



DOES MUTUAL FUND SIZE MATTER?

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- Do actively managed mutual funds outperform indexes of the same risk?
- Do mutual fund managers have information?

	1986 1995 270 funds	1999 2009 1,900 funds
alpha	-0.65	-0.66
Fees	1.25	1.18
Added value before fees	0.60	0.52

- In earlier studies we found that managers' past performance is predicative of future performance.

CAN THERE BE PREDICTABILITY?

- Management of mutual funds is not priced. A fund managed by a good manager will sell at net asset value. A fund managed by a bad manager will sell at net asset value.

GENERALIZED RULE

- While the market for securities is almost efficient, the market for managers is not efficient.

- Berk and Green 2004: there cannot be superior performance or any predictability

- 1) Managers capture all excess performance in fees
- 2) Good managers have large amounts of cash flow, their funds under management will grow, and there are diseconomies of scale
 1. Higher transaction costs
 2. Accepting inferior investments
 3. Span of management control

- Pollett and Wilson: management overwhelmingly reacts to increases by placing new inflows in existing securities. A doubling of size increases the number of stocks held by less than 10%
- What happens to trading costs and size:
 - Keim & Madhavan (1995) - up
 - Edelen, Evans and Kadlec (2002) – up
 - Christofferson, Keim and Musto (2006) – down
 - Chan, Faff, Gallagher, and Looi (2009) – no impact
- We observe return after trading costs so to the extent that trading costs go up with size - the effect is incorporated in our data.

- We agree with Berk and Green that some of their influence may be important. But even if important the time span for their influences to become important is sufficiently long that predictability still exists.
- Specifically we find size does not destroy predictability over horizons which are sufficiently long to be important.

SAMPLE

- All domestic common stock funds in the CRSP database for the period 1999-2009
- No international funds, index funds, sector funds, life cycle funds, flexible funds and funds backing variable annuity products.
- For total assets all asset classes combined. Returns are for the fund with the longest lived asset class.
- In each year for predicting the future eliminated funds with:
 1. Less than \$15 million in assets
 2. Existed for less than 3 years
 3. Had an R^2 with the model less than .60

ALL KNOWN AT TIME OF FORECAST

- Final sample more than 3,000 funds and 17,500 fund years.

DISTRIBUTION BY FUND SIZE

PANEL A

SAMPLE YEAR	NUMBER OF FUNDS	AVERAGE TNA (Millions)
1999	1,377	\$1,798.2
2000	1,539	\$1,565.4
2001	1,680	\$1,302.7
2002	1,711	\$1,021.4
2003	1,843	\$1,302.7
2004	1,890	\$1,485.8
2005	1,894	\$1,600.5
2006	1,919	\$1,795.3
2007	1,940	\$1,901.2
2008	1,950	\$1,135.9
All Years	17,743	\$1,488.5

PANEL B

TNA Range (Millions)	Percentage of Funds in Range (All Years)
\$15<\$50	14.8%
\$50<\$100	13.4%
\$100 <\$250	20.5%
\$250<\$500	14.8%
\$500<\$1,000	13.7%
\$1,000<\$2,000	9.6%
\$2,000<\$4,000	6.0%
\$4,000<\$10,000	4.7%
\$10,000<\$20,000	1.4%
>=\$20,000	1.2%

QUESTIONS OF INTEREST

- a) Do funds outperform indexes of same risk
- b) Is there predictability in performance
- c) Do funds that perform well in the past produce positive future alpha
- d) Does size affect performance and predictability of performance
- e) What is the relationship between performance and future expense and management fees
- f) What variables affect future performance and how important is past performance among this set of variables
- g) Some preliminary results from a new study of separate accounts

MODELS AND METHODOLOGY

All of the models we use for forecasting and evaluation are multi-index models of the form

$$R_i - R_f = \alpha_i + \sum_{j=1}^N \beta_{ij} I_j + \varepsilon_i$$

1. R_i is the return on the fund.
2. R_f is the return on the 30-day Treasury bill rate.
3. I_j is the excess return on an index. It is either the return on a single portfolio minus the return on the 30-day T-bill or the difference in return of two portfolios.
4. β_{ij} are sensitivity coefficients.
5. α_i is the measure of performance.
6. ε_i is the random error.

MODELS USED

1. Fama French (market, size, growth vs. value)
2. Fama French plus bonds
3. Fama French plus momentum
4. Fama French plus momentum plus bonds

Source

1. French website
2. Barclays government - corporate

FOR ALL MODELS

- Computed α in ranking year and formed deciles
- Examined α in subsequent year for each decile
- Used weekly data in estimation

Example:

Ranking year 2000 – estimate α and placed in 10 deciles by α in the ranking year

Evaluation year 2001 – computed α for all funds in each decile

**AVERAGE EVALUATION ALPHAS FUNDS ARE RANKED BY THE FIVE-FACTOR
(CARHART PLUS BOND) MODEL**

Decile	Carhart 4-Factor Plus Bond Factor 5- Factor Model Evaluation Alpha
Decile 1 (lowest)	-0.048
Decile 2	-0.027
Decile 3	-0.020
Decile 4	-0.021
Decile 5	-0.016
Decile 6	-0.015
Decile 7	-0.011
Decile 8	-0.003
Decile 9	0.004
Decile 10 (highest)	0.030
Spearman Corr.	0.988
p -value	<.0001

- Note that the top decile has a positive alpha. What is the probability that this could occur by chance
- Performed simulation
- Each year divided funds into 10 groups randomly. Computed the alpha for each of the 10 groups. Did this 1000 times. The probability of getting an alpha as high as we found for decile 10 is considerably less than 1%.

- **Not only do we find predictability across deciles - the top decile did about 1.5% per year better than index funds**

EVALUATION ALPHAS WHEN FUNDS ARE RANKED BY SIZE

Ranked within objective category by
Relative size **Carhart Bond Plus model**
(17,743 fund years)

Rank	TNA computed relative to category size	Evaluation alpha	Exp. ratio	Turnover
Decile 1	0.016	-0.018	1.37	1.032
Decile 2	.035	-0.015	1.29	0.957
Decile 3	.061	-0.013	1.24	0.934
Decile 4	.102	-0.019	1.25	0.989
Decile 5	.161	-0.011	1.25	0.954
Decile 6	.256	-0.019	1.19	0.901
Decile 7	.417	-0.008	1.14	0.858
Decile 8	.701	-0.013	1.10	0.795
Decile 9	1.352	-0.005	1.04	0.755
Decile 10	6.900	-0.007	0.93	0.590

Overall Avg -0.013
Rank Correlation 0.624
P-value 0.054

SOME ADDITIONAL METHODOLOGY

- Dimson & Marsh (non-synchronous trading)

Lead and Lag indexes by 1 period

$$\beta_{ij} = \text{sum of 3 betas}$$

- Christopherson, Ferson and Turner (conditional beta)

For each index add a term index times the lagged dividend yield and the lagged short term interest rate

$$\alpha_t = \alpha + \gamma_1 (\text{lagged dividend yield}) + \gamma_2 (\text{lagged short term interest})$$

ADDITIONAL EVALUATION ALPHAS

Decile	Carhart 4-Factor Plus Bond	DM Correction	FS Correction
1	-0.048	-0.05	-0.056
2	-0.027	-0.025	-0.027
3	-0.020	-0.017	-0.022
4	-0.021	-0.017	-0.021
5	-0.016	-0.015	-0.017
6	-0.015	-0.014	-0.016
7	-0.011	-0.013	-0.012
8	-0.003	0.004	0.005
9	0.004	0.002	0.000
10	0.030	0.032	0.017
Spearman Corr.	.988	.988	1.00
P- value	<.0001	<.0001	<.0001

MORE EVALUATION ALPHAS

Rank	Fama French 3-Factor	Carhart 4-Factor Model	Fama French 3-Factor plus bond factor (4-factor)
Decile 1	-0.064	-0.049	-0.061
Decile 2	-0.032	-0.026	-0.032
Decile 3	-0.022	-0.019	-0.024
Decile 4	-0.023	-0.018	-0.026
Decile 5	-0.019	-0.014	-0.021
Decile 6	-0.022	-0.014	-0.022
Decile 7	-0.013	-0.010	-0.014
Decile 8	-0.007	-0.005	-0.005
Decile 9	-0.001	0.000	0.004
Decile 10	+0.026	0.019	0.037
Spearman Correlation	0.976	0.988	0.976
P- value	<.0001	<.0001	<.0001

**EVALUATION ALPHAS WHEN FUNDS ARE RANKED AND
EVALUATED BY 5-FACTOR (CARHART PLUS BOND) MODEL
(RANKING YEARS 1999-2008)**

	BOTTOM HALF OF TNA	TOP HALF OF TNA	TNA >= \$500 million	TNA >= \$1 billion	TNA >= \$8 billion
Rank	Alpha	Alpha	Alpha	Alpha	Alpha
Decile 1	-0.054	-0.043	-0.034	-0.029	-0.032
Decile 2	-0.024	-0.026	-0.022	-0.020	-0.022
Decile 3	-0.030	-0.010	-0.012	-0.016	-0.017
Decile 4	-0.024	-0.016	-0.014	-0.013	-0.012
Decile 5	-0.021	-0.019	-0.018	-0.018	0.009
Decile 6	-0.013	-0.016	-0.010	-0.014	-0.002
Decile 7	-0.011	-0.006	-0.008	-0.006	-0.005
Decile 8	-0.010	-0.002	0.003	0.007	-0.008
Decile 9	0.009	0.003	0.001	-0.004	0.009
Decile 10	0.026	0.034	0.030	0.027	0.028
Overall Avg.	-0.015	-0.010	-0.008	-0.009	-0.005
Fund Years	8,872	8,872	6,492	4,063	615
Rank Corr.	0.9636	0.9152	0.9394	0.9273	0.8303
p - Value	<.0001	0.0002	<.0001	0.0001	0.0029
Avg Size	108	2,867	3,750	5,563	21,780

AVERAGE EXPENSE RATIOS AND MANAGEMENT FEES

FUND GROUP	EXPENSE RATIO	MANAGEMENT FEE	DIFFERENTIAL
Overall	1.18	0.71	0.47
Bottom ½ of TNA	1.28	0.73	0.55
Top ½ of TNA	1.09	0.70	0.39
TNA >= \$500 million	1.04	0.67	0.37
TNA >= \$1 billion	0.99	0.64	0.35
TNA >= \$3 billion	0.90	0.57	0.33
TNA >= \$8 billion	0.79	0.49	0.30

CHANGE IN EXPENSE RATIOS AND CHANGE IN MANAGEMENT FEES REGRESSED ON CHANGE IN SIZE

Variable	Total Funds	No. Sig Positive	No. Sig Negative	No. Positive	No. Negative
CHANGE IN EXPENSE RATIO	953	15	78	259	666
CHANGE IN MANAGEMENT FEE	953	28	32	410	495
CHANGE IN DIFFERENTIAL	953	8	86	263	690

This table shows the number of coefficients that are positive and the number that are negative, along with the number that are statistically significant at the 5% level when changes in expense ratios, changes in managements fees, and changes in those parts of expense ratios net of management fees are regressed on changes in fund size (TNA). Differential is expense ratio minus management fee. Changes and percentage changes are calculated using coincident and 1-year lagged values.

$$\Delta E = a + b \Delta \text{ size}$$

**AVERAGE CHANGE IN EXPENSE RATIO IN YEARS
FOLLOWING RANKING YEAR WHERE FUNDS ARE
RANKED BY ALPHA**

Decile	1 Year	2 Year	3 Year
1	0.0144	0.0155	0.0066
2	0.0070	0.0043	-0.0005
3	0.0054	0.0031	-0.0001
4	0.0018	0.0011	0.0004
5	-0.0004	0.0027	0.0029
6	0.0021	-0.0046	0.0007
7	0.0017	-0.0024	0.0040
8	-0.0043	0.0036	-0.0035
9	-0.0052	-0.0012	-0.0049
10	-0.0217	-0.0059	-0.0057

Regression Results

- The dependant variable we examine is the average weekly evaluation alpha in any year. We explain this alpha using the following set of variables:
 1. The average weekly alpha for a fund in the prior year (ranking alpha).
 2. The percent cash flow to the fund in the preceding year. Cash flow is defined as the total net assets at the end of a year minus the beginning total net assets times one plus the rate of return on the fund, all divided by the beginning total net assets (TNA).
 3. The size of the fund. This is measured as the log of TNA of the fund at the end of the prior year.
 4. The expense ratio of the fund in the prior year.
 5. The turnover ratio in the prior year.
 6. Family size in the prior year. Family size is measured by the aggregate of the TNA of all the funds in a fund family minus the TNA across all share classes of the fund being examined.

**REGRESSION OUTPUT FROM REGRESSING EVALUATION
ALPHAS ON LISTED VARIABLES
(OBJECTIVE AND SAMPLE YEAR DUMMY VARIABLES INCLUDED IN
REGRESSIONS)**

<u>Model Obs</u>	<u>Adj Rsq</u>	<u>Interce pt</u>	<u>Rank Alpha</u>	<u>Cash Flow Percent</u>	<u>In Portno Tna</u>	<u>Exp Ratio</u>	<u>Turn Ratio</u>	<u>Diff Log Size</u>
Reg 1	0.168	0.04475	0.1192	-0.00008	-0.00029	-1.56556	-0.01033	0.00068
T VALUE		6.32	16.44	-3.06	-0.44	-6.64	-8.82	1.28
Reg 2	0.168	0.04908	0.119	-0.00008	-0.00044	-1.6142	-0.01017	
T VALUE		7.88	16.44	-3.11	-0.68	6.64	-8.73	
Effects of a 1-Standard- Deviation Change for Regression 2			0.01874	-0.00348	-0.00058	-0.00809	-0.00896	

**REGRESSION OUTPUT FROM REGRESSING EVALUATION ALPHAS
ON LISTED VARIABLES
(OBJECTIVE AND SAMPLE YEAR DUMMY VARIABLES INCLUDED IN
REGRESSIONS)**

Dependent Variable Is First Year Evaluation Alpha

Adj. R-Square	Intercept	Ranking Alpha	Cash Flow %	Log TNA	Expense Ratio	Turnover Ratio	Family Size Differential
0.2145	0.02257 (3.00)	0.1802 (23.53)	-0.00011 (-3.95)	-0.00081 (-1.15)	-1.5654 (-6.18)	-0.0092 (-7.58)	0.00039 (0.67)

Dependent Variable Is Average of First and Second Year Evaluation Alphas

Adj. R-Square	Intercept	Ranking Alpha	Cash Flow %	Log TNA	Expense Ratio	Turnover Ratio	Family Size Differential
0.14566	0.00183 (0.34)	0.0753 (13.67)	-0.00009 (-4.46)	-0.00092 (-1.82)	-1.8159 (-9.96)	-0.0113 (-12.96)	0.00085 (2.05)

Dependent Variable Is Average of First, Second and Third Year Evaluation Alphas

Adj. R-Square	Intercept	Ranking Alpha	Cash Flow %	Log TNA	Expense Ratio	Turnover Ratio	Family Size Differential
0.12108	0.01228 (2.83)	0.0279 (6.32)	-0.00008 (-4.82)	-0.0003 (-0.75)	-1.7974 (-12.31)	-0.0099 (-14.19)	0.00125 (3.76)

1. First and foremost, the regressions are statistically significant and they all show forecasting ability.
2. The coefficient of determination goes down from 0.21 to 0.15 to 0.12.
3. The importance of past alphas in explaining future alphas decreases. However, even for the case of a three-year forecast, past alpha is still statistically significant at the 0.01 level and a one standard deviation change in past alpha has an impact on the three-year alpha of 23 basis points per year.
4. The importance of both expense ratio and turnover ratio increases as we forecast for longer horizons. The t value of each of these variables increases, as does the impact of a one-standard deviation change in each of these variables.
5. The impact of cash flows does not change in importance, and remains statistically significant.
6. Portfolio size is not significant in any case.
7. The importance of family size increases with longer horizons. It is not significant in the one-year case, but becomes statistically significant for the two- and three-year case.

CONCLUSIONS:

- There is a strong relationship between past and future alphas
- The best performing funds produce positive future alphas
- Growth in fund size erodes predictability, but slowly
- Size is not as important as past speculation would suggest
- Why doesn't performance and predictability disappear for large funds --
 - a) we know expense ratios go down with size
 - b) while size and particularly fund flow due to success lead to either larger trades or more investments, large funds may gain better analysts (they can pay more) or command the best resources of the fund family to which they belong

Separate Accounts

SAMPLE

- All separate accounts listed on Morningstar Direct

Table 1 – Characteristics of Separate Accounts and Mutual Funds

Panel A, Part 1 – Combined Separate Accounts

	Aggregate Size of Account (in thousands)	Number of Customers in an Account	Minimum Investment (in thousands)	Number of Stock Holdings	% Assets in Top 10	Expense Ratio %	Turnover %
Median	152,410	12	5,000	63	28.8%	0.81%	60.6%
10%	3,090	2	100	32	16.2%	0.44%	22.5%
25%	25,000	4	1,000	43	22.2%	0.61%	35.8%
75%	692,000	45	10,000	97	35.9%	0.98%	95.6%
90%	2,091,200	187	25,000	164	44.0%	1.53%	145.1%

Panel A, Part 2 – Mutual Funds

	Aggregate Size of Mutual Fund (in thousands)	Minimum Investment (in thousands)	Number of Stock Holdings	% Assets in Top 10 Stocks	Expense Ratio %	Turnover %
Median	403,703	1,000	79	26.3%	0.93%	85.4%
10%	17,279	1,000	41	14.7%	0.65%	35.0%
25%	95,115	1,000	56	20.6%	0.79%	53.7%
75%	1,032,196	5,000	114	32.9%	1.10%	120.3%
90%	2,533,428	5,000	195	41.8%	1.27%	169.0%

Table 2

Panel A, Separate Account Alphas

<u>Manager-Preferred Benchmark</u>	<u>Number of Funds</u>	<u>Manager-Preferred Benchmark Alpha</u>	<u>Best-Fit Alpha</u>	<u>5-Factor Model Alpha</u>
Large-Cap Growth	337	0.0898	-0.0335	-0.1019
Large-Cap Blend	677	0.0887	0.0087	-0.0351
Large-Cap Value	265	0.0871	0.0505	0.0481
Mid-Cap Growth	182	0.0860	0.0125	-0.0329
Mid-Cap Blend	154	0.0472	0.0527	0.0308
Mid-Cap Value	110	0.0814	0.1021	0.0971
Small-Cap Growth	186	0.1020	0.0332	-0.0633
Small-Cap Blend	185	0.1198	0.0713	-0.0355
Small-Cap Value	153	0.1687	0.1551	0.0865
Other	70	0.0997	0.0156	0.0086
Overall Manager-Preferred	2319	0.0945	0.0318	-0.0174
Overall Entire Sample	2627		0.0324	-0.0202

REASONS FOR DIFFERENCE

1. Note that any benchmark can be explained in part by multi-index model
2. When separate accounts are regressed on an index relative sensitivity to each factor is fixed and equal to the beta on the benchmark times beta on the factor
3. Thus differences in alphas are determined by differences in the sensitivity to the factors using the multi-index and the implicit sensitivity using the manager designated index

WHAT WERE PRINCIPAL DIFFERENCES

1. Greater market sensitivity than indicated by manager's benchmark
2. Tilted smaller than indicated by manager's benchmark
3. Funds designated as growth had more value tilt than indicated by manager's benchmark
4. Momentum is zero for any index but manager designated growth accounts had positive loading