

Analyzing Mutual Fund Performance Against Established Performance Benchmarks: A Test of Market Efficiency

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Abstract

The efficient market hypothesis maintains that active investment management is pointless. Rather, an investor is better off deploying a passive investment strategy by utilizing a market index alternative. However, the existence of a significant mutual fund industry illustrates a belief to the contrary. This paper analyzes the small cap growth stock sector of the mutual fund industry against risk-free and market returns over the ten years 1997-2006. Results are tested against a toolkit of performance benchmarks to see if expected performance closely corresponds to the actual results. Development of various performance benchmarks has allowed investors to quantitatively assess various portfolio alternatives and has established that diversification can reduce systematic risk. Mutual funds are a way for most investors to achieve these results without the need for expensive research and excessive trading costs. The results indicate that some excess returns have been generated; however, beyond a handful of the funds, it is impossible to rely upon a single benchmark as a reliable indicator of even past performance. A “portfolio approach” of combining the benchmarks does not seem to work any better. The evidence tends to support market efficiency since for the most part, the actively managed funds examined in this study produced returns that were largely expected.

Keywords: market, efficiency, active, management, mutual, fund, performance, benchmarks.

Introduction

Efficient market theory maintains that active investment management is pointless. Rather, an investor is better off deploying a passive investment strategy by utilizing a market index alternative. However, it follows that the existence of a significant mutual fund industry suggests that an active investment strategy could “beat the market”. When compared to various performance benchmarks that allow the necessary diversification to reduce systematic risk, can mutual fund performance “beat the market”? Do mutual funds offer an efficient way for most investors to achieve competitive returns and avoid expensive research and excessive trading costs?

The purpose of this paper is to test efficient market theory by examining the performance of mutual funds. Specifically, the study analyzes the small cap growth stock sector of the mutual fund industry against risk-free and market returns over the ten year period 1997-2006. The mutual fund performance results will then be further analyzed against a toolkit of performance benchmarks to see if the resulting metrics closely correspond to the actual results. Did the actual returns of the sample of actively managed mutual funds outperform expected risk-adjusted benchmark returns? If so, then efficient market theory is called into question.

Literature Review

Analysis of mutual fund performance is not a new area. Over forty years ago, Sharpe (1966) outlined methodologies to examine mutual fund performance within the context of three closely related areas: portfolio, selection, the capital asset pricing model (CAPM), and the general behavior of stock market prices.

Portfolio selection theory defines the roles of three market participants: the portfolio analyst, the security analyst, and the investor. Works by Markowitz (1955), Sharpe (1963), and Fama (1965) outline market taxonomy. The portfolio analyst estimates anticipated results through expected portfolio performance -- and its underlying risk -- and selects the most efficient portfolio. The security analyst predicts the performance of individual securities (within the portfolio) including the relationships between different securities. The investor, presented with an array of efficient portfolios must then factor in his risk profile in selecting the portfolio that optimizes the combination of risk and expected returns. Sharpe maintains that the performance of mutual funds can vary because of risk. This risk can either be a high-risk strategy that did not succeed; or, just poor execution by the manager (who is both portfolio and security analyst.)

CAPM, Sharpe (1964), defines a perfect market whereby participants use information to form their own portfolios -- that incorporate desired returns against risk. The general behavior of stock market prices concerns the theory of random walks. Fama (1965), which maintains that past performance of a security prices has no value in predicting its future price. Furthermore, in order to outperform the market, it is necessary to assume greater risk -- whether by design or by accident.

Fund performance analysis by Coggin, Fabozzi and Rahman (1993) also analyzes equity pension fund performance. They attempt to distinguish performance between security selection ability and market timing skill. The former employs CAPM methodologies to identify securities that are priced at a premium or a discount to the market. The latter refers to an ability to forecast what the market return will be so that the portfolio's risk levels can be proactively adjusted.

Although stocks will offer a higher return than T-Bills over time, the question still remains as to how much. Grinblatt and Titman (1994) outlined several shortcomings in traditional methodologies. The CAPM performance evaluation is very sensitive to the benchmark selected. Evaluation techniques – specifically Jensen’s – are statistically biased against successful market timers. Portfolio return analysis is “noisy.” And, although a portfolio manager of a large fund will create significant wealth, it might not be statistically significant – or detectable (i.e., 2% of a \$billion fund.) Conversely, there may just be a “lucky” manager – especially as the sample size increases. Finally, “Survivorship” is also an issue. To be included in a ten-year performance study, only funds that have lasted ten years are available. Funds that did not flourish will not be in the sample.

The literature is not overwhelming with praise for mutual fund management. Lehman and Modest (1987) find that assessment of fund performance can vary with the benchmark and metrics selected. They also found “statistically significant measured abnormal performance” across the various benchmarks, and left open the question as to the economic explanation for these phenomena.

Data Selection and Method

The study examined small-cap growth stocks from the Standard & Poor’s Net Advantage Database. The initial screening of small-cap growth mutual funds defined 681 funds. Of the 681, only 167 had an inception date prior to January 1, 1997. Of the 167 funds that met the ten-year threshold, forty funds were selected for the study. Since there were many fund families that had multiple funds meeting the criteria, only one fund was selected from each family – based on the earliest inception date. The Russell 2000 market index results were also downloaded for the corresponding time period. The risk-free market return was collected for the 30-Day T-Bills and annual returns were determined by combining quarterly results.

The sample of forty mutual funds was benchmarked against the Russell 2000.¹ The Russell 2000 includes the smallest 2000 securities in the Russell 3000. Calculations were performed for average return (r_i); Beta (β_i); variance (σ_i^2); and standard deviation (σ_i). Scatter diagrams for the 40 funds assessed against the benchmark were conducted.

Table 1: Initial Results

Symbol	Name	r_i	σ_i^2	σ_i	β
	30-Day T-Bill	3.57	2.69	1.64	
RUT	Russell 2000	9.48	374.70	19.36	
ARPAX	MTB Small-Cap Growth A	21.31	2248.84	47.42	1.163
ARTSX	Artisan Small Cap Growth	9.00	370.46	19.25	0.856
BCSIX	Brown Capital Small Co. I	12.89	491.04	22.16	0.847
BMCGX	Apex Mid Cap Growth	5.50	3707.54	60.89	2.631
BRUSX	Bridgeway Ultra-Small Co.	24.45	732.87	27.07	1.086

¹ The Russell 2000 Index is designed to represent the small-cap segment of the U.S. equity universe. It is intended to provide a comprehensive and unbiased small-cap barometer and is completely reconstituted annually to ensure larger stocks do not distort the performance and characteristics of the true small-cap opportunity set.

DTSGX	Wilshire Small Company Growth	7.54	179.63	13.40	0.640
EGWAX	Evergreen Growth A	8.97	278.09	16.68	0.785
FEFPX	Frontier MicroCap	(24.12)	852.55	29.20	0.154
FISSX	First Investors Special Situations	6.99	386.78	19.67	0.865
FMIOX	FMI Focus	23.59	708.60	26.62	0.866
FRMPX	First American Small-Cap Growth A	21.17	1869.82	43.24	1.209
HFCGX	Hennessy Cornerstone Growth	17.03	234.38	15.31	0.679
HRSCX	Heritage Small Cap A	9.94	285.51	16.90	0.694
HSOAX	HSBC Investor Opportunity A	12.67	430.81	20.76	0.860
KNEMX	Fifth Third Small Cap Growth A	8.09	338.06	18.39	0.853
MGMCX	DWS Micro Cap	16.09	678.69	26.05	0.856
MMEAX	Munder Microcap A	22.54	1141.11	33.78	1.243
MRSCX	Marshall Small Cap Growth	11.08	477.06	21.84	0.953
MSSGX	Morgan Stanley Small Company	18.31	1020.48	31.95	0.932
NAGQX	Nicholas-Applegate Growth I	11.06	1176.87	34.31	1.061
NSPAX	ING Small Cap A	15.43	2459.23	49.59	1.301
OBEGX	Oberweis Emerging Growth	8.87	748.07	27.35	1.157
OPOCX	Oppenheimer Discovery A	5.99	483.72	21.99	0.877
ORIGX	Pioneer Oak Ridge Small Cap Growth	10.26	234.51	15.31	0.695
PAGFX	Polynous Growth A	6.91	713.23	26.71	1.108
PGOFX	Pioneer Growth Opportunities A	11.18	554.34	23.54	0.867
PGSGX	JPMorgan Small Cap Growth A	10.82	280.19	16.74	0.722
PRCGX	Perritt Micro Cap Opportunities	15.96	397.17	19.93	0.692
PRNHX	T. Rowe Price New Horizons	10.37	378.31	19.45	0.928
QUASX	AllianceBernstein Small Cap Growth A	4.99	413.61	20.34	1.004
SCGAX	BlackRock Small/Mid Growth A	11.43	617.62	24.85	1.074
SDSCX	Boston Company Small/Mid Cap	12.49	881.37	29.69	1.036
SGWAX	SunAmerica Growth A	11.19	1212.57	34.82	1.114
SSCGX	SEI Small Cap Growth	11.10	934.35	30.57	1.190
TASGX	Target Small Cap Growth	6.21	378.70	19.46	0.851
TGSCX	TCW Small Cap Growth I	12.53	2241.73	47.35	1.419
TSCEX	Turner Small Cap Growth	13.28	1129.88	33.61	1.278
TWNOX	American Century New Opportunities	14.67	2267.88	47.62	0.940
VWMCX	Van Wagoner Small Cap Growth	11.82	4779.24	69.13	1.277
WTSGX	Credit Suisse Small Cap I	7.57	867.97	29.46	1.136

A series of performance benchmarks were then derived. Jensen's measure (or alpha) quantifies a portfolio's return (given its beta and average market return) in excess of what is predicted by CAPM. Both the Sharpe and Treynor measures compare the volatility of the portfolio with excess return. The difference is that Sharpe uses standard deviation and Treynor uses beta to measure risk. The risk-reward ratio was also calculated.

Table 2: Benchmark Results

Symbol	Name	Sharpe Measure	Treynor Measure	Jensen	Risk -R Reward
ARPAX	MTB Small-Cap Growth A	0.42	11.00	2.00	0.582
ARTSX	Artisan Small Cap Growth	0.03	0.73	(13.74)	0.090
BCSIX	Brown Capital Small Co. I	0.77	19.23	19.58	0.903
BMCGX	Apex Mid Cap Growth	0.30	6.20	(10.08)	0.562
BRUSX	Bridgeway Ultra-Small Co.	0.32	6.87	(2.20)	0.538
DTSGX	Wilshire Small Company	(0.95)	(179.29)	(31.88)	(0.826)
EGWAX	Evergreen Growth A	0.17	3.95	26.65	0.355
FEFPX	Frontier MicroCap	0.75	23.12	20.78	0.886
FISSX	First Investors Special	0.41	14.55	(5.89)	0.490
FMIOX	FMI Focus	0.88	19.81	(4.91)	1.113
FRMPX	First American Small-Cap	0.38	9.17	(8.36)	0.588
HFCGX	Hennessy Cornerstone	0.44	10.57	1.74	0.610
HRSCX	Heritage Small Cap A	0.25	5.29	(4.18)	0.440
HSOAX	HSBC Investor Opportunity	0.48	14.63	7.34	0.618
KNEMX	Fifth Third Small Cap	0.56	15.26	4.51	0.667
MGMCX	DWS Micro Cap	0.34	7.87	(11.17)	0.507
MMEAX	Munder Microcap A	0.46	15.81	6.45	0.573
MRSCX	Marshall Small Cap Growth	0.22	7.06	(7.69)	0.322
MSSGX	Morgan Stanley Small	0.24	9.12	6.55	0.311
NAGQX	Nicholas-Applegate Growth I	0.19	4.58	(7.25)	0.324
NSPAX	ING Small Cap A	0.11	2.75	(3.69)	0.272
OBEGX	Oberweis Emerging Growth	0.44	9.61	3.39	0.670
OPOCX	Oppenheimer Discovery A	0.12	3.01	(3.81)	0.259
ORIGX	Pioneer Oak Ridge Small Cap	0.32	8.77	3.83	0.475
PAGFX	Polynous Growth A	0.43	10.03	0.82	0.646
PGOFX	Pioneer Growth	0.62	17.91	5.03	0.801
PGSGX	JPMorgan Small Cap Growth	0.35	7.33	(5.22)	0.533
PRCGX	Perritt Micro Cap	0.07	1.41	(5.36)	0.245
PRNHX	T. Rowe Price New Horizons	0.32	7.31	6.84	0.460
QUASX	AllianceBernstein Small Cap	0.30	8.61	0.84	0.421
SCGAX	BlackRock Small/Mid	0.22	6.83	(1.43)	0.321
SDSCX	Boston Company Small/Mid	0.25	6.32	0.16	0.363
SGWAX	SunAmerica Growth A	0.14	3.10	(4.90)	0.319
SSCGX	SEI Small Cap Growth	0.19	6.31	8.36	0.265
TASGX	Target Small Cap Growth	0.29	7.59	(1.01)	0.395
TGSCX	TCW Small Cap Growth I	0.23	11.80	1.43	0.308
TSCEX	Turner Small Cap Growth	0.12	6.45	(3.23)	0.171
TWNOX	American Century New	0.14	3.51	(3.86)	0.257
VWMCX	Van Wagoner Small Cap	0.37	15.25	10.87	0.449
WTSGX	Credit Suisse Small Cap I	0.28	6.34	(10.61)	0.468

Table 3 provides rankings (from 1 to 40) for each of the four measures.

Table 3: Benchmark Rankings

Symbol	Name	Sharpe Measure	Treynor Measure	Jensen Measure	Risk – Reward
ARPAX	MTB Small-Cap Growth A	14	7	4	21
ARTSX	Artisan Small Cap Growth	23	27	37	19
BCSIX	Brown Capital Small Co. I	11	11	14	11
BMCGX	Apex Mid Cap Growth	39	39	39	39
BRUSX	Bridgeway Ultra-Small Co.	2	3	3	2
DTSGX	Wilshire Small Company	21	30	36	13
EGWAX	Evergreen Growth A	17	24	22	14
FEFPX	Frontier MicroCap	40	40	40	40
FISXX	First Investors Special	32	33	1	26
FMIOX	FMI Focus	3	1	2	3
FRMPX	First American Small-Cap	12	9	32	17
HFCGX	Hennessy Cornerstone	1	2	29	1
HRSCX	Heritage Small Cap A	13	15	35	10
HSOAX	HSBC Investor Opportunity	8	12	15	9
KNEMX	Fifth Third Small Cap	25	31	27	22
MGMCX	DWS Micro Cap	6	8	6	8
MMEAX	Munder Microcap A	5	6	11	6
MRSCX	Marshall Small Cap Growth	16	19	38	16
MSSGX	Morgan Stanley Small	7	5	9	12
NAGQX	Nicholas-Applegate Growth I	29	23	34	28
NSPAX	ING Small Cap A	26	16	8	31
OBEGX	Oberweis Emerging Growth	30	32	33	27
OPOCX	Oppenheimer Discovery A	37	37	24	33
ORIGX	Pioneer Oak Ridge Small Cap	9	14	13	5
PAGFX	Polynous Growth A	35	36	25	35
PGOFX	Pioneer Growth Opportunities	18	17	12	18
PGSGX	JPMorgan Small Cap Growth	10	13	18	7
PRCGX	Perritt Micro Cap	4	4	10	4
PRNHX	T. Rowe Price New Horizons	15	21	30	15
QUASX	AllianceBernstein Small Cap	38	38	31	37
SCGAX	BlackRock Small/Mid	19	22	7	20
SDSCX	Boston Company Small/Mid	20	18	17	23
SGWAX	SunAmerica Growth A	28	25	21	29
SSCGX	SEI Small Cap Growth	24	28	19	25
TASGX	Target Small Cap Growth	34	35	28	30
TGSCX	TCW Small Cap Growth I	31	29	5	34
TSCEX	Turner Small Cap Growth	22	20	20	24
TWNOX	American Century New	27	10	16	32
VWMCX	Van Wagoner Small Cap	36	26	23	38
WTSGX	Credit Suisse Small Cap I	33	34	26	36

Table 4 provides the sum of the 4 ranks for each fund from Table 3 and produces the overall accumulative ranking of each fund.

Table 4: Combined Rankings

Symbol	Name	Sum of	Overall
FMIOX	FMI Focus	9	1
BRUSX	Bridgeway Ultra-Small Co.	10	2
PRCGX	Perritt Micro Cap Opportunities	22	3
MGMCX	DWS Micro Cap	28	T4
MMEAX	Munder Microcap A	28	T4
HFCGX	Hennessy Cornerstone Growth	33	T6
MSSGX	Morgan Stanley Small Company	33	T6
ORIGX	Pioneer Oak Ridge Small Cap Growth	41	8
HSOAX	HSBC Investor Opportunity A	44	9
ARPAX	MTB Small-Cap Growth A	46	10
BCSIX	Brown Capital Small Co. I	47	11
PGSGX	JPMorgan Small Cap Growth A	48	12
PGOFX	Pioneer Growth Opportunities A	65	13
SCGAX	BlackRock Small/Mid Growth A	68	14
FRMPX	First American Small-Cap Growth A	70	15
HRSCX	Heritage Small Cap A	73	16
EGWAX	Evergreen Growth A	77	17
SDSCX	Boston Company Small/Mid Cap Growth	78	18
NSPAX	ING Small Cap A	81	T19
PRNHX	T. Rowe Price New Horizons	81	T19
TWNOX	American Century New Opportunities	85	21
TSCGX	Turner Small Cap Growth	86	22
MRSCX	Marshall Small Cap Growth	89	23
FISSX	First Investors Special Situations	92	24
SSCGX	SEI Small Cap Growth	96	25
TGSCX	TCW Small Cap Growth I	99	26
DTSGX	Wilshire Small Company Growth	100	27
SGWAX	SunAmerica Growth A	103	28
KNEMX	Fifth Third Small Cap Growth A	105	29
ARTSX	Artisan Small Cap Growth	106	30
NAGQX	Nicholas-Applegate Growth I	114	31
OBEGX	Oberweis Emerging Growth	122	32
VWMCX	Van Wagoner Small Cap Growth	123	33
TASGX	Target Small Cap Growth	127	34
WTSGX	Credit Suisse Small Cap I	129	35
OPOCX	Oppenheimer Discovery A	131	T36
PAGFX	Polynous Growth A	131	T36
QUASX	AllianceBernstein Small Cap Growth A	144	38
BMCGX	Apex Mid Cap Growth	156	39
FEFPX	Frontier MicroCap	160	40

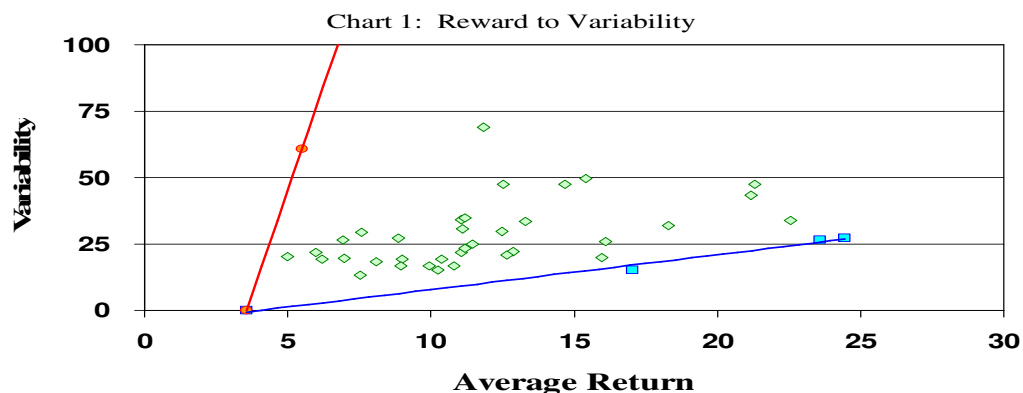
Findings

Of the forty funds studied over the ten-year performance horizon, 39 (97.5%) generated a higher return than the risk-free benchmark. Further, 27 (67.5%) generated a higher return than the Russell 2000 market benchmark. Group 2 is defined as those funds exceeding the Russell 2000 benchmark and Group 1 is defined as those funds not reaching the Russell 2000 benchmark – but exceeding the risk-free return. Table 5 provides the key statistical benchmarks.

Table 5: Benchmark Metrics by Result Category

Result Category	Statistic	Treynor	Sharpe	Jensen	R/V
Group 2 (n=27) Return > 9.48% Russell 2000 Benchmark	Mean	11.38	0.400	16.70	0.535
	Standard Deviation	4.67	0.182	10.36	0.212
	Minimum	6.31	0.119	2.00	0.171
	Maximum	23.12	0.879	38.00	1.113
Group 1 (n=12) Return > 3.57% Risk free return and < Russell 2000 Benchmark	Mean	3.98	0.177	27.42	0.344
	Standard Deviation	1.86	0.089	9.53	0.131
	Minimum	0.73	0.032	1.00	0.090
	Maximum	6.87	0.324	39.00	0.562

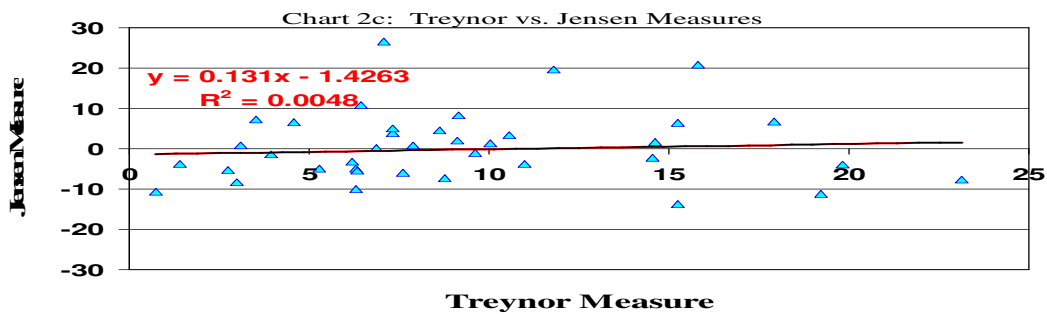
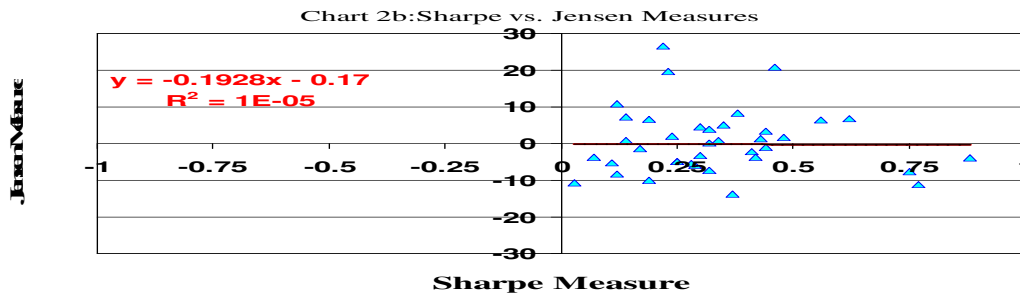
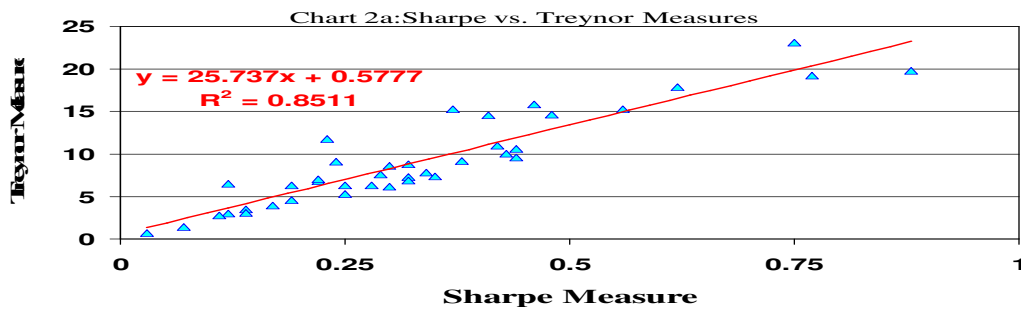
In Chart 1, we examine the results of the reward-variability by plotting the results of all 40 funds. However, the blue line shows that only three points/funds prove superior to the remaining 37 funds because the three funds all provide superior returns with less variability.



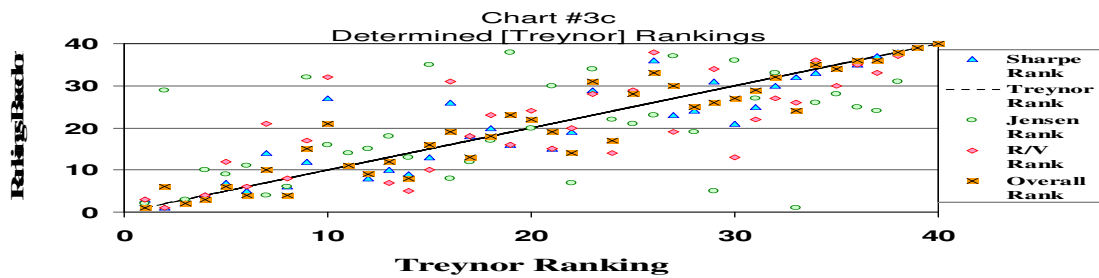
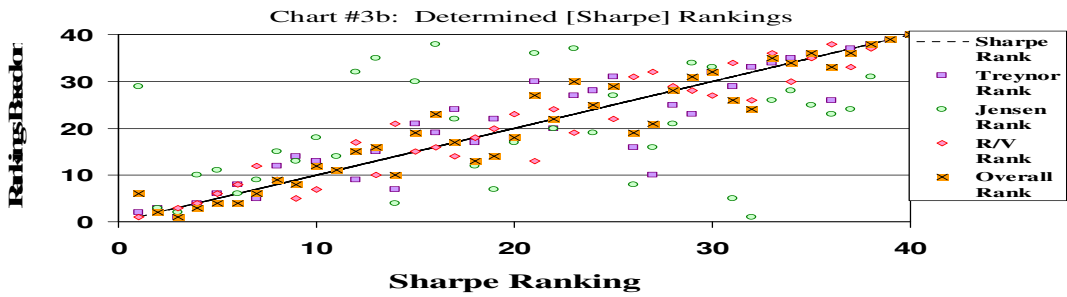
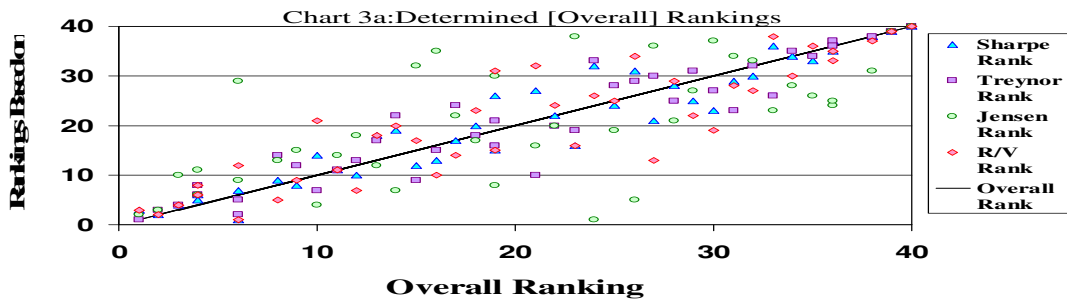
We examined the relationship between the three benchmarks to detect any evidence of correlation.² In all correlations, the data outlier, FEFPX, was excluded so as not to skew the

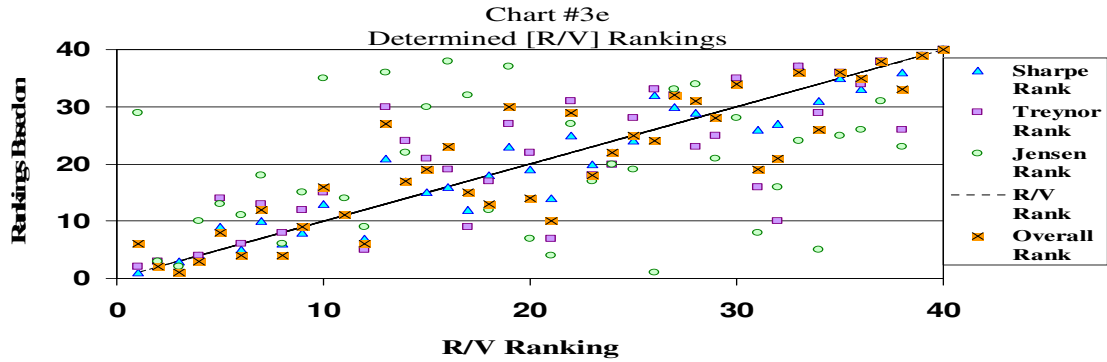
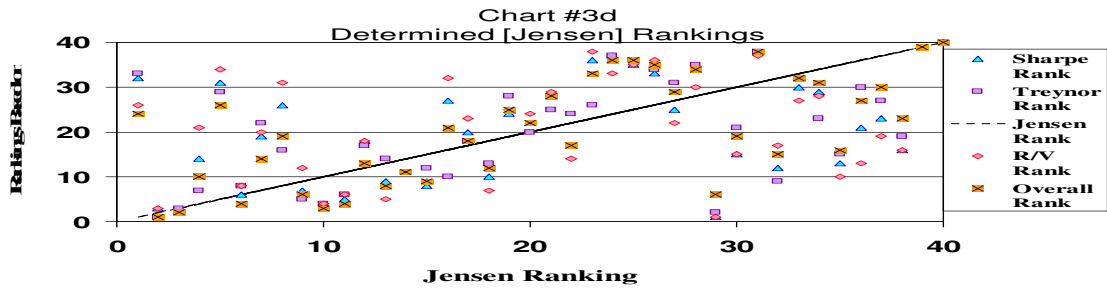
² For these three charts, the scatter diagram excluded the scatter point for Frontier MicroCap (FEFPX), so there are only 39 scatter points on these charts. The data for this fund appeared to be an anomaly, so it was excluded from this phase of the analysis.

results. Chart 2a shows a goodness-of-fit between the Sharpe and Treynor measures ($r^2 = 0.8511$) that is not surprising considering their formulaic closeness. However, as shown in Charts 2b and 2c, neither the Sharpe Measure, nor the Treynor Measure, seemed to indicate any fit with the Jensen Measure since both r^2 approached zero. When R/V was plotted against the three metrics no goodness-of-fit was detected.

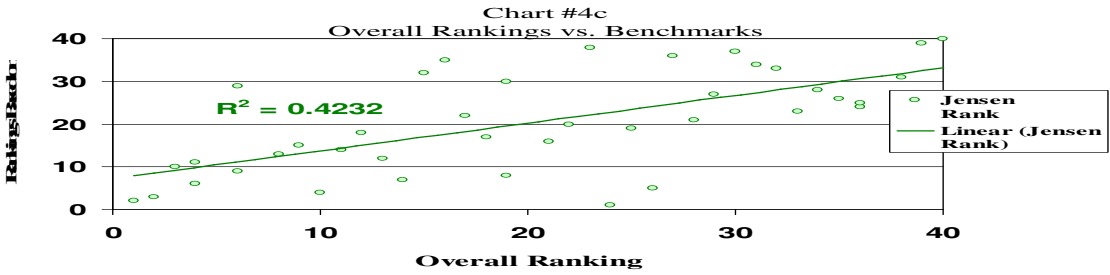
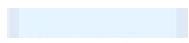
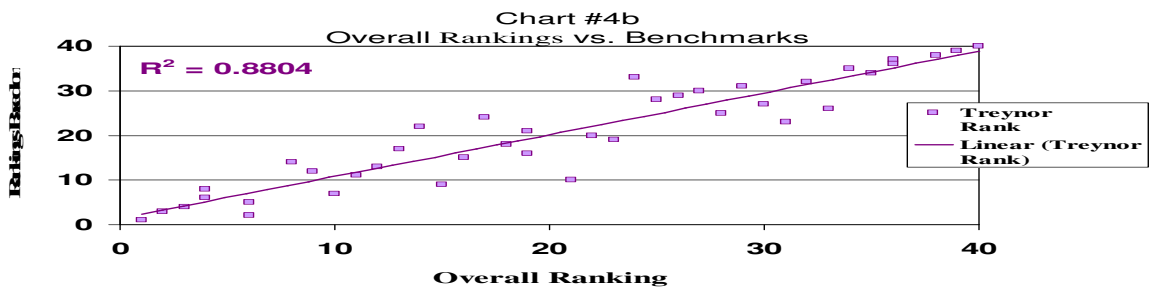
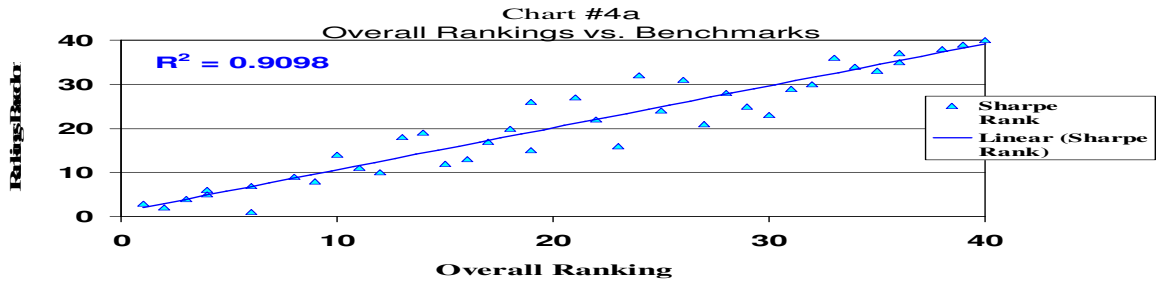


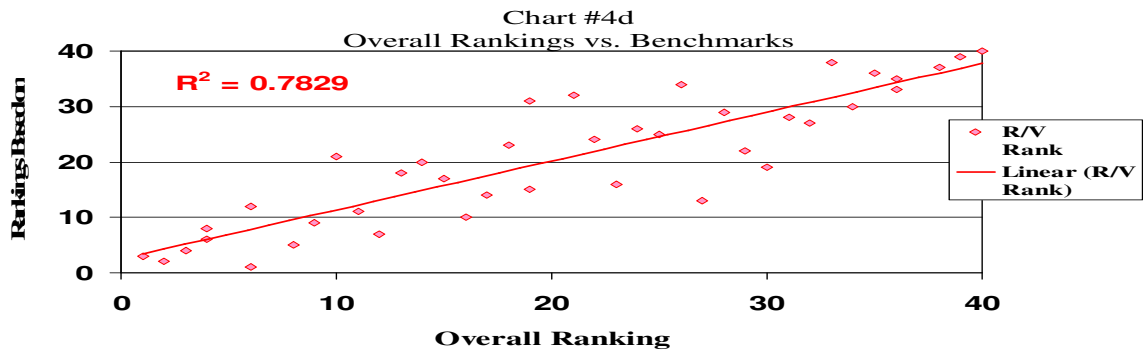
In Charts 3a-3e the benchmark rankings were shown against each other in a scatter diagram. Sharpe (1966) performed a similar exercise comparing the Reward-to-Variability Ratio to the Treynor Index. In this case, we have just expanded the comparison. The black line in these charts (with a slope of 1) is just a reference for where the x-axis and y-axis ranks are the same. (i.e., $y = x$)



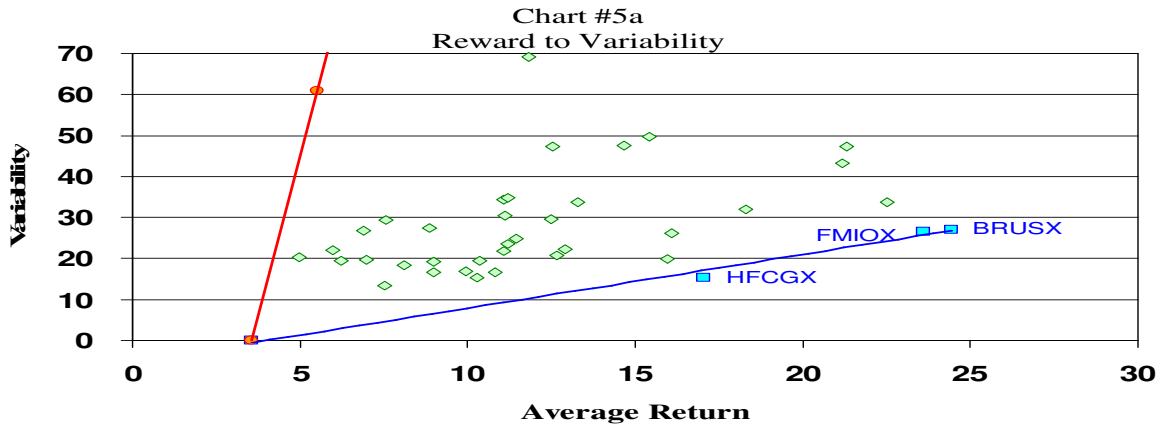


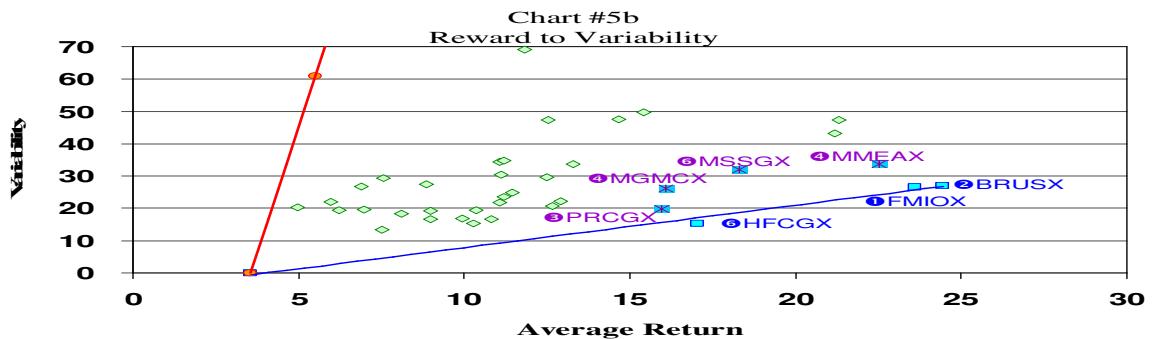
In Charts 4a-d each benchmark ranking was plotted against the overall ranking. A regression line and r^2 is provided. The Sharpe (Chart 4a) and Treynor (Chart 4b) ranks show a close fit with the final overall rank. ($r^2 = 0.9098$ and 0.8804 , respectively.) The R/V comparison (Chart 4d) showed an $r^2 = 0.7829$ – which is still a “fit.” The Treynor comparison (Chart 4c) showed the worst fit, with $r^2 = 0.4232$.





In Chart 5a, we return to Chart 1; however, we identify the three funds that provide the best reward-variability ratio. In Chart 5b, we show the rankings of these three funds. The two funds with the highest returns were also ranked 1 and 2 in the combined rankings; however, the third fund on this line was only rated 6. The other four intervening funds are also identified.





Conclusion

The efficient market hypothesis maintains that active investment management is pointless. Rather, an investor is better off deploying a passive investment strategy by utilizing a market index alternative. However, the existence of a significant mutual fund industry illustrates a belief to the contrary.

The results indicate that some excess returns have been generated; however, beyond a handful of the funds, it is impossible to rely upon a single benchmark as a reliable indicator of even past performance. A “portfolio approach” of combining the benchmarks does not seem to work any better. The evidence tends to support market efficiency since for the most part, the actively managed funds examined in this study produced returns that were largely expected.

Perhaps Coggin, Fabozzi and Rahman (1993) expressed the situation best. “We still do not know why some active managers are able to provide substantial, risk-adjusted performance, while many cannot. Identifying the characteristics of successful money managers should be one focus of future research. Furthermore, while there are some interesting statistical explanations, we still do not have a satisfactory substantive model of the relationship between the security selection and market timing skill of active equity managers. This is another fertile area for study.”

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