THE PERFORMANCE OF EQUITY MUTUAL FUNDS DURING BULL AND BEAR MARKETS

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ABSTRACT

We used three measures of portfolio performance to examine a large sample of domestic equity mutual funds, which has substantial variability in the size of assets under management. Over the study period, February 1990 to January 2010, we find that the average mutual fund outperformed the stock market as represented by S&P 500 index. Our findings are in line with the larger number of previous studies that reported a positive relation between fund size and portfolio performance. All three measures of portfolio performance tell us the same story, thus reinforcing one another.

We examine the portfolio performance again, by focusing on two separate periods marked by extreme market movements. The period from January 2003 to September 2007 was marked by excessive investor exuberance and the stock market rose substantially. The October 2007 to January 2010 period, on the other hand, was marked by extreme pessimism on the part of investors and the stock market declined appreciably. The results for the depressed years are substantially worse than those for the 2003 to September 2007 period, as indicated by the fund's excess returns.

However, when we adjusted the portfolio performance for market risk, the portfolio performance during the depressed years turned out to be remarkably better irrespective of the size of funds under management. Further, in each of the two sub-periods and for the sample as a whole,

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performance improved with the size of assets under management, suggesting that economies of scale indeed exist in mutual operations.

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I.   INTRODUCTON

Although the relation between the risk adjusted performance of actively managed equity mutual funds and the size of the fund's assets under management has been intensively studied over the past three decades, the empirical results are inconclusive. On the one hand, a few studies (Droms and Walker, 1994; Grinblatt and Titman, 1994), have determined that the investment performance of mutual funds is not related to the fund's size. Grinblatt and Titman found that performance is positively related to portfolio turnover, but not to the size of the mutual fund or its expenses. Droms and Walker studied a sample of international equity mutual funds and found that asset size and portfolio turnover are not related to investment performance.

A larger number of empirical studies, however, have found that economies of scale exist in mutual fund operations. These studies (Indro, et al., 1999; Jan and Hung, 2003; Collins and Mack, 1997; Baumol, et al., 1990; Sirri and Tufano, 1993; Dermine and Roller, 1992; Grinblatt and Titman, 1989; Loeb, 1983) have found that investment performance improves as assets under management gets larger. Grinblatt and Titman (1989) found that mutual funds with the smallest net asset values have the largest performance, although this advantage does not offer investors an opportunity to achieve abnormal performance, perhaps because of high transaction costs for this group of funds. Unlike their 1994 study which relies on net returns, Grinblatt and Titman (1989) used a sample of the 1975-84 quarterly holdings of a sample of mutual funds and estimates of gross returns to measure investment performance. Further, Sirri and Tufano (1993), Dermine and Roller (1992), Baumol et al. (1990), and Collins and Mack (1997), have determined that both economies of scale and economies of scope exist for mutual fund complexes.

Other studies have determined that, instead of economies of scale, diseconomies of scale in fact exist for equity mutual funds (Droms and Walker, 1994; Beckers and Vaughan, 2001; Dahlquist, 2000; Gorman, 1991; Perold and Salomon, 1991; Ciccotello and Grant, 2001; and Gallagher and Martin, 2005). According to Beckers and Vaughan (2001), success can be self-defeating in investment management, because as the amount of money under management increases, portfolio managers tend to lose flexibility and executing a desired trade takes longer or creates adverse market impact price moves. Consequently, it becomes harder to switch in and out of positions. Such loss of flexibility will inevitably impair portfolio performance, leading to diminishing returns to scale. According to Becker and Vaughan, fattening the goose that laid the golden egg eventually leads to an unhealthy and unproductive animal. Their empirical results indicate that when a mutual fund's size doubles, portfolio return is reduced by 0.5%. Beckers and Vaughan, contrary to Indro, et al. (1999) and Collins and Mack (1997), argue that there is no such thing as optimal size for a mutual fund, because the "potential to add value invariably drops as a fund grows," leading to a loss in efficiency. Beckers and Vaughan assert that net performance worsens with size, that "the race is to the small and nimble players," and that there is no cost advantage associated with size. For Swedish mutual funds, Dahlquist, et al. (2000), found that large equity funds perform less well than small equity funds, but that the opposite holds for bond funds.

Moreover, Perold and Salomon (1991) contended that there are diseconomies of scale in active management stemming from increased costs associated with larger transactions. "As assets under management increase, position sizes also increase, and the portfolio return as a percentage of assets declines.

With regard to other types of investment companies, Philpot, et al. (1998) and Dahlquist et al. (2000) found that economies of scale exist in bond funds. Dermine and Roller (1992) found that economies of scale and scope exist in money market mutual funds. However, Gregoriou and Rouah (2002) found that the size of a hedge fund or funds of hedge funds has no impact on its performance.

The purpose of the present study is to explore the relation between the performance of domestic equity mutual funds and the size of the funds' net assets, using a large sample that has substantial variability in the net

assets. Our study period is from February 1990 to January 2010—a period when the stock market changed from a very bullish phase to a markedly bearish period. We study the variability of mutual fund's performance over these two phases and the extent to which the observed variability relates to both the size of the fund and its investment objective.

II. DATA

We begin with a sample 2978 actively managed domestic equity mutual funds obtained from the Morningstar Principia Database. All of the mutual funds were randomly drawn from five investment objective categories, including Aggressive Growth (AG), Growth (G), Growth and Income (GI), Equity Income (EI), and Small Company (SC) categories. Excluded from the sample are Funds of Funds, Index Funds, Master Feeder Funds, Specialty Funds, and Money Market Funds. The sample consists of 1081 funds with total assets of less than $100 million, and 1897 funds with assets greater than $500 million. We used "total assets" to pull out the sample but opted to use "net assets" as the measure of fund size.

The statistical profile of the sample is shown in Table 1. The average fund in the sample has $515 million in net assets, with a large standard deviation of $1950 million. Thus the sample has substantial variability in the size of the funds--which facilitates our statistical analyses. The average fund has approximately 92% of its portfolio invested in domestic stocks, and less than 5% of the portfolio invested in foreign stocks or bonds. Moreover, the average mutual fund holds 142 stocks and has 27% of its portfolio invested in the top ten (TopTen) stocks it holds. The average expense ratio is 1.4% and the average portfolio turnover is 97%, suggesting that the average mutual fund purchases and replaces its stocks in approximately 12.3 months.

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Table 1. Sample Profile of Actively Managed Domestic Equity Mutual Funds
(February 1990 – January 2010)

Variable	N	Mean	Std. Dev.
Net Assets (mm)	2559	515.010	1950.550
U.S. Stocks %	2978	91.746	6.370
Non-US Stocks	2978	4.886	3.992
Bonds %	2978	0.227	1.199
Cash %	2978	2.739	4.055
Holdings	2978	142.000	177.000
Top-Ten %	2978	27.112	10.426
Expense Ratio	2978	1.405	0.559
Turnover %	2977	97.063	84.239

Note: N is the number of mutual funds with non-missing data; "Std. Dev." is short for "standard deviation;" and Top-Ten is the percentage of the mutual fund portfolio invested in the top ten companies held by the average mutual fund in the sample. Net Assets are in millions of dollars. Other investments are less than 1% of the fund's portfolio and are not shown in the Table.

Table 2 shows the sample profile again sorted by investment objective. Equity Income mutual funds have the largest average net assets of $865 million and the Small Company category has the smallest average net assets of $352 million. Portfolio holdings vary from $220 million for the Small Company group to $95 million for the Equity Income group. Moreover, the Small Company group has the highest expense ratio and the Equity Income group has the lowest expenses. The Equity Income group is the least diversified as suggested by the TopTen of 30% and the Small Company group is the most diversified in this regard. Finally, portfolio turnover varies from 140% for the Aggressive Growth category to 68% for the Growth and Income category.

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Table 2. Sample Profile Sorted by Investment Objective
(February 1990 - January 2010)

Objective	Net Assets	DOM	Bonds	Exp. Ratio %	Holdings	Turnover %	TopTen	N
AG	507.392	91.758	0.037	1.507	112	140.354	27.804	82
G	444.570	92.201	0.127	1.403	127	105.821	28.444	1804
GI	834.110	90.443	0.713	1.290	137	68.236	27.501	513
EI	865.933	87.769	0.475	1.288	96	69.350	30.006	117
SC	352.249	92.421	0.046	1.552	220	94.225	20.626	462
Sample	515.010	91.746	0.227	1.405	142	97.063	27.112	2978

Note: N is the number of mutual funds in the sample; Bonds is the percentage of the mutual fund's portfolio invested in bonds; DOM is the percentage of the portfolio invested in domestic common stocks; Holdings is the number of stocks held by the fund, on average; and TopTen is the percentage of the mutual fund's portfolio invested in the top ten stocks it holds. Net Assets are in millions of dollars. The relevant investment objective categories are: Aggressive Growth (AG), Growth (G), Growth and Income (GI), Equity Income (EI), and Small Company (SC).

Monthly mutual fund returns for the February 1990 to January 2010 sample period were extracted from the Morningstar Principia Database. The corresponding returns on the market, represented by the S&P 500 Index, as well as the monthly returns on three-months Treasury bills were also obtained from the Morningstar Database.

III.   METHODOLOGY

The risk-adjusted performance of the equity mutual fund is measured using the following model:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} , \qquad [1]$$

where, R_{it} is the excess return on fund i, in month t, i.e. the fund's return in excess of the 91-day Treasury bill rate; R_{mt} is the excess return on the S&P 500 index in month t; and ε_{it} is the residual return on fund i, in month t. Fund i's risk-adjusted performance is measured by Jensen's alpha, α_i.

Additionally, we measure the risk-adjusted performance again using the Sharpe Information Ratio, S_p, as suggested by Reilly and Norton (2006)

and Goodwin (1998). If "D_t" is the tracking error, that is, the difference in return between the portfolio and the benchmark (R_{pt}–R_{mt}) in period t, then:

$$S_p = \frac{\bar{D}}{\sigma_D},$$ [2]

where, $\bar{D}$ is the average value of the monthly differences in return between the portfolio and the benchmark, $\frac{1}{n}\sum_{t=1}^{n} D_t$; σ_D is the standard deviation of the differential returns, and n is the number of monthly returns. The t-statistic for the test of the null hypothesis that the excess returns over the market portfolio are zero, on average, is:

$$t = \frac{\bar{D}}{\sigma_D/\sqrt{n}},$$ [3]

where, σ_D is the standard deviation of the average excess return; and n is the number of observations. The t statistic has a t distribution with n-1 degrees of freedom.

As with Jensen's alpha, this performance measure indicates portfolio performance relative to the benchmark portfolio and lends itself to statistical tests of significance. However, unlike the Jensen's alpha, the Sharpe Information Ratio adjusts for total risk, rather than just systematic risk, and this is crucial to performance measurement because previous studies have shown that mutual fund portfolios, on average, contain significant idiosyncratic risks. Reilly and Norton (2006) and Goodwin (1998) argue that the Sharpe Information Ratio is a more general measure of portfolio performance than the traditional Sharpe measure.

IV. EMPIRICAL RESULTS

Of the 2978 equity mutual funds in the sample, 425 had missing net assets data and were eliminated from the analyses. Thus the final sample consists of 2553 domestic equity mutual funds. As shown in Table 3, four of the five investment objective categories, on average, have a positive and statistically significant Jensen's alpha. Thus, except for Aggressive Growth group, which tracks the market, the other four groups have outperformed the market over the 20 year sample period. Altogether, the 2553 funds as a single group have, on average, outperformed the market as measured by the S&P 500 index over the February 1990 to January 2010 period, since the

Jensen's alpha for the sample is 0.097 and is statistically significant. The average portfolio beta is close to unity, which indicates that the average domestic equity mutual fund had gyrated closely with the market over the 20 year period.

Table 3. Cross-Sectional Regressions of Monthly Excess Fund Returns on the Market Portfolio (February 1990 – January 2010)

Object	N	Jensen's Alpha	T-Statistics	Portfolio Beta	S_p	MeanD
AG	71	0.064	1.91	1.198	0.030	0 .119
G	1544	0.089	17.04*	1.016	0.030	0.113
GI	439	0.041	7.10*	0.896	0.003	0.020
EI	99	0.059	4.72*	0.811	0.004	0.020
SC	400	0.231	16.90*	0.979	0.070	0.242
Sample	2553	0.097	23.91*	0.984	0.031	0.114

Note: N is the number of funds in the sample; S_p is the average information ratio for the funds measured as given by Equation (2); and MeanD is the average tracking error for the mutual funds. The market portfolio is represented by the S&P 500 Index and monthly returns on 91-day Treasury bills are used in the calculation of excess returns. The regression equation is represented by Equation [1], as follows:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \,$$

where R_{it} is fund i's return in excess of 91-day Treasury bill yield; α_i is Jensen's alpha; and ε_{it} is fund i's residual return in month t. overall, from February 1990 to January 2010, 469 mutual funds--18.37% of the sample-- had significantly positive information ratios.

*Jensen's alpha is significantly different from zero at the 5% significance level.

As with the Jensen's alpha, the Shape information ratio indicates that the average fund had outperformed the market over the sample period, since the information ratio was positive for each investment objective category and for the sample. Moreover, four hundred and sixty nine funds (18.37% of the sample) had a positive and statistically significant information ratio. The average tracking error (MeanD) was positive for all categories and for the sample as a whole, thus supporting the results obtained by using the Jensen's alpha.

Next, we ranked the 2553 funds on the basis of their net assets and then formed ten portfolios based on these ranks. Panel A of Table 4 shows the average Jensen's alpha, portfolio beta, average net assets, and average monthly fund return in excess of the yield on 91-day Treasury bills. The first portfolio, which is associated with the lowest net assets, had the worst performance as indicated by the Jensen's alpha which is negative but not significant. As the portfolio gets larger, the performance gets better, and the largest portfolio has the best performance as indicated by the alpha of 0.188 which is statistically significant. All portfolios, on average, had a positive and statistically significant Jensen's alpha, with the exception of the first two portfolios which tracked the market as judged by the statistically insignificant alphas. What is remarkable about our results is that, as the portfolio grows in size, on average the performance gets better, thus economies of scale appear to be present. The fund's excess return over the Treasury bill yield (Exret) supports these findings. The alpha and the "Exret" estimates tell the same story.

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Table 4. Cross-Sectional Regressions of Monthly Excess Fund Returns on the Market Portfolio (February 1990 – January 2010)

Deciles	Jensen's α	T(α)	Portfolio Beta	N_Assets ($m)	Exret (%)
Panel A: Sample Averages (2/90 – 1/10)					
0	-0.019	-1.47	1.001	0.760	0.228
1	0.012	0.80	1.021	4.421	0.236
2	0.049	3.27*	1.010	12.338	0.303
3	0.083	5.95*	0.997	25.616	0.319
4	0.074	5.25*	0.982	46.969	0.373
5	0.099	7.45*	0.975	84.629	0 .391
6	0.156	11.25*	0.979	202.266	0.462
7	0.159	12.65*	0.954	462.324	0.459
8	0.167	12.24*	0.972	921.299	0.501
9	0.188	14.80*	0.942	4474.250	0.529
Panel B: The Good Years (2/90 – 9/07)					
0	-0.068	-4.49*	1.093	0.783	0.900
1	-0.066	-4.16*	1.117	4.416	0.901
2	-0.024	-1.47	1.137	12.277	0.982
3	-0.009	-0.56	1.111	25.692	0.962
4	0.001	0.07	1.119	46.848	0.995
5	0.019	1.22	1.082	84.167	0.977
6	0.101	6.58*	1.096	203.082	1.085
7	0.083	5.63*	1.080	461.449	1.050
8	0.117	7.55*	1.091	917.158	1.092
9	0.131	8.73*	1.047	4186.870	1.070
Panel C: The Bad Years (10/07 – 1/10)					
0	0.021	0.73	1.041	0.789	-0.968
1	0.070	2.33*	1.077	4.422	-0.953
2	0.095	2.99*	1.066	12.280	-0.918
3	0.139	4.68*	1.051	25.743	-0.860
4	0.176	5.62*	1.059	46.876	-0.830
5	0.145	5.02*	1.037	84.044	-0.841
6	0.192	6.30*	1.056	203.010	-0.812
7	0.232	7.97*	1.043	461.732	-0.759
8	0.213	6.98*	1.050	918.051	-0.784
9	0.214	6.82*	1.049	4177.15	-0.783

Note: Jensen's alpha and portfolio beta are measured for each fund using the regression equation [1]:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \text{ ,}$$

where, R_{it} is fund i's monthly return in excess of the monthly yield on 91-day Treasury bills; α_i is Jensen's alpha; β is the portfolio beta; R_{mt} is the market portfolio's monthly return in excess of the monthly yield on 91-day Treasury bills. The market portfolio is represented by the S&P 500 Index. Fund i's residual return in month t is measured by ε_{it}; N_Assets is the average net assets for the investment objective category (in millions of dollars); and Exret is the funds monthly return in excess of the T-bill yield.

*Jensen's alpha is significantly different from zero at the 5% significance level.

Our findings are in line with the mainstream literature including (Indro, et al., 1999; Jan and Hung, 2003; Collins and Mack, 1997; Baumol, et al., 1990; Sirri and Tufano, 1993; Dermine and Roller, 1992; Grinblatt and Titman, 1989; Loeb, 1983) who found that investment performance improves as assets under management gets larger. Our findings are contrary to some of the previous studies that found no relationship between assets under management and portfolio performance, and those studies that found that diseconomies of scale exist in mutual fund operations. We conjecture that these other studies were hampered by small sample sizes and very short study periods. Moreover, our findings are in line with Philpot, et al. (1998) and Dahlquist et al. (2000) who found that economies of scale exist in bond funds and Dermine and Roller (1992) who found that economies of scale exist in money market mutual funds.

Further, we repeated the statistical analyses by focusing on two separate periods marked by extreme movements in the stock market. January 2003 to September 2007 is a period during which the stock market participants were exuberant and the stock market moved up appreciably. The average return on the portfolio, in excess of the Treasury bill yield (Exret), shown in Panel B of Table 4 indicates that mutual fund performance was markedly better for this period than for the October 2007 to January 2010 period (Panel C) when investors were pessimistic and the stock market declined substantially. In this latter period, the variable "Exret' was negative for all portfolios. However, when we adjusted

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portfolio performance for the market (beta) risk, the risk adjusted (relative) performance turned out to be surprisingly positive and statistically significant for nine of the ten portfolios, as indicated by the Jensen's alpha in Panel C. The performance of the first portfolio was also positive and good since the portfolio tracked the market. Moreover, the portfolio beta, on average, was no larger in the depressed period than it was in the positive market environment of the 2003 to 2007 period.

V.   SUMMARY AND CONCLUSIONS

We used three measures of portfolio performance to examine a large sample of domestic equity mutual funds, which has substantial variability in the size of assets under management. Over the study period, February 1990 to January 2010, we find that the average mutual fund outperformed the stock market as represented by S&P 500 index. Our findings are in line with the larger number of previous studies that reported a positive relation between fund size and portfolio performance. All three measures of portfolio performance tell us the same story, thus reinforcing one another.

Moreover, we examine the mutual fund performance again, by focusing on two separate periods marked by extreme market movements. The period from January 2003 to September 2007 was marked by excessive investor exuberance and the stock market rose substantially. The October 2007 to January 2010 period, on the other hand, was marked by extreme pessimism on the part of investors and the stock market declined appreciably. Our results for the depressed years are substantially worse than those for the 2003 to September 2007 period, as indicated by the fund's excess returns. However, when we adjusted the portfolio performance for market risk, the portfolio performance during the depressed years turned out to be remarkably better irrespective of the size of funds under management. Further, in each of the two sub-periods and for the sample as a whole, performance improved with the size of assets under management, suggesting that economies of scale indeed exist in mutual operations.

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