Is the Dow Jones Industrial Average Even Weak-Form Market Efficient?

Darrol J. Stanley
Pepperdine University

Michael D. Kinsman
Pepperdine University

Clemens Kownatzki
Pepperdine University

James DiLellio
Pepperdine University

The Efficient Market Hypothesis (EMH), in its weak-form, postulates that future returns cannot be predicted by strategies involving mechanical and technical trading rules. This study investigates the weak-form of the EMH on DJIA component stocks using two mechanical trading strategies: 1) Price gain over the previous twelve months and 2) Contrarian twelve months reversal strategy. The current forty-four-year study ending in 2018 exhibits no anomaly or a pocket of inefficiency in the EMH either before or after transaction costs. The DJIA appears to be fully efficient with regard to the weak-form hypothesis of two possible price momentum strategies.

Keywords: Dow Jones Industrial Average, DJIA, market efficiency, EMH, price momentum

INTRODUCTION

A prominent investment theme of twenty-first century investors will be the continued application of financial modeling. The Age of Information has created an environment in which relevant decision-making information can be instantaneous. Further, inexpensive computing capabilities and low transaction costs facilitate increased investor transactions. Technical analysis and the computer are a true fit, and the widely followed Dow Jones Industrial Average has transcended from its original purpose as a market-timing tool (The Dow Theory) to a globally recognized barometer of financial markets.

The objective of this paper is to add to the body of knowledge surrounding the Dow Jones Industrial Average by utilizing technical methods of stock selection against component stocks of the Index. Many investment strategies have attempted to achieve extraordinary profits. One such strategy consisted of holding the highest yielding DJIA stocks for a period of one year in an attempt to outperform both the DJIA and S&P 500 Indices. The current study will explore the possibility of further anomalies using technical methods of stock selection on the DJIA as the sole investment vehicle.

The study utilized two technical interpretations of stock price behavior:

(1) Price gain over the past twelve months (PGY)
(2) A contrarian modified twelve-month price momentum wherein the last three months (PGQ) and the last month (PGN) are weighted as follows: PGY-PGQ-(3*PGN). This is a contrarian reversal strategy.

These price momentum strategies were applied to DJIA stocks over the 44 years (January 1, 1975 to December 31, 2018) utilizing monthly and quarterly holding periods. The study utilized stocks in the index at the end of each month. Revisions in the component stocks of the DJIA over the time period under investigation have moved it from an index centered on industrials to one that is more in line with the American economy today. As a result, the DJIA consists of more service and technology-oriented businesses similar to those of the S&P 500. No attempt has been made to decompose these numerous changes over the years. It is worth mentioning, however, that the correlation between the DJIA (a price-weighted index) and the S&P 500 (a capitalization-weighted index) is extremely high, close to +1.00 as calculated by the authors. Between 2000 and 2018, the 120-day correlation between the two indices was +0.99 on average.

This investigation seeks to uncover extraordinary performances of individual Dow component stocks utilizing technical analyses testing the following hypotheses:

(1) High price momentum Dow stocks will outperform low price momentum stocks and the DJIA index, risk-adjusted, for price gain over the most recent twelve months (PGY).
(2) High price momentum Dow stocks will outperform low price momentum stocks and the DJIA index, risk-adjusted, for contrarian price momentum (PRM).

WEAK-FORM LITERATURE

The Efficient Market Hypothesis (EMH) states that asset prices in securities markets continuously fully reflect all available information relevant to their valuation. According to the Efficient Market Hypothesis, strategies pursued to outperform a market index will not produce superior returns consistently after adjusting for risk and transaction costs. The vast majority of studies conducted to test the validity of the EMH have confirmed the stock market's efficiency, beginning with Eugene Fama, (1970) who received the Nobel Prize in Economics (2013) for this theory. However, there are other academics who question the validity of the EMH suggesting the contrary. (Hansen (1999) and Lakomishok (1994))

Richard Thaler, recipient of the Noble Prize in Economics (2017), questions the market's efficiency based on his Behavioral Markets Hypothesis (BMH). The BMH suggests that investors may use information in ways that are not strictly rational, and therefore market prices can deviate from intrinsic value. In such a world, an active manager could anticipate market environments acting irrationally, providing an opportunity to capture abnormal profits. Some technical analysis tools might help discover this mispricing. In practice today, there are managers who have utilized the VIX and other like indicators to aid in this determination. Jegadeesh and Titman (2001) have provided evidence that provides support for behavioral science models.

A compilation and review of technical analysis papers suggests that the literature is robust with such studies (Nazario, 2017). Park and Irwin (2007) suggest that participants in several financial markets use technical analysis.

Technical analysis generally uses historic market price and volume data to estimate future returns in financial assets by studying past market data. Tests of this weak-form of the Efficient Market Hypothesis examine whether one or more of the following can be used to predict future prices in such a way as to produce abnormal returns:

(1) Mechanical rules, such as the pattern of price movement and trading volume. This would include PGY- which is reviewed in this study.
(2) Overreaction rules indicating excess over or under price changes. This would include PRM- also reviewed in this study.

PREVIOUS PGY/PRM STUDY

In a previous study of the DJIA for a twenty-year period ended December 31, 1997, Stanley and Ferraro (1998) found advantages to terciling the DJIA 30 by both PGY and PRM, which indicates a market inefficiency in the index. The 1998 study utilized the same computer program and methodology used in this study. However, the earlier version of the program was not able to handle transaction costs, so its results ignored such costs. Likewise, the comparable universe return could not be calculated. The results of the study are shown below in Table 1.

TABLE 1

Data Item	Mean	Standard Deviation	Coefficient of Variation
Monthly PGY			
Top Tercile	23.0	17.5	0.77
Middle Tercile	17.6	16.1	0.91
Bottom Tercile	17.2	16.7	0.96
Quarterly PGY			
Top Tercile	23.5	17.4	0.74
Middle Tercile	17.3	16.3	0.94
Bottom Tercile	16.9	16.7	0.99
Monthly PRM			
Top Tercile	24.4	17.3	0.72
Middle Tercile	16.6	15.8	0.95
Bottom Tercile	17.0	16.5	0.97
Quarterly PRM			
Top Tercile	23.1	17.3	0.75
Middle Tercile	17.5	16.6	0.95
Bottom Tercile	17.3	16.7	0.91

DATA AND METHODOLOGY

The hypotheses were tested using a total return model for the forty-four-year period (January 1, 1975 to December 31, 2018) with two separate investment holding periods (1) monthly, and (2) quarterly. In all cases, the DJIA was segmented into three equal groups or terciles and rebalanced at the end of each holding period. The study is conducted on an equal-weighted basis to be in conformity with the price weighted DJIA Index.

Two technical methods in reference to stock selection were employed: (1) the actual twelve-month price gain expressed in percent (PGY) and (2) the PRM that is an adjusted PGY for a reversal pattern based on a statistical regression developed by Ford Investor Services in the early 1990s. The statistical equation is as follows: Price gain for the past twelve months (PGY) minus price gain for the past three months (PGQ) minus three times the price gain of the last month (PGN).

Numerous technical service providers have developed metrics similar to PRM. One such provider is Value Line and its Technical Rank, which attempts to predict short-term movements based on the price patterns of the past. Value Line does not disclose the formula used to calculate its Technical Rank, but comments from Value Line indicate that it is a series of overlapping price period movements looking for a reversal of a decline towards the long-term (52 week) price trend.

In this study, we used the Ford Equity Research, Inc. HIPER program for our data analysis. Ford Equity Research, a subsidiary of the London Stock Exchange Group, is located in San Diego, California. Ford Equity Research is a well-recognized institutional provider of investment data and services. Only the actual stocks in the DJIA at each point in the study were incorporated in the testing. Since the hypothesis is being

back tested against its population, survivorship bias is inherent, as is true with all indices with changing stocks.

The results of the study are based on total return after transaction costs. Total return for a stock involves both its price change and its dividend, calculated as 1/12 of the annualized dividend yield from the last reported dividend for monthly rebalancing. All special dividends are excluded from the return calculation due to its complexity. This results in a small inherent bias for the few stocks having such special dividends. The total return also includes transaction costs of 0.5% per trade, but excludes bid-ask spreads, slippage, and taxation. This transaction cost rate was selected by Ford Research, after consultation with investment managers. The cost of 0.5% per trade may be excessive in today's highly competitive transaction environment. However, including transaction costs can have significant impact on total returns for a portfolio, so selection of an appropriate rate is essential. (Lynch,1999) The results are risk-adjusted using the Coefficient of Variation rather than the Sharpe Ratio. This eliminates the effects of multiple changes in the risk-free rate over the relatively long timeframe of the study.

DATA RESULTS

Two hypotheses were used to tercile the DJIA into both monthly and quarterly price returns for the forty-four-year period ended December 31, 2018. The results of the study can be found in Appendix I.

The monthly pre-transaction costs PGY returns for the year period supported the hypothesis with the top tercile having a CV of 1.25 while the bottom tercile had a CV of 1.66. The top tercile did match the DJIA, which had an identical CV of 1.25. However, the monthly post-transaction costs PGY returns in the top tercile outperformed the bottom tercile with a CV of 1.54 v. 2.11. However, the top tercile at 1.54 underperformed the DJIA at 1.25.

The quarterly pre-transaction costs PGY returns for the year period supported the hypothesis with the top tercile having a CV of 1.22 while the bottom tercile had a CV of 1.70. The top tercile had a slight advantage over the universe at 1.25. This advantage was lost after incorporating transaction costs. The top tercile outperformed the bottom, (1.36 v. 1.95) but the tercile CV of 1.36 was inferior to the index at 1.25.

Table 2 summarizes the Coefficient of Variation (CV) results of this investigation.

TABLE 2

PGY MONTHLY CV RESULTS

Tercile	Pre-transaction costs	Post-transaction costs
Top Tercile	1.25	1.54
Bottom Tercile	1.66	2.11
Index	1.25	1.25

PGY QUARTERLY CV RESULTS

Tercile	Pre-transaction costs	Post-transaction costs
Top Tercile	1.22	1.36
Bottom Tercile	1.70	1.95
Index	1.25	1.25

The monthly pre-transaction cost PRM returns for the year period supported the hypothesis with the top tercile having a CV of 1.20 while the bottom tercile had a CV of 1.98. The top tercile was also superior at a CV of 1.20 to the universe's CV of 1.25. This advantage was lost when utilizing results after transaction costs. The top tercile did outperform the bottom tercile with a CV of 2.09 versus a CV of 6.32, but the CV of the index remains at 1.25. Thus, the index remains a superior choice.

The quarterly pre-transaction costs PRM returns for the year period supported the hypothesis with the top tercile having a CV of 1.31 outperforming the bottom tercile with a CV of 1.63. Again, the index had a

CV of 1.25. On a post-transaction basis, the top tercile with a CV of 1.59 outperformed the bottom tercile with a CV of 2.17. Thus, the top tercile with a post-transaction cost CV of 1.59 was inferior to the index at 1.25. Table 3 summarizes the Coefficient of Variation (CV) of this investigation.

TABLE 3

PRM MONTHLY CV RESULTS

Tercile	Pre-transaction costs	Post-transaction costs
Top Tercile	1.20	2.09
Bottom Tercile	1.98	6.32
Index	1.25	1.25

PRM QUARTERLY CV RESULTS

Tercile	Pre-transaction costs	Post-transaction costs
Top Tercile	1.31	1.59
Bottom Tercile	1.63	2.17
Index	1.25	1.25

CONCLUSION

The results of the study clearly show that the Dow Jones Industrial Average is weak-form efficient. Both the twelve-month price momentum strategy (PGY) and the twelve-month price momentum reversal strategy (PRM) could not outperform the DJIA index on an after-transaction basis. This was the case for both monthly and quarterly rebalancing of the tercile portfolios.

Although this paper centered on two sets of tests, a myriad of weak-form technical studies could be undertaken to extend the analysis of this paper. Nonetheless, the results are robust in indicating that an investor could have great difficulty using our sample of technical analysis on individual stocks of the DJIA in an attempt to outperform the index.

An open question is why these methods provided a superior ability to outperform in a previous twenty-year study ended in 1997. It is possible that markets have become more efficient. However, this efficiency could well have occurred due to Exchange Traded Funds (ETFs) which have come to dominate the investment horizon. Does the price of individual stocks in an index determine the value of the index or does the actively-traded index determine the prices of the individual stocks? Examining the arrow of causality between index and its component stocks may be an interesting extension to this paper.

REFERENCES

Balduzzi, P., & Lynch, A.W. (1999). Transaction costs and predictability: Some utility cost calculations. *Journal of Financial Economics*, *52*, 47-78.

Brock, W., Lakonishok, J., & LeBaron, B. (1992). Simple Technical Trading Rules and the Stochastic Properties of Stock Returns. *Journal of Finance*, *47*(5), 1731-1764.

Dow Theory. (n.d.). Retrieved August 8, 2020, from https://en.wikipedia.org/wiki/Dow_theory

Fama, E., (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. *Journal of Finance*, *24*(2), 383-417.

Ford Equity Research HIPER Investment Program. (n.d.). Ford Equity Research, San Diego, California.

Haugen, R.A. (1999). *The New Finance: The Case Against Efficient Markets* (2nd Edition). Prentice-Hall. Upper Saddle River, New Jersey

Jegadeesh, N., & Titman, S. (2001). Profitability of Momentum Strategies: An Evaluation of Alternative Explanations. *Journal of Finance*, *56*(2), 699-720.

Lakonishok J., Shleifer, A., & Vishay, R. (1994). Contrarian Investment, Extrapolation, and Risk. *Journal of Finance*, *49*(5), 1541-1578.
Nazario, R.T.F., e Silva, J.L., Sobreiro, V.A., & Kimura, H. (2017). A Literature Review of Technical Analysis on Stock Markets. *The Quarterly Review of Economics and Finance*, *66*, 115-126.
Park, C.H., & Irwin, S.H. (2007). What do we know about the profitability of technical analysis? *Journal of Economic Studies*, *21*(4), 786-836.
Stanley, D.J., & Ferraro, S. (1998). *The New DJIA and Component Price Momentum*. A paper presented at the 1998 Annual Conference of the Western Decisions Sciences, Reno, Nevada.

APPENDIX 1
PGY TRICLES DJIA UNIVERSE MONTHLY

Monthly Performance

Total Cumulative for Entire Range

	Performance				Performance w/transaction costs		
	Sector 1	Sector 2	Sector 3	Comp Univ	Sector 1	Sector 2	Sector 3
12/74-01/19	22010	14423.5	15612.1	19408.2	7939.1	2130.1	5664.3
Annual	13	12	12.2	12.7	10.5	7.3	9.6
Annual STD	16.2	16	20.3	15.9	16.2	16	20.3
CV	1.25	1.33	1.66	1.25	1.54	2.19	2.11

Average Annual % Turnover

231.6	427.7	228.9

Total Cumulative for Intermediate Periods

	Performance				Performance w/transaction costs		
	Sector 1	Sector 2	Sector 3	Comp Univ	Sector 1	Sector 2	Sector 3
12/74-12/18	20977.2	13852.9	14374.5	18330.7	7570.9	2044.5	5210.3
Annual	12.9	11.9	12	12.6	10.4	7.2	9.4
Annual STD	16.2	16	20.3	15.9	16.2	16	20.3
CV	1.26	1.34	1.69	1.26	1.56	2.22	2.16

Correlation Matrix for Intermediate Periods

	Sector 1	*Sector 2*	*Sector 3*	*Comp*	*Sector 1*	*Sector 2*	*Sector 3*
Sector 1 W/O T	1						
Sector 2	0.793937	1					
Sector 3	0.591575	0.75705	1				
Comp Univ	0.861522	0.937572	0.895232	1			
Sector 1 W/ T	0.999489	0.782921	0.580292	0.85261855	1		
Sector 2	0.803084	0.999306	0.750395	0.93741669	0.79303054	1	
Sector 3	0.595408	0.759194	0.999827	0.89717186	0.58428443	0.75300946	1

Intermediate Period

	Performance				Performance w/transaction costs		
	Sector 1	Sector 2	Sector 3	Comp Univ	Sector 1	Sector 2	Sector 3
12/74-12/75	32.7	49.6	66.9	49.4	29.3	42.9	63.1
12/75-12/76	22.9	35.2	36.7	31.5	19.7	28.5	32.7
12/76-12/77	-5.8	-4.9	-25.2	-12.3	-7.2	-7.8	-26.4
12/77-12/78	3.8	0.3	-5.8	-0.5	1.3	-3.3	-7.2
12/78-12/79	18.4	9.5	15.8	14.7	16	5.4	13.4
12/79-12/80	38.8	13.3	17.3	23.3	36.6	9.8	15.5
12/80-12/81	-7.6	0.2	-5.5	-4.2	-9.7	-4.4	-8
12/81-12/82	44.7	17.4	3.2	20.9	42.6	13.1	0.8
12/82-12/83	21.6	39.7	47.1	36	18.9	34.2	44
12/83-12/84	-8.2	-3.3	17.2	1.5	-10.7	-8.1	14
12/84-12/85	34.2	28.6	33.2	32.2	30.8	22.9	30.1
12/85-12/86	39.4	18.6	2.9	20.1	37.4	14.8	1
12/86-12/87	6.1	7.2	13.8	9.3	3.5	2.3	10.7
12/87-12/88	14.1	10.5	41.3	21.5	11.6	5.9	37.6
12/88-12/89	37.4	40.1	5.5	26.9	33.3	33.6	3.2
12/89-12/90	4.5	-8.8	-16.1	-7	3.4	-11.1	-17.5
12/90-12/91	26.6	20.4	36.5	27.9	24.1	16	33.5
12/91-12/92	15.4	11	9.9	12.3	12.8	6.6	7.6
12/92-12/93	21.9	19.1	17	19.5	18.8	13.5	14.3
12/93-12/94	0.1	1.2	9.3	3.6	-2.7	-3.8	6.3
12/94-12/95	36.9	35.4	36.3	36.3	34.1	30.1	33.2
12/95-12/96	18.8	39.3	23.7	27.2	16	33.2	20.4
12/96-12/97	30	24.2	23.6	26	26.9	18.9	20.9
12/97-12/98	19	7.1	26.5	17.5	16.5	2.2	22.9
12/98-12/99	25.8	24.6	22.1	25.1	23	19.1	18.7
12/99-12/00	-13.2	-7.6	13.2	-2.4	-15.1	-11.4	10.9
12/00-12/01	-5.3	-12.6	6.4	-3.3	-7.6	-16.6	3.5
12/01-12/02	-18	-18.9	-10.1	-15.5	-20.3	-22.8	-12.1
12/02-12/03	31.9	23.8	39.1	31.9	28.3	18.1	36
12/03-12/04	0.4	13.8	0.5	4.9	-2.6	8.1	-2.1
12/04-12/05	5.1	4.2	-3.9	1.9	2.9	0.3	-5.5
12/05-12/06	15.9	17.2	33	21.9	13	12.2	29.9
12/06-12/07	13.1	5.6	7.1	8.7	10.5	1.1	4.3
12/07-12/08	-23.7	-30.1	-57.4	-38.2	-25.8	-32.9	-58
12/08-12/09	11.9	32.7	30.2	26.5	9	27.1	27.6
12/09-12/10	11	10.6	16.5	12.9	7.8	4.9	13.8
12/10-12/11	6.4	9.7	-6.7	3.1	4	5.3	-8.5
12/11-12/12	9.6	10.3	20.2	13.6	7	5.6	17.1
12/12-12/13	30.1	32.5	33.3	32.1	26.4	26.7	30.3
12/13-12/14	9.2	20.4	7	12.1	6.9	15.9	5.1
12/14-12/15	9.4	-4.5	1.4	2.1	7.6	-7.9	-0.6
12/15-12/16	4.9	10.5	32.8	15.6	2.3	5.8	29.8
12/16-12/17	32.6	22.3	17.2	24.2	29.8	17.1	14.2
12/17-12/18	0.1	3.7	-3.4	0.3	-1.4	-0.1	-5.7

PGY TRICLES DJIA UNIVERSE QUARTERLY

Monthly Performance

Total Cumulative for Entire Range

	Performance				Performance w/transaction costs		
	Sector 1	Sector 2	Sector 3	Comp Univ	Sector 1	Sector 2	Sector 3
12/74-12/18	24961	14329.3	12788.6	19408.2	14072.3	5625.3	7148.3
Annual	13.3	11.9	11.7	12.7	11.9	9.6	10.2
Annual STD	16.2	16.2	19.9	15.9	16.2	16.2	19.9
CV	1.22	1.36	1.7	1.25	1.36	1.69	1.95

Average Annual % Turnover

130.3	211.5	132.1

Total Cumulative for Intermediate Periods

	Performance				Performance w/transaction costs		
	Sector 1	Sector 2	Sector 3	Comp Univ	Sector 1	Sector 2	Sector 3
12/74-12/18	23790.4	13762.3	11773.4	18330.7	13449.1	5421.5	6595.9
Annual	13.3	11.9	11.5	12.6	11.8	9.5	10
Annual STD	16.2	16.3	19.9	15.9	16.2	16.2	19.9
CV	1.22	1.37	1.73	1.26	1.37	1.71	1.99

Correlation Matrix for Intermediate Periods

	Sector 1	*Sector 2*	*Sector 3*	*Comp*	*Sector 1*	*Sector 2*	*Sector 3*
Sector 1 W/O T	1						
Sector 2	0.808315	1					
Sector 3	0.551747	0.692304	1				
Comp Univ	0.875102	0.931389	0.855921	1			
Sector 1 W/ T	0.999884	0.806173	0.548605	0.87304303	1		
Sector 2	0.808321	0.999846	0.68989	0.93027551	0.80635885	1	
Sector 3	0.553612	0.694747	0.999927	0.85749509	0.55052407	0.69247111	1

Intermediate Period

	Performance				Performance w/transaction costs		
	Sector 1	Sector 2	Sector 3	Comp Univ	Sector 1	Sector 2	Sector 3
12/74-12/75	38.9	51.9	57.2	49.4	37.4	49.4	55.5
12/75-12/76	21.6	41.1	32.7	31.5	19.9	38.4	31.1
12/76-12/77	-2.9	-7.7	-25.3	-12.3	-4	-9.6	-26.2
12/77-12/78	5	0.1	-6.6	-0.5	3.9	-1.8	-7.7
12/78-12/79	17	9.9	16.9	14.7	15.7	7.5	15.2
12/79-12/80	39.6	11.8	18.3	23.3	38.6	9.7	16.9
12/80-12/81	-4.3	-3.3	-5.6	-4.2	-5.7	-5.6	-7
12/81-12/82	42.6	20.1	1.5	20.9	41.3	17.8	0.1
12/82-12/83	24.9	42.9	39.6	36	23.6	40.6	38.3
12/83-12/84	-7.8	-1.5	14.2	1.5	-9.3	-3.6	12.5
12/84-12/85	40.7	25.3	28.4	32.2	39	22.9	26.9
12/85-12/86	36.4	22.4	2	20.1	34.9	19.9	0.7
12/86-12/87	14.5	3.8	9	9.3	12.6	1.4	7.6
12/87-12/88	11.8	14.7	38.9	21.5	10.6	12.3	36.8
12/88-12/89	41.9	32.2	8.4	26.9	39.9	29.4	6.8
12/89-12/90	2.5	-11.5	-11.7	-7	1.4	-13	-12.5
12/90-12/91	27.3	16.2	37.8	27.9	25.7	13.6	35.7
12/91-12/92	18.2	10.3	8.1	12.3	17	8.3	7
12/92-12/93	24.4	25.2	8.9	19.5	22.9	22.9	7.7
12/93-12/94	1.4	6.8	2	3.6	-0.2	4.4	0.8
12/94-12/95	36	43.7	29.3	36.3	34.5	40.9	27.4
12/95-12/96	19.7	32.1	29.6	27.2	18.1	29.4	27.7
12/96-12/97	34.2	20.6	23.2	26	32.3	17.8	21.8
12/97-12/98	22	11.1	18.9	17.5	20.8	9.1	17.2
12/98-12/99	23.9	28.1	12.9	25.1	22.7	25.4	11.6
12/99-12/00	-12.7	-17.6	26.1	-2.4	-13.9	-19.2	24.3
12/00-12/01	-14.6	-11.4	18.2	-3.3	-15.9	-13.5	16.4
12/01-12/02	-23.1	-12.7	-10.8	-15.5	-24.5	-15.1	-12.3
12/02-12/03	31.7	18.1	46.1	31.9	30	15.6	44.4
12/03-12/04	-0.2	9.4	6.2	4.9	-1.8	6.7	4.5
12/04-12/05	7.6	-2.3	0.1	1.9	6.2	-4.4	-1
12/05-12/06	18	16.7	31.1	21.9	16.6	14.1	29.3
12/06-12/07	17.4	10.1	-1.1	8.7	16	7.7	-2.5
12/07-12/08	-26.4	-27.5	-57.3	-38.2	-27.3	-28.7	-57.8
12/08-12/09	17.1	23.9	34.1	26.5	15.5	21.6	32.7
12/09-12/10	8.4	9.8	20.1	12.9	6.6	6.9	18.2
12/10-12/11	2	9.8	-2.6	3.1	0.5	7.7	-3.7
12/11-12/12	10.3	14.9	14.9	13.6	8.5	12.6	13.7
12/12-12/13	35.5	31	29.5	32.1	33.4	27.8	27.7
12/13-12/14	8	19.1	9.3	12.1	6.7	17	8.4
12/14-12/15	5.5	-2.1	2.7	2.1	4.4	-3.8	1.3
12/15-12/16	0.9	15.9	31.8	15.6	-0.5	13.1	30
12/16-12/17	30.7	21.7	18.6	24.2	28.6	18.7	16.6
12/17-12/18	0.3	5.4	-5.1	0.3	-0.6	3.3	-6.3

PRM TRICLES DJIA UNIVERSE MONTHLY

Monthly Performance

Total Cumulative for Entire Range

	Performance				Performance w/transaction costs		
	Sector 1	Sector 2	Sector 3	Comp Univ	Sector 1	Sector 2	Sector 3
12/74-12/18	46850.2	26435.4	4270	19408.2	3747.9	909.9	231.3
Annual	15	13.5	8.9	12.7	8.6	5.4	2.8
Annual STD	18	16.2	17.6	15.9	18	16.2	17.7
CV	1.2	1.2	1.98	1.25	2.09	3	6.32

Average Annual % Turnover

571.5	745.9	586.4

Total Cumulative for Intermediate Periods

	Performance				Performance w/transaction costs		
	Sector 1	Sector 2	Sector 3	Comp Univ	Sector 1	Sector 2	Sector 3
12/74-12/18	43300.1	24762.2	4158	18330.7	3470.1	850.6	224.1
Annual	14.8	13.4	8.9	12.6	8.5	5.3	2.7
Annual STD	18	16.2	17.6	15.9	18	16.2	17.7
CV	1.22	1.21	1.98	1.26	2.12	3.06	6.56

Correlation Matrix for Intermediate Periods

	Sector 1	*Sector 2*	*Sector 3*	*Comp*	*Sector 1*	*Sector 2*	*Sector 3*
Sector 1 W/O T	1						
Sector 2	0.815474	1					
Sector 3	0.772828	0.802008	1				
Comp Univ	0.930221	0.934541	0.924329	1			
Sector 1 W/ T	0.999467	0.821644	0.778809	0.93418668	1		
Sector 2	0.812726	0.999573	0.803956	0.93410588	0.81925483	1	
Sector 3	0.764834	0.793023	0.999514	0.9180869	0.77131791	0.79536536	1

Intermediate Period

	Performance				Performance w/transaction costs		
	Sector 1	Sector 2	Sector 3	Comp Univ	Sector 1	Sector 2	Sector 3
12/74-12/75	56.6	63.1	29.8	49.4	48.7	52.5	22.1
12/75-13/76	31.2	39.7	23.7	31.5	24.7	29.7	16.9
12/76-12/77	-11.1	-9.3	-16.9	-12.3	-16.5	-16.5	-21.7
12/77-12-78	2.8	6.1	-10	-0.5	-3.3	-0.9	-15.7
12/78-12/79	24.8	10.8	8.7	14.7	17.1	1.7	1.7
12/79-12/80	29.2	22.5	17.6	23.3	21.8	13.9	10.9
12/80-12/81	-1.4	-2.7	-8.8	-4.2	-7.2	-9.9	-14.8
12/81-12/82	34.4	16.2	12.4	20.9	26.5	7.5	5.6
12/82-12/83	25.3	40	42.4	36	19.5	30.1	35.4
12/83-12/84	-2.1	12	-5.1	1.5	-8.4	3.6	-11.5
12/84-12/85	32.6	36	27.5	32.2	24.9	27.2	20.7
12/85-12/86	22	10.7	27.2	20.1	15.9	4	21.6
12/86-12/87	17.8	-2.2	12.1	9.3	11.5	-9.1	5.6
12/87-12/88	18.2	29.9	16.1	21.5	12	20.9	9.7
12/88-12/89	40.2	20.2	21	26.9	31.4	10.8	13.2
12/89-12/90	-8.2	-5.8	-7.4	-7	-13	-12.7	-12.7
12/90-12/91	25.8	22.5	35	27.9	20.2	14.2	28.6
12/91-12/92	10.2	12.5	13.6	12.3	4.4	4.6	7.7
12/92-12/93	16.2	25.9	16.1	19.5	10.3	17.9	9.9
12/93-12/94	-0.8	11.3	0.4	3.6	-5.4	3	-5.5
12/94-12/95	44.9	26.2	38.1	36.3	37.4	17.7	31.4
12/95-12/96	35.3	26.5	19.6	27.2	27.6	17.3	12.1
12/96-12/97	39.9	24.5	14.2	26	32.1	15.6	7.7
12/97-12/98	33.4	15.7	3.9	17.5	25.9	7.9	-2.5
12/98-12/99	34.7	30.3	10	25.1	27.1	20.9	3.3
12/99-12/00	-14.7	3.4	3.1	-2.4	-19.9	-4.4	-3.3
12/00-12-01	10.6	3	-22.6	-3.3	4.5	-4.8	-27.8
12/01-12/02	-14.9	-22.7	-9.2	-15.5	-20.9	-28.8	-13.9
12/02-12-03	27.5	35.1	31.8	31.9	20.3	25.2	24.6
12/03-12/04	4.4	7.4	2.5	4.9	-0.6	-0.4	-3.2
12/04-12/05	2.4	7.3	-4.1	1.9	-3.2	-0.1	-9.4
12/05-12/06	20.9	24.1	20.3	21.9	15.2	16	13.5
12/06-12/07	12.9	12.1	1.1	8.7	6.4	3.9	-4.6
12/07-12/08	-41.7	-29.8	-43.3	-38.2	-45.8	-35.1	-47.4
12/08-12/09	14.3	23.9	38.2	26.5	7.1	15.8	30.6
12/09-12-10	24.8	7.1	7	12.9	18.2	-0.6	1.4
12/10-12/11	7.2	-2.9	4.5	3.1	1.1	-9.8	-1.2
12/11-12/12	16.1	11.4	13.2	13.6	9.7	3.2	6.2
12/12-12/13	41.3	29.3	25.8	32.1	34.4	20.5	19.3
12/13/12/14	14.6	10.5	11	12.1	8.5	2.7	5.1
12/14-12/15	4.3	3	-1.3	2.1	-1.5	-4.6	-6.5
12/15-12/16	7.5	22.5	17.1	15.6	2.2	13.9	10.9
12/16-12/17	34.6	13.9	24.3	24.2	27	5	18.2
12/17-12/18	2.2	1.8	-3.3	0.3	-2.8	-5.3	-8.4

PRM TRICLES DJIA UNIVERSE QUARTERLY

Monthly Performance

Total Cumulative for Entire Range

	Performance				Performance w/transaction costs		
	Sector 1	Sector 2	Sector 3	Comp Univ	Sector 1	Sector 2	Sector 3
12/74-12/18	32701.9	19779.9	7716.3	19408.2	12214.8	6356.1	2633.8
Annual	14	12.8	10.4	12.7	11.5	9.9	7.8
Annual STF	18.3	16.3	16.9	15.9	18.3	16.2	16.9
CV	1.31	1.27	1.63	1.25	1.59	1.64	2.17

Average Annual % Turnover

224.5	257.8	239.5

Total Cumulative for Intermediate Periods

	Performance				Performance w/transaction costs		
	Sector 1	Sector 2	Sector 3	Comp Univ	Sector 1	Sector 2	Sector 3
12/74-12/18	30221.5	18526.4	7516	18330.7	11336.5	5983.2	2582
Annual	13.9	12.6	10.3	12.6	11.4	9.8	7.8
Annual STD	18.3	16.3	16.9	15.9	18.3	16.2	16.9
CV	1.32	1.29	1.64	1.26	1.61	1.65	2.17

Correlation Matrix for Intermediate Periods

	Sector 1	*Sector 2*	*Sector 3*	*Comp*	*Sector 1*	*Sector 2*	*Sector 3*
Sector 1 W/O T	1						
Sector 2	0.831948	1					
Sector 3	0.707027	0.846112	1				
Comp Univ	0.9158	0.953308	0.916095	1			
Sector 1 W/ T	0.999813	0.834794	0.709091	0.91732121	1		
Sector 2	0.828861	0.99978	0.843692	0.95109856	0.83185431	1	
Sector 3	0.705576	0.848364	0.999796	0.91613808	0.70786246	0.84619389	1

Intermediate Period

	Performance				Performance w/transaction costs		
	Sector 1	Sector 2	Sector 3	Comp Univ	Sector 1	Sector 2	Sector 3
12/74-12/75	54.6	52.9	40.3	49.4	51.4	50.3	37.9
12/75-12/76	33.4	34.1	27.2	31.5	30.8	31	24.6
12/76-12/77	-3.6	-13.9	-19.1	-12.3	-5.8	-16.5	-21.4
12/77-12/78	5.4	3.3	-9.7	-0.5	2.6	0.4	-12.3
12/78-12/79	18.7	17.9	7.6	14.7	15.6	14.5	4.5
12/79-12/80	32.9	18.6	17.9	23.3	30.2	15.8	15.2
12/80-12/81	-6.9	-2.6	-3.5	-4.2	-9	-4.9	-5.4
12/81-12/82	28.1	14.5	19.2	20.9	25.5	11.2	16.1
12/82-12/83	26	42	39.8	36	23.8	38.9	37.5
12/83-12/84	4	-2.8	2.8	1.5	0.9	-5.8	0.2
12/84-12/85	33.3	34	26.9	32.2	30.5	31	24.5
12/85-12/86	20.9	20.4	18.3	20.1	18.4	17.6	15.6
12/86-12/87	15.2	7.8	4.3	9.3	12.5	4.7	1.7
12/87-12/88	22.1	18.2	23.9	21.5	19.6	15	20.7
12/88-12/89	27.1	30.7	22.7	26.9	24.1	28	19.8
12/89-12/90	-5.8	-5.6	-9.9	-7	-7.8	-7.9	-12.1
12/90-12/91	29.6	24.5	26.7	27.9	26.8	21.1	23.4
12/91-12/92	16.1	12.9	7.5	12.3	13.9	10	4.8
12/92-12/93	17.1	29.5	12.1	19.5	14.2	26.5	9.6
12/93-12/94	2.3	1.2	6.9	3.6	0.6	-0.9	5.1
12/94-12/95	43.5	32.1	33.1	36.3	40.7	28.9	29.8
12/95-12/96	44.6	28.8	9.8	27.2	41.4	26	7.1
12/96-12/97	36.8	22.1	19.3	26	33.5	18.7	16.1
12/97-12/98	24.7	11.1	16.3	17.5	22.1	8.8	13.3
12/98-12/99	27.3	13.8	24.7	25.1	24	10.8	21.5
12/99-12/00	-7	0	-2.3	-2.4	-9.5	-2.7	-5.1
12/00-12/01	1.7	11.9	-21.6	-3.3	-0.2	9.1	-23.4
12/01-12/02	-19.3	-17.7	-9.9	-15.5	-21.4	-20.1	-12.5
12/02-12/03	47.4	25	23.5	31.9	43.8	21.8	20.4
12/03-12/04	10.4	-3.9	9.2	4.9	7.5	-6.8	6.4
12/04-12/05	-1.1	8	-1.3	1.9	-3.4	5.2	-3.7
12/05-12/06	19.9	16.9	28.6	21.9	17.7	13.7	25.8
12/06-12/07	14.9	6.6	4.6	8.7	12.6	4.3	2.3
12/07-12/08	-34.3	-33.2	-46.9	-38.2	-36	-35	-48.4
12/08-12/09	-2	29.3	55.4	26.5	-4.5	26.4	51.7
12/09-12/10	9.2	12.5	16.2	12.9	6.6	9.6	13.6
12/10-12/11	-5	5.9	8.1	3.1	-6.5	3.8	5.9
12/11-12/12	14.5	13.5	12.5	13.6	11.7	10.8	10.1
12/12-12/13	31.9	30.2	33.9	32.1	29	26.5	31
12/13-12/14	11.7	14	10.4	12.1	9.5	11.1	8.3
12/14-12/15	-2.4	8.5	0.1	2.1	-4.2	6.1	-2.1
12/15-12/16	6.2	17.8	23.1	15.6	4.4	14.4	20.2
12/16-12/17	36.5	18.6	16.9	24.2	33.2	15.6	14.4
12/17-12/18	-1	-1	2.7	0.3	-2.6	-3.3	1.1