at best, and probably not at all. Throwing darts to select stocks would be just about as effective.

Serious chinks in this simple view of investment performance began to appear by the late 1970s and early 1980s. Basu, drawing on earlier work by Nicholson, reported that portfolios comprised of stocks with low price/earnings ratios outperformed portfolios with high price/earnings ratios by about 7 per cent per year, even after adjusting returns for the beta risk of the Capital Asset Pricing Model.[1] Banz and

1. Footnotes appear at end of article.

Reinganum found that stocks with very small market capitalizations had outperformed large-capitalization companies by about 20 per cent on an annual basis.[2] Other "investment anomalies," characterizing peculiar patterns in the timing of stock returns, also emerged, ranging from a month-of-the-year or January effect to a week-of-the-month effect to a day-of-the-week effect and even down to an hour-of-the-day effect.[3] While each of these studies focused on a different problem, they shared at least one conclusion: Investors may be able to beat stock performance benchmarks using publicly available information. (Whether the potential superior performance reflects deficiencies in the benchmark or informational inefficiencies in the stock market is still being debated.)

This article analyzes characteristics of past stock market winners to see whether they may yield some insights into successful investment strategies. Earlier research has isolated a particular attribute (such as P/E or size) and then investigated its associated return behavior; we take the opposite tack. We single out stocks with exceptionally high returns to see whether these firms share any common attributes. If history does repeat itself, these common attributes may suggest an investment strategy.

The Data

Our research differs not only in its experimental design, but also in its data. We turned to the *Datagraph* books (published by William O'Neil + Co. and sold primarily to institutional investors), which report a host of fundamental and technical information about firms traded on listed exchanges and the OTC markets.[4] In a search for common attributes among stock market winners, these data offer a much wider choice of potential candidates than CRSP or Compustat data. We also garnered our list of "winners" from an O'Neil publication, *The Greatest Stock Market Winners: 1970–1983*, which contains 272 episodes of explosive price appreciation for companies that traded on the NYSE, AMEX and OTC markets.

The Set Of Winners

We considered the universe of winners comprising the firms contained in *The Greatest Stock Market Winners: 1970–1983*. Several companies were classified as "great" winners during two separate episodes over the 1970–83 period. To be considered a great winner, a company typi-

cally had to at least double in value within a calendar year; there were a few exceptions to this guideline, and not all companies that doubled in value were selected.[5]

We merged the list of great winners with a file containing historical information on 2,279 NYSE and AMEX companies; these data were published in various issues of O'Neil's *Datagraph* over the 1970–83 period. Of 272 winning cases, 222 could be matched with the *Datagraph* information; the unmatched companies were OTC firms not covered in the historical files or firms whose CUSIP numbers could not be matched because of name changes. The complete list of 272 winners enjoyed average price appreciation of 361 per cent; the matched list of 222 winners increased in value by an average 349 per cent.

To compute the price appreciation of the winners, we assigned them hypothetical buy and sell dates. These dates were selected *ex post facto*, hence were not generated from actual stock market recommendations. The number of weeks between hypothetical purchase and sale varied from company to company. Panel A of Table I summarizes the price appreciations of the 222 winners between the buy and sell dates. While the average advance of 349 per cent was pulled up by the performance of a couple of stocks with astronomical price advances (4009 and 2554 per cent), more than half the firms increased in value by at least 237 per cent. One-quarter of these firms earned more than 370 per cent, and more than 95 per cent at least doubled in value.

Panel B of Table I displays the number of weeks that elapsed between buy and sell dates. Half the firms were held for less than 60 weeks. One-tenth of the firms were held for more than

Table I Price Appreciation and Length of Time Position Held

Panel A: Price Appreciation (per cent)					
		Percentiles			
Mean	349	5%	104	95%	945
Median	237	10%	119	90%	652
		25%	159	75%	370

Panel B: Elapsed Time Between Buy and Sell Dates (in weeks)					
		Percentiles			
Mean	77	5%	26	95%	178
Median	60	10%	34	90%	155
		25%	44	75%	96

three years. Only 5 per cent of the firms were held for less than 26 weeks.

Regardless of the precise method by which companies were chosen for inclusion in *The Greatest Stock Market Winners*, the performance of the sample firms is truly exceptional by any standard. Below, we compare the firms' financial conditions in the buy quarter with their conditions in the sell quarter and in the quarters immediately preceding the buy signal.

Characteristics of the Winners

We classified each variable contained in the *Datagraph* files into one of five categories.[6] The first category, "smart money," includes the behaviors of professionally managed funds and corporate insiders. The second category contains valuation measures such as price/book and price/earnings ratios. The third grouping includes technical indicators such as relative strength. The fourth class consists of accounting earnings and profitability measures. The final category contains some miscellaneous variables that did not seem to fit into the other four groups.

"Smart Money" Variables

The "smart money" variables reveal the stock holdings of professionally managed investment funds and corporate insiders. Even if they are not clairvoyants, money managers and corporate insiders are probably well-informed. We broke professionally managed funds down into four groups—investment advisers, banks, mutual funds and insurance companies. For each of these groups, O'Neil reports the number of institutions holding a particular issue as well as the aggregate holdings of these institutions as percentages of the outstanding common stock. We will focus on the holdings of investment advisers, which exhibit the most pronounced changes; the results for the other groups are qualitatively similar.[7]

Table II provides data on *investment adviser holdings* in the sell quarter, the buy quarter and the eight quarters preceding the buy date. Between the buy and sell dates, the number of investment advisers owning the 222 winners more than doubled, increasing from an average of 9.3 advisers per company to 20.9. The change in investment adviser ownership claims is just as dramatic; these more than doubled on average. The percentage of outstanding stock held by investment advisers rose from an average of 7.2 per cent in the buy quarter to 14.9 per cent in the sell quarter.

As a group, investment advisers concentrated their holdings in fewer companies than banks or mutual funds. Of the 222 winners, only 103 and 145 were in the portfolio of at least one invest-

Table II Investment Adviser Holdings in Sell, Buy and Eight Preceding Quarters

Panel A: Number of Investment Advisers Owning Shares										
						Percentile				
Quarter	Mean	1st	5th	10th	25th	50th	75th	90th	95th	99th
Sell	20.9	0	0	0	0	14	31.0	47.0	74.5	125
Buy	9.3	0	0	0	0	0	13.0	26.4	35.8	110
Buy-1	7.7	0	0	0	0	0	9.0	23.7	30.8	100
Buy-2	7.2	0	0	0	0	0	8.2	22.7	30.8	96
Buy-3	7.2	0	0	0	0	0	7.0	21.0	31.8	105
Buy-4	7.2	0	0	0	0	0	7.0	21.0	36.0	107
Buy-5	7.2	0	0	0	0	0	6.5	20.4	34.2	110
Buy-6	7.2	0	0	0	0	0	6.0	20.5	30.7	117
Buy-7	7.2	0	0	0	0	0	5.0	22.0	27.5	115
Buy-8	7.2	0	0	0	0	0	4.0	22.0	28.2	121

Panel B: Percentage of Outstanding Stock held by Investment Advisers										
						Percentile				
Quarter	Mean	1st	5th	10th	25th	50th	75th	90th	95th	99th
Sell	14.9	0	0	0	0	10.5	25.0	36.0	40.7	82.3
Buy	7.2	0	0	0	0	0.0	13.0	23.0	31.8	58.1
Buy-1	6.3	0	0	0	0	0.0	10.2	20.7	31.5	58.0
Buy-2	5.8	0	0	0	0	0.0	9.2	21.0	27.8	44.0
Buy-3	6.3	0	0	0	0	0.0	8.5	21.6	26.3	36.0
Buy-4	6.3	0	0	0	0	0.0	8.0	20.0	27.0	37.0
Buy-5	6.3	0	0	0	0	0.0	7.0	20.2	29.1	38.0
Buy-6	6.3	0	0	0	0	0.0	8.0	22.5	27.0	34.1
Buy-7	6.3	0	0	0	0	0.0	6.5	21.0	24.6	35.1
Buy-8	6.3	0	0	0	0	0.0	7.0	19.0	25.6	36.2

ment adviser in the buy and sell quarters, respectively. But although investment advisers avoided placing funds in a substantial fraction of the winners, they appear to have been very aggressive with their investments in the companies they did purchase.

Despite the investment advisers' aggressive positioning during the period of major price appreciation, their sponsorship data hold little promise of forecasting the big price change. Although there is a slight increase in sponsorship by investment advisers in the quarter or two preceding the buy date, the change is minuscule compared with that observed between the buy and sell dates. While these data do not indicate whether investment advisers jumped on the bandwagon or followed it, they suggest that these institutions cannot serve as the bellwether of stock price surges. The past behavior of investment advisers is not apt to be a good predictor of future stock price movements.

We can draw several general observations from the professionally managed funds as a whole. If hindsight were foresight, one would like to know of impending significant increases in the sponsorship of stock held by banks, mutual funds and investment advisers. Between the buy and sell dates, these groups of

professionally managed funds increased their average ownership stakes in the 222 winners by 25, 60 and 107 per cent, respectively. At least at the conclusion of the rapid price advance, these funds were where the action was. Prior to the buy quarter, the ownership claims of these managed funds tended to rise only slightly; the big increase in sponsorship occurred as prices began to escalate sharply. Thus professional money managers may participate in, but do not prophesy, extraordinary price appreciation.

Corporate insiders form another group that may be privy to information about a company's prospects. Will tracking their transactions lead to profitable trading? Several prior studies have suggested that insider trading does predict future price changes.[8] Panel A of Table III gives summary statistics for the number of insiders purchasing our sample stocks. The data do not indicate any great changes in the pattern of insider trading.

For most companies, no corporate insiders bought stock either prior to the large price advance or after it; there was no flurry of insider buying prior to the big price run-up. Selling transactions seem equally uninformative. One might expect insider selling to subside prior to the major price advance. In fact, insider selling for these 222 companies actually increased

Table III Corporate Insider Transactions in the Sell, Buy and Eight Preceding Quarters

		Panel A: Number of Insiders Buying Stock								
						Percentile				
Quarter	Mean	1st	5th	10th	25th	50th	75th	90th	95th	99th
Sell	0.44	0	0	0	0	0	1	2	2.84	3.77
Buy	0.37	0	0	0	0	0	1	1	2.00	3.77
Buy-1	0.31	0	0	0	0	0	0	1	2.00	3.00
Buy-2	0.35	0	0	0	0	0	0	1	2.00	4.00
Buy-3	0.21	0	0	0	0	0	0	1	1.00	2.86
Buy-4	0.32	0	0	0	0	0	1	1	2.00	3.00
Buy-5	0.30	0	0	0	0	0	0	1	2.00	3.02
Buy-6	0.21	0	0	0	0	0	0	1	1.00	2.15
Buy-7	0.29	0	0	0	0	0	0	1	2.00	4.00
Buy-8	0.29	0	0	0	0	0	0	1	1.00	3.12
		Panel B: Number of Insiders Selling Stock								
						Percentile				
Quarter	Mean	1st	5th	10th	25th	50th	75th	90th	95th	99th
Sell	1.80	0	0	0	0	1	3	5	6	10
Buy	1.38	0	0	0	0	1	2	4	5	8
Buy-1	0.84	0	0	0	0	0	1	3	4	9
Buy-2	0.72	0	0	0	0	0	1	3	4	6
Buy-3	0.80	0	0	0	0	0	1	2	4	7
Buy-4	0.68	0	0	0	0	0	1	2	3	5
Buy-5	0.75	0	0	0	0	0	1	2	4	9
Buy-6	0.67	0	0	0	0	0	1	2	4	6
Buy-7	0.78	0	0	0	0	0	1	3	4	7
Buy-8	0.69	0	0	0	0	0	1	3	3	7

Table IV Price/Book and Price/Earnings Ratios in the Sell, Buy and Eight Preceding Quarters

Panel A: Price/Book Ratios

		Percentile								
Quarter	Mean	1st	5th	10th	25th	50th	75th	90th	95th	99th
Sell	2.64	0.17	0.33	0.42	1.15	2.24	3.43	4.95	6.49	11.26
Buy	0.95	0.07	0.12	0.20	0.31	0.60	1.10	2.14	2.74	6.92
Buy-1	0.69	0.04	0.08	0.14	0.26	0.45	0.80	1.52	1.94	5.28
Buy-2	0.62	0.04	0.08	0.13	0.26	0.40	0.68	1.39	1.86	4.74
Buy-3	0.58	0.04	0.07	0.11	0.22	0.41	0.66	1.33	1.89	4.75
Buy-4	0.49	0.05	0.07	0.11	0.18	0.40	0.60	1.10	1.41	2.83
Buy-5	0.52	0.05	0.07	0.10	0.20	0.38	0.61	1.06	1.58	3.19
Buy-6	0.50	0.05	0.07	0.10	0.18	0.38	0.63	1.03	1.71	2.82
Buy-7	0.49	0.05	0.06	0.09	0.18	0.34	0.57	0.95	1.55	3.35
Buy-8	0.45	0.04	0.07	0.09	0.18	0.29	0.50	0.96	1.46	2.52

Panel B: Price/Earnings Ratios

		Percentile								
Quarter	Mean	1st	5th	10th	25th	50th	75th	90th	95th	99th
Sell	29.4	7.0	9.0	11.0	16.5	24.0	37.0	59.0	71.1	92.1
Buy	13.6	2.0	4.0	5.0	7.0	10.0	14.0	20.0	27.8	119.7
Buy-1	11.7	2.0	4.0	5.0	6.0	8.0	12.0	18.0	23.0	152.0
Buy-2	10.8	1.9	4.0	5.0	6.0	9.0	13.0	17.0	21.0	36.3
Buy-3	10.9	1.9	5.0	5.0	6.0	9.0	13.0	18.0	23.4	48.6
Buy-4	11.1	1.9	5.0	5.0	6.0	8.0	13.0	18.0	27.1	68.0
Buy-5	12.1	2.0	4.6	5.0	7.0	9.0	13.0	21.0	34.0	66.7
Buy-6	12.5	2.0	4.0	5.0	7.0	9.0	14.0	21.0	26.4	100.0
Buy-7	11.7	2.0	4.0	5.0	7.0	9.0	14.0	21.0	27.5	59.0
Buy-8	11.7	2.0	4.0	5.0	6.0	9.0	14.0	19.2	25.6	76.2

slightly before the advance, rising from an average of 0.84 insider sales per company to 1.38. Insider selling continued slightly higher after the large price advance, which is consistent with expectations. But insider buying was also somewhat greater, which runs contrary to expectations. In short, the buying and selling transactions of corporate insiders do not adumbrate the large price advances of the 222 winners.

While the "smart money" variables may reflect the actions of well-informed investors, the evidence suggests that well-informed investors do not predict major price advances. The transactions of corporate insiders do not suggest either a leading or contemporaneous relation with the large price changes. The actions of professional money managers do not reveal a leading relation with the large price changes, although significant shifts in institutional ownership seem to be contemporaneously correlated with large price movements.

Valuation Measures

We looked at five different valuation variables—(1) price/book ratio, (2) price/earnings ratio, (3) stock price level, (4) stock market capitalization and (5) beta. Prior research has discovered a relation between each of these variables and performance.

Price/book ratio compares the market value of equity to its book value. A ratio less than 1.0 indicates that the market value of a company is less than its book value and might suggest that the stock is "underpriced." Panel A of Table IV shows the sample's ratios.

Among the 222 winners, 164 were selling for less than book value in the buy quarter. The median price/book ratio for the 222 winners was 0.60. In the two quarters prior to the buy date, 183 and 184 of the 222 winners were selling at market prices less than their book values. While a price/book value less than one may not be a perfect indicator of a stock market winner, a price/book value less than one does seem to be a common characteristic of these 222 winners. This suggests that *an investment strategy should isolate firms that sell below book value.*

Panel B of Table IV gives the distribution of *price/earnings ratios* (P/E). In the buy quarter, the average P/E ratio equaled 13.6; the median P/E, which is less influenced by the extreme values, was 10. Although previous research has reported an association between high performance and low P/E, the P/E ratios for this set of 222 winners do not tend to be very small.[9] In fact, only one of every 10 of these firms had P/E ratios less than five in the buy quarter. This

Table V Share Prices and Market Capitalizations

Panel A: Share Prices on the Buy Date (dollars)

			Percentiles		
Mean	27.69	5%	10.71	95%	58.59
Median	24.07	10%	12.80	90%	49.70
		25%	17.32	75%	32.81

Panel B: Stock Market Capitalizations on Buy Date (millions of dollars)*

			Percentiles		
Mean	484.3	5%	19.3	95%	1,375.5
Median	120.1	10%	30.9	90%	802.9
		25%	53.9	75%	316.4

* Stock market captializations are defined as price per share times number of shares outstanding.

indicates that very low P/E ratios are *not* a necessary ingredient of a successful investment strategy.

Prior research has found that small firms outperform their larger cousins. Our 222 winners, however, are not characterized by either low *stock prices* or small *stock market capitalizations* (number of shares times price per share). Panel A of Table V shows that the median share price on the buy date was $24.07. Only nine companies sold for less than $10 a share. The median capitalization was $120.1 million—a figure that would fall in the upper half of an NYSE-AMEX capitalization ranking.[10] Only one of the 222 winners had a market capitalization less than $10 million, and only 12 had capitalizations less than $20 million. This evidence suggests that small size, whether measured by share price or stock market capitalization, is not a necessary component of a successful investment strategy.

To test whether the extraordinary rates of return earned by the 222 winners might be compensation for riskiness, we looked at the stocks' betas (Table VI). The average and median beta of these firms was 1.14.[11] Fewer than 5 per cent of the companies had betas greater than 2.0. While the firms as a group were slightly riskier than the market as a whole, the additional beta risk cannot account for the extraordinary returns of these winners.

The valuation evidence indicates that companies whose market values are less than their book values are potential winners. This is not startling or new. The more surprising discovery is that the 222 winners did *not* have low-priced stocks or low P/Es or small market capitalizations.[12] While low price, low P/E or small capitalization may be an integral part of some successful investment strategies, these charac-

teristics are not essential to every successful strategy.

Technical Indicators

Panel A of Table VII gives the *relative-strength ranks* of the 222 winners. The ranks range from 1 (lowest) to 99 (highest). The relative strength of a stock is the weighted average of quarterly price changes during the previous year, where the most recent quarter receives a weight of 40 per cent and the other three quarters each receive weights of 20 per cent. The sample's median rank in the buy quarter was 93; 212 of the 222 firms possessed relative-strength measures in excess of 70. Between the buy-1 and buy quarters, the median relative-strength rank jumped from 81 to 93. In fact, the relative-strength measures for 170 of the 222 winners increased between these two dates. These findings have two implications for investment strategy: First, one should *seek out firms with relative strength ranks of at least 70*; second, one should try to identify firms that exhibit *a positive change in their relative strength rank* from the prior quarter.

Table VI Stock Betas*

			Percentiles		
Mean	1.14	5%	0.41	95%	1.97
Median	1.14	10%	0.52	90%	1.78
		25%	0.79	75%	1.46

* Betas are calculated using weekly returns during the period two years prior to the buy date. The proxy for the market portfolio is a value-weighted index of all New York and American stock exchange companies.

The *datagraph ratings* of the 222 winners also tended to be high in the quarter of the buy date (Panel B of Table VII). The datagraph rating is based on a proprietary formula that assigns weights to "reported earnings [primary operating], capitalization, sponsorship, relative strength of stock, price-volume characteristics, group rank and other factors." The datagraph rating can range from 1 (lowest) to 99 (highest). The sample's median rating in the buy quarter was 80; the ratings for 188 firms exceeded 70. Thus the set of winners was characterized by a *datagraph rating in excess of 70* in the buy quarter. One might also consider incorporating positive changes in datagraph ratings into an investment strategy, although there is substantial overlap between these changes and changes in relative strength.

Table VII Relative-Strength Ranks and Datagraph Ratings in the Sell, Buy and Eight Preceding Quarters

Panel A: Relative-Strength Ranks (99 = highest, 1 = lowest)										
		Percentile								
Quarter	Mean	1st	5th	10th	25th	50th	75th	90th	95th	99th
Sell	74.0	5.2	20.0	37.0	62.0	82.0	93.0	97.0	98.0	99.0
Buy	90.2	52.1	72.0	78.0	87.0	93.0	97.0	99.0	99.0	99.0
Buy−1	78.1	21.6	45.0	50.0	69.0	81.0	92.0	96.0	98.0	99.0
Buy−2	70.0	6.7	23.0	32.9	56.0	78.0	90.0	96.0	98.0	99.0
Buy−3	64.4	1.1	11.0	17.0	48.0	69.0	87.0	94.0	98.0	99.0
Buy−4	57.9	1.0	11.0	18.0	37.0	61.0	82.0	92.0	96.0	98.0
Buy−5	58.4	3.7	9.0	16.0	35.5	63.0	83.5	94.0	96.5	98.1
Buy−6	60.6	4.4	10.0	16.0	40.0	63.0	86.0	95.0	97.0	99.0
Buy−7	58.6	1.0	8.2	15.0	37.0	61.5	83.7	93.0	98.0	99.0
Buy−8	60.8	1.8	9.0	17.1	39.0	65.5	84.0	95.0	97.0	99.0
Panel B: Datagraph Ratings (99 = highest, 1 = lowest)										
		Percentile								
Quarter	Mean	1st	5th	10th	25th	50th	75th	90th	95th	99th
Sell	72.2	40.3	50.1	55.0	64.0	73.0	81.5	88.0	91.0	96.7
Buy	78.3	1.2	60.0	64.0	73.0	80.0	87.0	93.0	96.0	99.0
Buy−1	67.4	1.4	45.0	51.0	58.0	70.0	77.0	85.0	89.0	97.0
Buy−2	63.9	23.4	37.0	43.0	54.0	66.0	75.0	84.0	86.0	94.8
Buy−3	61.8	20.1	29.0	37.0	50.0	63.0	76.0	83.0	90.5	96.9
Buy−4	57.7	10.6	29.8	35.0	46.0	59.0	70.0	77.0	83.0	94.1
Buy−5	59.9	21.8	34.0	38.0	49.0	59.0	71.0	83.2	88.6	97.1
Buy−6	60.9	10.6	29.0	37.0	49.0	63.0	74.0	85.0	92.2	97.0
Buy−7	58.4	16.8	26.2	34.0	46.0	58.5	71.0	84.5	89.0	96.3
Buy−8	56.9	1.0	24.1	33.0	43.2	58.0	70.7	81.0	85.0	94.5

Earnings and Profitability Measures

Panel A of Table VIII shows the *pretax profit margins* of the 222 winners. The average pretax margin in the buy quarter equaled 12.3 per cent. In the buy-1 quarter, this margin was slightly smaller, at 12.0 per cent. By the sell quarter, however, the pretax profit margin had increased to 14.5 per cent on average. Along with the great run-up in price, the firms experienced an increase in pretax margins. Indeed, the nearly 2 per cent increase in the pretax margins may have contributed to the price appreciation of these firms. Prior to the period of rapid price appreciation, pretax profit margins increased gradually. However, 216 of the 222 winners had positive pretax margins in the buy quarter and 215 had positive margins in the buy-1 quarter. This evidence clearly indicates that a *positive pretax profit margin* should be one of the selection screens in an investment strategy.

Panel B of Table VIII presents *changes in quarterly earnings* on a percentage basis. These were not seasonally adjusted in any way and represent changes in the raw accounting earnings. Quarterly earnings in the buy quarter rose nearly 45.9 per cent, on average, from the previous quarter. Quarterly earnings in the buy-1 quarter registered an average increase of 60.8

per cent. A notable feature of the data is the change between the buy-2 and buy-1 quarters. (Because of the lag in the release of accounting information, the accounting data from these quarters are the last that could be used as a leading indicator of the price advance.) The average change in quarterly earnings from 50.4 to 60.8 per cent between the buy-2 and buy-1 quarters represents a positive change in the change in quarterly earnings—i.e., an acceleration in quarterly earnings. Thus another investment rule suggested by the 222 winners is to seek out firms with a *positive change in the change in quarterly earnings—that is, earnings acceleration*.

The behavior of *changes in quarterly sales* (Panel C of Table VIII) closely parallels that of changes in quarterly earnings. Quarterly sales, like quarterly earnings, accelerated during the buy-2 and buy-1 quarters. The average rates of change were positive and increasing. Average sales during the buy-1 quarter rose by 11.8 per cent over the previous quarter; the buy-2 quarter witnessed an average increase of 6.7 per cent. In general, the information contained in the changes in quarterly sales duplicates the information incorporated in the changes in quarterly earnings.

Table IX reveals a picture of earnings over a

Table VIII Pretax Profit Margins and Changes in Quarterly Earnings and Sales in the Sell, Buy and Eight Preceding Quarters

Panel A: Pretax Profit Margins (per cent)

Quarter	Mean	Percentile								
		1st	5th	10th	25th	50th	75th	90th	95th	99th
Sell	14.5	−3.2	3.7	5.7	8.2	13.0	18.5	26.4	33.0	46.3
Buy	12.7	−3.5	2.9	4.0	7.0	11.2	16.2	23.5	28.2	39.6
Buy−1	12.3	−6.0	2.2	3.5	6.5	10.8	15.7	24.5	30.6	45.0
Buy−2	12.0	−6.0	2.0	3.4	6.1	10.5	15.3	23.9	32.1	45.4
Buy−3	11.1	−6.4	1.6	2.4	5.5	10.0	14.8	21.6	28.4	38.6
Buy−4	10.2	−6.9	1.4	2.2	4.9	9.3	13.5	20.8	26.7	37.9
Buy−5	9.7	−14.5	0.5	1.8	4.4	8.5	12.7	19.8	24.8	38.1
Buy−6	9.8	−6.0	0.6	1.9	4.3	8.3	12.5	20.1	28.4	40.6
Buy−7	9.0	−24.2	0.4	1.8	4.1	8.2	12.2	18.9	24.9	40.7
Buy−8	8.4	−24.4	−3.1	1.8	4.1	7.8	11.9	17.7	25.1	40.9

Panel B: Changes in Quarterly Earnings (percentages)

Quarter	Mean	Percentile								
		1st	5th	10th	25th	50th	75th	90th	95th	99th
Sell	16.9	−70	−44	−32	−10	8.05	29.4	66	113	262
Buy	45.9	−82	−41	−26	0	7.40	39.0	103	179	1747
Buy−1	60.8	−63	−42	−22	0	14.10	41.7	108	232	1731
Buy−2	50.4	−91	−60	−33	−4	3.00	35.7	100	241	1158
Buy−3	22.6	−90	−50	−40	−3	0.00	33.3	100	150	500
Buy−4	29.0	−97	−73	−45	−11	0.00	34.3	100	180	867
Buy−5	32.7	−92	−54	−37	−14	0.00	43.1	137	221	603
Buy−6	41.5	−276	−76	−50	−16	0.00	30.4	97	147	1925
Buy−7	19.2	−700	−81	−53	−7	1.90	42.3	100	194	484
Buy−8	35.8	−326	−59	−37	−10	4.00	40.0	131	257	828

Panel C: Changes in Quarterly Sales (percentages)

Quarter	Mean	Percentile								
		1st	5th	10th	25th	50th	75th	90th	95th	99th
Sell	8.4	−29	−21	−9	−1.5	7.10	14.8	29.7	40.4	96.8
Buy	9.5	−48	−22	−10	−1.4	7.30	16.0	32.9	40.4	93.9
Buy−1	11.8	−35	−14	−7	0.2	9.25	16.0	30.6	54.2	153.1
Buy−2	6.7	−30	−25	−17	−2.7	5.20	14.0	25.2	34.8	114.1
Buy−3	8.5	−47	−31	−15	−4.3	6.00	16.3	30.9	44.1	99.7
Buy−4	7.1	−74	−29	−13	−3.7	4.40	15.5	27.5	40.7	158.8
Buy−5	9.8	−29	−15	−9	−1.2	5.60	15.7	32.6	49.1	86.5
Buy−6	3.9	−36	−24	−18	−4.7	4.30	12.0	22.1	29.2	57.9
Buy−7	7.0	−52	−32	−17	−4.4	4.20	14.4	31.2	51.8	144.5
Buy−8	10.7	−41	−19	−7	0.0	9.30	18.9	34.6	45.2	95.3

longer period of time, as reflected by the *five-year quarterly earnings growth rates*. These rates were computed with five years of quarterly earnings data and then annualized. In the buy and buy-1 quarters, the sample's average growth rates equaled 23.0 and 21.6 per cent, respectively. By the sell quarter, the average earnings growth rate increased dramatically, to 38.2 per cent. This increase can be explained by the fact that the calculation of the growth rates

Table IX Five-Year Earnings Growth Rates in the Sell, Buy and Eight Preceding Quarters

Quarter	Mean	Percentile								
		1st	5th	10th	25th	50th	75th	90th	95th	99th
Sell	38.2	−14.0	3.3	10.6	18.0	30.0	48.5	83.8	98.1	156
Buy	23.0	−22.5	−10.5	−4.0	8.5	17.0	31.0	55.0	70.5	131
Buy−1	21.6	−24.5	−10.7	−5.0	7.0	16.0	29.5	54.0	70.2	128
Buy−2	21.4	−28.6	−13.0	−6.2	6.0	16.0	30.0	52.2	71.6	137
Buy−3	20.1	−29.2	−13.0	−7.0	4.0	16.0	29.0	54.0	69.0	152
Buy−4	21.5	−20.8	−10.1	−4.6	6.2	16.0	30.7	54.6	72.6	159
Buy−5	21.2	−18.6	−9.6	−4.0	5.0	17.0	31.5	55.6	73.2	114
Buy−6	22.9	−16.8	−7.0	−4.0	6.5	17.0	33.5	58.0	76.0	137
Buy−7	24.7	−14.7	−8.5	−3.0	9.0	19.0	36.7	63.1	78.1	178
Buy−8	24.2	−13.7	−8.6	−0.6	8.0	19.0	36.2	62.3	75.0	90

Table X Common Shares Outstanding in the Sell, Buy and Eight Preceding Quarters (in thousands)

		Percentile								
Quarter	Mean	1st	5th	10th	25th	50th	75th	90th	95th	99th
Sell	23360	1431	2034	2985	5895	10925	25652	47805	65924	328405
Buy	13885	712	1301	1583	2637	5740	11355	21113	34899	308358
Buy−1	13197	712	1257	1506	2577	5145	10832	19317	34827	281323
Buy−2	13098	712	1131	1493	2557	4955	10767	19317	34258	281323
Buy−3	13110	711	1110	1434	2540	4930	10845	18652	33114	294743
Buy−4	12834	710	1110	1420	2560	5050	11320	18820	32490	315620
Buy−5	12883	705	1110	1414	2522	5110	11275	19033	32518	323784
Buy−6	12915	680	1116	1420	2440	5090	11320	19388	30762	337393
Buy−7	12899	678	1115	1380	2385	5090	10955	19590	30975	342838
Buy−8	12871	677	1111	1359	2387	4875	10712	19302	31755	360903

discards the low rates from several years prior and replaces them with the high earnings growth rates these firms experienced during the large price advance. Over the buy-1 and previous quarters, the average five-year rates remained very stable. In the buy-1 quarter, however, more than 85 per cent of the firms exhibited positive five-year quarterly earnings growth rates. This suggests that one should select companies from the set of those that possess *positive five-year quarterly earnings growth rates.*

Miscellaneous Measures

Table X presents data on common shares outstanding. In the buy quarter, the sample had an average of about 13.8 million outstanding shares; the median number is much less, 5.7 million. In the sell quarter, the average and median number of outstanding shares nearly doubled. This probably indicates that many of the firms split their shares of stock during the period of rapid increase in price. Perhaps the only salient point about these data that might be relevant for an investment strategy is that nearly 90 per cent of the firms had fewer than 20 million shares of stock outstanding. One might limit one's selection to firms with *fewer than 20 million outstanding shares of stock.*

Table XI gives the *ratio of the price on the buy*

Table XI Ratio of Price on Buy Date to Maximum Price During Previous Two Years*

			Percentile		
Mean	0.899	5%	0.699	95%	1.000
Median	0.922	10%	0.785	90%	0.996
		25%	0.871	75%	0.969

* Computed by dividing the price of the stock on the buy date by its maximum price during the previous two-year period. All prices have been adjusted for stock splits.

date to the maximum price during the two previous years—one measure of whether these firms had "fallen out of favor" in the investment community. This variable measures the extent to which the extraordinary success of these 222 winners might have been captured by a "contrarian" investment strategy of selecting stocks that have suffered substantial price declines. The data indicate that it is unlikely these stock would have been selected by a contrarian rule. More than half the winners were selling on the buy date within 8 per cent of their previous two-year high. Only one company was selling at a price less than half its previous two-year high. More than 80 per cent of the firms were selling within 15 per cent of their previous two-year high. An investment strategy that *selects stocks that are selling within 15 per cent of their maximum price during the previous two years* would capture a characteristic common to the 222 stock market winners.

Trading Strategy Results

Given the number of variables examined, we could come up with myriad potential investment strategies. We will limit our investigation here to two.

The first strategy examined includes the nine technical and fundamental variables that either changed noticeably before the big price run-up or seemed to be pervasive among the winners; this strategy thus overlays nine investment screens on the data. The second strategy uses a subset of four of these nine investment screens. As we did not define these strategies after an exhaustive search of all possible strategies, we can make no claim that they represent the best possible strategies. They do, however, illustrate that lessons learned from an examination of the empirical regularities associated with the biggest winners may be applied profitably to a

broader universe of companies.

The rules for each trading strategy were straightforward. After a buy signal was generated, we waited 63 trading days before assuming a position in the stock; this delay ensured that accounting information assumed known had actually been released. The stock purchased was held for two years; no sell signal, other than the lapse of two years, was investigated. We calculated the cumulative holding-period return through each of the eight quarters. We then compared the cumulative holding-period returns of each selected stock with the cumulative returns of the S&P 500 index over the identical time period; the difference was labeled an excess return. In cases where a buy signal for a particular company was generated at different times, we tracked the return for each buy signal separately.

The data employed to generate the buy signals were contained on an O'Neil data tape that gave the fundamental and technical variables for 2,279 NYSE and AMEX firms over the 1970–83 period. Any firm on our list of 222 winners was excluded from the trading strategy.[13] Thus 2,057 companies were considered. The return data for the individual securities and the S&P 500 index were gathered from the files provided by the University of Chicago's Center for Research in Security Prices (CRSP).

A Nine-Screen Strategy

Under the first trading strategy using nine investment screens, a firm receives a buy signal when all the following conditions are met:

(1) price-to-book ratio is less than 1.0;
(2) five-year growth rate based on quarterly earnings is positive;
(3) quarterly earnings are accelerating (i.e., there is a positive change in the percent-

age change in quarterly earnings);
(4) pretax profit margins are positive;
(5) fewer than 20 million common shares are outstanding;
(6) relative-strength rank is at least 70;
(7) relative-strength rank of the stock in the current quarter is greater than the rank in the previous quarter;
(8) O'Neil datagraph rating is at least 70; and
(9) stock is selling within 15 per cent of its maximum price during the previous two years.

These nine investment screens were not determined from an analysis of the universe of 2,057 firms contained on the large O'Neil tape. Rather, these are prespecified conditions based upon the investigation into the common characteristics of O'Neil's 222 greatest stock market winners.

The investment strategy results, shown in Table XII, are impressive. The strategy generated 453 buy signals for 319 different companies over the 1970–83 period. On average, the cumulative holding-period returns of the selected securities exceeded the equivalent return for the S&P 500 index in each of the eight quarters. After one quarter (buy+1), these stocks outperformed the S&P 500 by about 6 per cent. Over the two-year interval, the selected firms outperformed the S&P 500 index by more than 50 per cent. That is, the individual firms appreciated on average by more than 65 per cent, while the S&P 500 managed gains of only about 15 per cent. Furthermore, the excess returns were not concentrated in a few firms: More than 79 per cent of the firms outperformed the S&P 500 index over a two-year period. On an annual basis, the firms selected by the nine investment screens earned excess holding-period returns of about 23 per cent per year.

Table XII Distribution of Cumulative Excess Holding-Period Returns from Nine-Screen Strategy (per cent)*

| Quarter | Mean | Percentile | | | | | | | | |
		1st	5th	10th	25th	50th	75th	90th	95th	99th
Buy+1	5.97	−24.7	−18.2	−12.2	−3.7	4.7	14.8	26.0	31.6	46.2
Buy+2	11.56	−30.0	−22.1	−13.8	−5.2	9.8	22.6	37.1	54.1	89.6
Buy+3	18.20	−34.6	−23.1	−17.4	−2.7	14.7	34.5	55.8	72.2	133.4
Buy+4	23.71	−36.0	−25.4	−17.7	−3.8	17.4	43.5	74.1	96.8	158.2
Buy+5	30.20	−40.4	−25.1	−16.5	−2.3	20.5	51.7	91.2	113.3	182.6
Buy+6	37.80	−56.5	−29.0	−18.2	0.1	27.6	62.6	114.5	144.3	219.9
Buy+7	44.09	−53.1	−33.6	−18.7	5.5	34.5	71.1	126.1	160.1	242.3
Buy+8	50.65	−56.2	−32.4	−20.2	5.1	39.4	83.4	132.0	170.1	303.8

* An excess return is defined as the difference between the holding-period return on the security and the holding-period return on the S&P 500 index over the same period of time.

Table XIII Betas, Stock Market Capitalizations, Share
Prices and Shares Outstanding for Firms
Selected by the Nine Investment Screens

Panel A: Betas*					
		Percentiles			
Mean	1.03	5%	0.29	95%	1.95
Median	0.99	10%	0.45	90%	1.66
		25%	0.69	75%	1.34

Panel B: Stock Market Capitalizations (millions of dollars)					
		Percentiles			
Mean	182.9	5%	11.0	95%	614.0
Median	102.3	10%	19.6	90%	441.9
		25%	40.8	75%	241.3

Panel C: Share Prices (dollars)					
		Percentiles			
Mean	28.21	5%	7.88	95%	58.50
Median	26.25	10%	11.30	90%	45.70
		25%	18.25	75%	34.82

Panel D: Common Shares Outstanding (thousands)					
		Percentiles			
Mean	5649	5%	921	95%	15052
Median	3958	10%	1246	90%	12797
		25%	2108	75%	7890

* Betas are calculated relative to the S&P 500 index using weekly
returns during the period two years prior to the buy date.

The higher returns earned by the investment strategy need not be "abnormal"; they may merely reflect compensation for bearing additional risk. But risk (at least as measured by historical betas) does not explain the average 23 per cent per year excess return earned by the selected firms. The betas, computed with weekly returns for individual securities and the S&P 500 index, averaged only 1.03 in the two-year period preceding the buy date (Panel A of Table XIII). Half the firms possessed betas of *less* than 1.0. The betas of 80 per cent of the selected companies ranged between 0.45 and 1.66. (Similar values were obtained when a value-weighted NYSE-AMEX market index was used as the market proxy.)

Recent research has suggested that stock market capitalization may be a very good proxy for risk.[14] Reinganum reported that firms with a median capitalization of $4.6 million earned about 32 per cent per year on average over the 1963–82 period; the excess returns of these very small firms are of about the same magnitude as the excess returns associated with the investment strategy reported here.[15] However, the firms selected by this investment strategy are not particularly small (Panel B of Table XIII). Their median stock market capitalization of $102.3 million compares to the median capital-

ization of Reinganum's seventh decile, $119 million. Firms in this decile earned average returns of 15.6 per cent per year over the 1963–82 period. Firms selected by the nine investment screens in the 1970–83 period earned an average of 30.6 per cent in the first year after they were bought. Thus firms selected by the nine-screen investment strategy apparently outperformed a portfolio of firms with comparable stock market capitalization. Stated differently, the excess returns earned by this investment strategy cannot be attributed to the "small firm effect." This is not particularly surprising, as fewer than 5 per cent of the firms could be considered to be very small.

Panels C and D of Table XIII present the distributions of the two components of stock market capitalization—share prices and shares outstanding. The median share price was $26.25. One-quarter of the firms were priced over $34.82; only 8 per cent sold at less than $10.00 on the day they were purchased. The selected companies are clearly not in general low-priced stocks. The median number of shares outstanding was slightly less than four million; the dispersion in outstanding shares was fairly large, with 80 per cent of the companies falling in the range between 1.2 million shares and 12.8 million shares.

A Four-Screen Strategy

To assess the sensitivity of the strategy's results to all nine criteria, we generated an alternative strategy that employed only four of these criteria. To choose which four criteria to use, we applied each investment screen to the 222 winners and selected the four screens that produced the highest median returns. For example, of the 222 winners, those with price-to-book values less than 1.0 possessed a median return of 260 per cent, versus the median return for all 222 winners of 237 per cent. The four investment screens associated with the highest median returns were:

(1) price-to-book ratio less than 1.0 (260 per cent);

(2) accelerating quarterly earnings (253 per cent);

(3) a relative-strength rank of the stock in the current quarter greater than the rank in the previous quarter (253 per cent); and

(4) fewer than 20 million common shares outstanding (251 per cent).

Table XIV Distribution of Cumulative Excess Holding-Period Returns from Four-Screen Strategy (per cent)*

Quarter	Mean	*Percentile*								
		1st	*5th*	*10th*	*25th*	*50th*	*75th*	*90th*	*95th*	*99th*
Buy+1	3.04	−37.5	−24.7	−18.4	−8.3	1.4	11.4	24.8	36.8	68.0
Buy+2	8.19	−45.3	−29.8	−21.7	−8.6	4.4	19.8	40.3	57.5	108.1
Buy+3	12.65	−53.3	−34.8	−25.3	−9.5	7.3	26.9	53.8	75.3	148.6
Buy+4	16.67	−60.1	−39.1	−27.9	−9.8	9.7	33.7	65.1	93.1	170.2
Buy+5	20.84	−65.8	−44.6	−31.5	−10.9	12.7	41.0	78.9	111.2	215.8
Buy+6	26.10	−70.0	−45.5	−31.6	−9.4	15.6	48.1	92.7	131.3	243.6
Buy+7	31.13	−71.1	−47.2	−34.1	−9.3	18.5	56.0	106.4	148.1	267.6
Buy+8	37.14	−74.0	−48.3	−33.1	−7.6	22.3	64.2	118.7	161.6	319.3

* Excess return is defined as the difference between the holding-period return on the security and the holding-period return on the S&P 500 index over the same period of time.

A buy signal was generated whenever the above four criteria were satisfied. (The 222 winners were excluded from the analysis.) As might be expected, more buy signals were generated with only four filters than with nine. The four-screen filter rule generated 10,543 buy signals, whereas the more restrictive nine-screen filter rule produced only 453. Clearly, the other five investment screens severely limit the selection of firms. But do these other five screens seem to matter?

Table XIV gives the performance results for the investment strategy with only four filters; these results should be compared with those in Table XII. The strategy with four screens still does well relative to the S&P 500 index. After one year, the selected firms experienced an average excess holding-period return of 16.67 per cent, versus 23.71 per cent for the nine-screen firms; they appreciated in value by 23.85 per cent, whereas the S&P 500 advanced by only 7.18 per cent. After two years, the excess holding-period returns increased to an average of 37.14 per cent, versus 50.65 per cent for the nine-screen firms.

The performance results with four screens are impressive; they fall short, however, of the excess holding-period returns earned when all nine investment screens are applied. At the margin, the other five investment rules seem to improve performance.

Obviously, these results should not be construed to mean that these four investment screens are the four best filters. They do suggest, however, that the nine investment rules are not entirely redundant. It seems unlikely that any one of the investment rules will yield better performance results than all nine jointly.

Finally, the absence of certain characteristics from the trading strategies merits mention. What is truly remarkable about the strategies is that they do not exploit characteristics that prior research has revealed to be associated with superior performance. The strategies are not tilted in favor of stocks with very small market capitalizations. Nor are firms with low share prices singled out, or those with low price/earnings ratios. The strategies are not "contrarian" in the sense that companies with substantial previous price declines are selected. Indeed, only firms that are selling near their maximum price for the two previous years are eligible for inclusion. Despite the absence of these characteristics, the trading strategies produce excess returns that are economically significant. This suggests that there may be more than one way to skin the performance cat! ∎

Footnotes

1. See S. Basu, "The Investment Performance of Common Stocks in Relation to Their Price-Earnings Ratios: A Test of the Efficient Market Hypothesis," *Journal of Finance* 32 (1977), pp. 663–682 and S. Francis Nicholson, "Price Earnings Ratios," *Financial Analysts Journal*, September/October 1960, pp. 43–45.
2. R.W. Banz, "The Relationship Between Return and Market Value of Common Stocks," *Journal of Financial Economics* 9 (1981), pp. 3–18 and M.R. Reinganum, "Misspecification of Capital Asset Pricing: Empirical Anomalies Based on Earnings Yields and Market Values," *Journal of Financial Economics* 9 (1981), pp. 19–46.
3. See D.B. Keim, "Size-Related Anomalies and Stock Return Seasonality—Further Empirical Evidence," *Journal of Financial Economics* 12 (1983), pp. 13–32; R.A. Ariel, "A Monthly Effect in Stock

Returns" (Working Paper No. 1629–84, Sloan School, M.I.T., 1984); K. R. French, "Stock Returns and the Weekend Effect," *Journal of Financial Economics* 8 (1980), pp. 55–69; M.R. Gibbons and P. Hess, "Day of the Week Effects and Asset Returns," *Journal of Business* 54 (1981), pp. 579–596; and L. Harris, "A Transaction Data Study of Weekly and Intradaily Patterns in Stock Returns," *Journal of Financial Economics* 16 (1986), pp. 99–117.

4. For this research, William O'Neil + Co. provided me with a specially formatted computer tape containing the information on NYSE and AMEX firms from the *Datagraph* books. This is the first time William O'Neil + Co. has made these proprietary data available for an academic study.

5. O'Neil personnel employed criteria other than just price appreciation to choose firms. However, such criteria are not explicitly stated. Based on the University of Chicago's CRSP tapes, there are 4,049 occurrences of a NYSE or AMEX firm doubling in value within a given calendar year during the 1970–83 period. For example, one additional criterion seemingly applied to stocks by O'Neil personnel is related to the price per share of a stock. In O'Neil's universe of 272 firms, fewer than 5 per cent sold at a price less than $10 a share. Of the list of 4,049 firms that doubled, if one eliminated those selling for less than $10, the number would dwindle to 1,311 companies. Given the customer base subscribing to this publication, such a price level screen is not all that surprising. Furthermore, it does not bias this analysis. At worst it might caution one against applying the findings from this research to stocks selling for less than $10.

6. These categories are strictly the author's and are not part of the O'Neil data.

7. Upon request, the author will provide similar data for the banks, mutual funds and insurance companies.

8. See J.F. Jaffe, "Special Information and Insider Trading," *Journal of Business* 47 (1974), pp. 410–428 and H. N. Seyhun, "Insiders' Profits, Costs of Trading, and Market Efficiency," *Journal of Financial Economics*, June 1986, pp. 189–212.

9. See Basu, "The Investment Performance of Common Stocks," *op. cit.* and Reinganum, "Misspecification of Capital Asset Pricing," *op. cit.*

10. See M. R. Reinganum, "The Anomalous Stock Market Behavior of Small Firms in January: Empirical Tests for Tax-Los Selling Effects," *Journal of Financial Economics*, June 1983, pp. 89–104.

11. Betas were calculated using ordinary–least-squares regressions and weekly returns during the two-year period prior to the buy date. The proxy for the market portfolio is a value-weighted index of all NYSE and AMEX companies.

12. One cannot rule out the possibility that O'Neil personnel implicitly (it is not stated in the publication) applied some of these criteria to define a great winner. For example, given their institutional customers, it might make commercial sense for them to exclude most companies selling at a price less than $10 or whose market capitalizations are smaller than $20 million.

13. To the extent that the samples of 222 winners and other firms are correlated, some subtle biases may remain. Application of the trading strategies in other time periods should eliminate any remaining biases.

14. See K.C. Chan and N-F. Chen, "Estimation Error of Stock Betas and The Role of Firm Size as an Instrumental Variable for Risk" (CRSP Working Paper No. 179, University of Chicago, 1986).

15. See Reinganum, "Anomalous Stock Market Behavior," *op. cit.*

Guest Speaker footnotes, from page 12.

Footnotes

1. The Trust Universe Comparison Service is a cooperative performance comparison service operated by Wilshire Associates, Santa Monica.

2. *Funds Evaluation Report* (New York: SEI Corporation, 1987).

3. New York Stock Exchange, 1986.

4. Trading costs include commissions, market impact, market-maker spreads, clearing costs—the total (but untraceable) difference between what the buyer pays and what the seller receives.

5. Labor costs are also high because of errors and complications in the clearing process, but that is not the subject of this paper.

6. Remarks by Morton Klevan, Deputy Administrator, Office of Pension and Welfare Benefits, Department of Labor, at the Institutional Investor Conference, January 1987, New York.

7. R. Grinold and A. Rudd, "Incentive Fees: Who Wins? Who Loses?" *Financial Analysts Journal*, January/February 1987.

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