

THE PERFORMANCE OF MUTUAL FUNDS THAT CLOSE TO NEW INVESTORS

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Abstract

We examined mutual funds that closed to new investors for the period 1995 to 2001. We found that closed funds outperformed their peers before closing and that this superior performance decreased after the fund closed. We also investigated the performance of funds that reopened, a sample never before examined. We found that this group of funds performed similarly to those that didn't reopen, outperforming their peers before closure but underperforming while closed. We also found that the funds that reopened performed significantly worse after reopening than before closing. While our sample was small, these results suggest that funds that close to new investors do not maintain the competitive advantage they seek to protect by closing. They also are unable to recover their advantage by reopening.

Introduction

A large number of academic studies have examined mutual fund performance during the past forty years. One area that has received little attention, however, is the behavior of mutual funds that close to new investors. Do mutual funds that close perform better or worse after they close? Should investors stay in funds that close or seek to invest in such funds just before closing? While these issues have been raised

in the financial press,¹ hard evidence is limited. Our goal in this study was to provide some hard evidence using a sample of funds that closed during the period 1995 to 2001.

When a mutual fund closes its doors to investors, it can choose to close to all investors or only to investors not already in the fund. Further, the decision to close a mutual fund need not be permanent. Mutual funds often reopen after closing, with some funds opening and closing several times. The meteoric rise of the NASDAQ and other financial markets in the 1990s brought with it a significant increase in the number of mutual funds that closed to new investors. Fund closings grew as markets rose, but reopenings became more common as markets subsequently declined.

Funds state various reasons for closing, but the most common is to limit the fund size to maintain some operational advantages. Management argues that once a fund reaches a certain size, it may become more difficult to manage effectively, and, more important, it may become more difficult to achieve relatively high returns. This argument applies especially to small-cap funds, which, not surprisingly, make up a large portion of our sample. Size is the typical reason stated for fund closure, but it doesn't appear that funds of given types find particular sizes ideal. We found that many funds closed before they reached the average size of their peer group,

while other funds were several times larger than their peer-group average before closing.

If a fund closes to maintain an operational advantage, its performance after closing should be similar to or better than it was before closing. Manakyan and Liano appear to have published the only academic study about this topic. They examined twenty-seven funds that closed from 1982 to 1994.² They found that funds that closed to new investors outperformed peer funds before closing and performed similarly to their peers after closing. The Manakyan and Liano results suggest that the stated objective of closing a fund to maintain performance is not met.

The Manakyan and Liano sample is limited due to the small number of funds that closed during their window of investigation. As they point out, many more funds closed to new investors after they finished their study and before it was published, and a number of funds even reopened.

In this study, we extended and updated the Manakyan and Liano analysis by examining mutual funds that closed to new investors between 1995 and 2001. We used research methods similar to those of Manakyan and Liano to investigate fund performance both before and after closing. We appear to be the first to examine mutual funds that reopened to new investors. Our results about the performance of closed funds are consistent with Manakyan and Liano. We also found that funds performed worse than their peers after reopening to new investors.

Research methods

We compiled a list of mutual funds that closed to new investors by calling and emailing fund families and asking for the dates and names of any funds that had closed. We also collected information about funds that reopened. Every fund family responded, although the information given was based upon the knowledge of the spokesperson. We found several additional funds that had closed but were not reported in the phone calls or emails. Fund performance and characteristics were gathered from the Center for Research in Security Prices (CRSP) *Mutual Fund Database*. We classified each fund in our sample according to its Strategic Insight (SI) investment objective code

(as identified by CRSP) on the fund closing date. We then obtained a set of peer funds from the database consisting of all other funds with the same SI code. Because the SI code first appeared in 1995, our sample included funds that closed to new investors beginning in January 1995 and ending in December 2001. This period provided us with a database of funds that, for the most part, has not been examined in prior studies.

Strategic Insight has more than 170 mutual-fund categories. Because we chose to include only equity funds, our sample has eighteen categories. Table 1 shows the SI categories of funds in our sample, as well as the number of funds in each category.

TABLE 1

This table shows Strategic Insight fund categories and category abbreviations for mutual funds in our sample. The number of funds in each category in our sample is also shown. All funds are equity funds.

SI CATEGORY	ABBREVIATION	NUMBER OF FUNDS IN SAMPLE
Aggressive growth	AGG	7
Balanced	BAL	1
Global growth	EGG	3
Global small cap	EGS	1
Global equity sector	EGX	1
International growth	EIG	5
International small cap	EIS	3
Latin America equity	ELT	1
Principal return funds	EPR	1
Flexible	FLX	2
Mid cap growth	GMC	1
Growth & income	GRI	7
Growth	GRO	17
Health sector	HLT	1
Income-growth	ING	1
Natural resources	NTR	1
Small company growth	SCG	24
Technology sector	TEC	1

Our statistical tests of fund performance required an adequate number of observations before and after either closing or reopening. We therefore excluded funds that did not have twelve months of data both before and after either closing or reopening. Although it is possible to use a longer period both before and after fund closing, it would have severely limited our sample size. Manakyan and Liano examined a limited set of

funds for the thirty-six months before and after closings and found results that are similar to the plus/minus one-year window. Given the lack of significant difference with the longer time frame, we restricted our analysis to plus or minus twelve months to maximize sample size. We further limited our sample to stock funds, then divided it into funds that have closed and not reopened and funds that have closed and reopened. Our final sample consists of fifty-eight funds that closed and did not reopen and twenty funds that closed and reopened.

For each fund in our sample, we identified a time-matched set of peer funds with identical SI objectives and available data that did not close. This means each fund in the sample has a different peer group, even for funds in the same category. The peer-group sample was equally weighted for all fund variables. Excess returns were calculated using the equally weighted return for the peer group.

We first examined the size of the mutual funds at closing and reopening. The most common reason given for fund closure is that the fund has grown too large to manage effectively. Because the optimum size may vary by fund objective, we examined each closed fund by comparing its size to its peer set at the end of the month it closed.

Another fund characteristic that may affect, or be affected by, fund closure is fund flows. Fund flows are a measure of new money into the fund. Because this variable is not available in the data set, we estimated fund flows as:

$$\text{Inflows}_t = \text{End of period } t \text{ assets} - \text{Beginning of period } t \text{ assets} - (\text{beginning of period } t \text{ assets} \times \% \text{ increase in NAV during period } t) \quad (1)$$

The dollar value of inflows is not of interest because the effect of inflows is likely to depend on fund size. For example, a \$50 million inflow may mean little to a fund with \$20 billion in assets, but may overwhelm a fund with \$100 million in assets. Therefore, we standardized fund inflows by dividing the inflow during the period by the beginning of period assets of the fund.

Second, we examined fund performance before closing, after closing, and, where appropriate, after reopening. To do so, we used four well-known measures of risk and performance commonly used with

mutual funds: the Sharpe ratio, the Treynor ratio, Jensen's alpha, and the Fama-French alpha.

The Sharpe ratio is defined as:

$$\frac{R_p - R_f}{\sigma_p} \quad (2)$$

where R_p is the average monthly return of the fund, R_f is the corresponding monthly risk-free rate, and σ_p is the standard deviation of monthly fund returns. The Sharpe ratio is a reward-to-risk ratio that measures the excess return relative to the total risk of the portfolio.

The Treynor ratio is the portfolio's excess return divided by the beta coefficient:

$$\frac{R_p - R_f}{\beta_p} \quad (3)$$

The Treynor ratio measures the reward-to-risk ratio for a fund concentrating only on its systematic or market risk.

Jensen's alpha is the return of a portfolio minus the predicted return from a "CAPM" regression estimate. More formally:

$$\alpha_p = R_p - [R_f + \beta_p(R_m - R_f)] \quad (4)$$

where R_p is the return on the fund, R_f is the risk-free rate, R_m is the return on the market portfolio, and β_p is the estimated beta of the fund. Jensen's alpha is interpreted as the excess return earned by the fund.

Our final performance measure is similar to Jensen's alpha, but uses the three factors examined in Fama and French.³ The Fama-French alpha is calculated as:

$$\alpha_p = R_p - (R_f + b_p \text{ RMRF} + s_p \text{ SMB} + h_p \text{ HML}) \quad (5)$$

where RMRF is the excess return of the market portfolio, and SMB ("small minus big") and HML ("high minus low") are returns on zero-investment, factor-mimicking portfolios for the size effect and book-to-market effect, respectively.⁴

We examined changes in Jensen's alpha and the Fama-French alpha using two dummy variables. The first is equal to zero before a fund's closing and equal to one while it is closed. This allows a direct test of the relative performance of the fund before and after closing. If the dummy alpha is positive, the fund experienced an

increase in excess return, and if the dummy alpha is negative, the excess return decreased. Our second dummy is zero before a fund's reopening and one after it reopens, and it is interpreted similarly as the change in excess return after reopening.

We also tested for a potential look-ahead bias. Our alpha estimates assumed that the betas of a fund are the same before and after a fund closes. We also estimated alphas with a dummy variable for the betas pre-closing and post-closing. Although not reported here, the estimates from these regressions generally indicate that fund betas do not change around fund closing for funds in our sample.

Survivorship bias is a problem that arises in almost all mutual-fund research. The overall effect of survivorship bias is to increase the average mutual-fund return. We alleviated the problems caused by survivorship bias by using only those funds that have survived as our control sample. In other words, by comparing survivors to survivors, any bias will tend to net out.

Results

The tables that follow contain the results of the analysis of our sample. We first examine the funds that closed but did not reopen, then examine the funds that did reopen.

Funds that closed but didn't reopen

Our sample consisted of fifty-eight funds that closed and did not reopen. Of these funds, twenty-five were load funds. When the funds closed, only one decreased its front-end load; one other increased its front-end load. After closing, the expense ratio decreased at sixteen funds, stayed constant at eight funds, and actually increased at the remaining thirty-four. The average expense-ratio increase for these thirty-four funds was fifteen basis points. Perhaps more interesting are changes we found in the 12b-1 fees, which originally were designed to pay for marketing and distribution costs. Assuming a fund closes because it does not want additional investments, we would expect that the 12b-1 fee would decline, because the marketing effort should be curtailed. In fact, none of the funds decreased the 12b-1 fee, and two funds actually increased the 12b-1 fee.

Table 2 provides a list of closed funds, including the fund ticker, SI objective, relative size ratio, fund flows pre- and post-closing, and the peer-group size. We computed the relative size by dividing a fund's total net assets in the month it closed by the average size of the peer set of funds with matching SI objectives. For funds that closed multiple share classes simultaneously, we report the results for only Class A shares because we don't want to count the same fund manager multiple times.

It is apparent from table 2 that fund size (relative to peer funds) is a factor. Thirty-seven of the fifty-eight funds in the sample had a size ratio greater than one, meaning these funds were larger than the average fund in their objective category. At the same time, the fact that twenty-one funds were the same size or smaller than their peers when they closed suggests that size is not the only consideration.

Table 2 also reports the standardized inflows for twelve months before fund closing and twelve months after fund closing. Forty of the fifty-eight funds had positive inflows in the twelve months before closing, and eighteen funds had net outflows. After closing, only twenty-two funds had positive inflows in the next twelve months. Only eight funds experienced an increase in fund flows after closing. Interestingly, all eight funds experienced net outflows before closing. For five of the eight funds, the net outflows decreased. For the three funds that had increased fund flows after closing, fund flows after closing were actually positive in contrast to the net outflow in the twelve months before closing.

The number of funds with inflows after closing is somewhat surprising, but even more interesting is the number of funds with relatively large inflows after closing. Because the funds are closed to new investors, fund inflows can only be caused by current shareholders' new investments. It appears that closing a fund does not necessarily affect the decisions of existing shareholders to invest in these funds.

The number of funds in the peer group for each closed fund is listed in the last column. One fund, the Kemper Target 2010 Fund, had only one other fund in its peer group. The peer group, principal return funds, is a small fund category. The next smallest peer group had thirty-one funds. The largest peer group had 1,576 funds. The average peer group size was 603 funds.

TABLE 2

This table shows relative size, standardized inflows, and the number of peer-group funds for the funds that closed and did not reopen. The relative size is the size of the fund divided by the average size of all funds in the category in the month of closing. The pre-close and post-close columns show the standardized flows to the fund relative to the fund size for the year before closing and for the year after closing. The peer-fund column shows the number of funds used for the peer-group analysis.

FUND NAME	TICKER	OBJ	RELATIVE SIZE	PRE-CLOSE FLOWS	POST-CLOSE FLOWS	PEER FUNDS
Fidelity Magellan Fund	FMAGX	GRO	142.01	-13.18	-1.28	993
Janus Investment Fund:Janus Fund	JANSX	GRO	78.55	14.37	-8.42	1576
Janus Investment Fund:Worldwide Fund	JAWWX	EGG	61.77	42.74	-8.51	204
RS Investment Trust:Emerging Growth	RSEGX	SCG	25.95	329.4	-0.74	760
Janus Investment Fund:Global Life Sciences	JAGLX	EGX	14.62	1304.33	-16.42	121
Janus Investment Fund:Olympus Fund	JAOLX	GRO	13.55	122.18	-14.1	1546
Scudder Latin America Fund	SLAFX	ELT	13.40	-13.9	-15.43	31
Janus Investment Fund:Overseas Fund	JAOSX	EIG	12.31	84.7	-1.10	369
T Rowe Price Intl Fund:Discovery Fund	PRIDX	EIS	11.28	131.55	-21.21	65
Lord Abbett Developing Growth Fund	LAGWX	SCG	8.20	50.42	-6.24	678
Dreyfus Founders Funds:Discovery Fund	FDISX	SCG	6.48	75.57	-7.80	769
Dreyfus Growth & Value Fds:Emerging Leaders	DRELX	SCG	5.94	264.79	20.66	764
GE S&S Program:Mutual Fund	GESSX	GRI	5.75	-8.59	-2.79	1086
Founders:Large Cap Growth	FRGRX	GRO	5.67	0.57	-41.16	1499
Fidelity New Millennium Fund	FMILX	GRO	3.35	135.52	-4.13	799
Monetta Fund	MONTX	SCG	3.26	341.19	-14.04	155
Dreyfus Founders Funds:Passport	FPSSX	EIS	3.15	16.05	10.19	64
Berger Small Cap Value Fund/Investor	BSCVX	SCG	2.62	177.57	70.83	753
Dreyfus Founders Funds:Balanced Fund	FRINX	BAL	2.55	-13.74	-37.28	466
Van Kampen Series Fd:American Value Fund	MSAVX	SCG	2.38	36.06	0.12	678
Nationwide Invest Found III Fund	MUIFX	GRI	2.36	19.05	8.31	775
Dreyfus Gro & Value Fds:Small Co Value Fund	DSCVX	SCG	2.33	634.77	-30.4	585
Dreyfus Premier Third Century Fund	DRTHX	GRO	2.30	3.21	-3.18	1374
MAS Funds:Small Cap Value Portfolio	MPSCX	SCG	2.26	64.23	17.81	238
JPMorgan Select Small Cap Equity Fund	VSSCX	SCG	2.17	-10.7	-10.26	857
CGM Capital Development Fund	LOMCX	GRO	1.74	3.95	0.74	518
State Street Research:Capital Fund	SCFBX	AGG	1.50	-22.45	-29.53	259
SteinRoe Investment Trust:Growth Stock Fund	SRFSX	GRO	1.38	10.23	-3.37	1001
MFS New Discovery Fund	MNDAX	AGG	1.27	189.11	53.70	272
Weitz Series Fund:Hickory Portfolio	WEHIX	GRO	1.26	1543.22	28.39	1200
State Street Research:Strategic Grth & Inc	SSRMX	FLX	1.25	9.28	-19.56	174
IDEX:JCC Global Portfolio	IGL BX	EGG	1.24	36.59	-19.51	204
BlackRock Small Cap Growth Equity/Serv	PCGEX	SCG	1.22	-18.63	20.92	669
Strong Advisor Small Cap Value Fund	SSMVX	SCG	1.22	368.89	103.24	772
Caldwell & Orkin Market Opportunity Fund	COAGX	FLX	1.21	177.02	4.37	158
State Street Research:Investment Trust	SITBX	GRI	1.16	32.24	-6.42	888
Standish:Small Capitalization Equity Fund	SDSCX	SCG	1.14	14.64	-8.29	400
American Century:New Opportunity	TWNOX	GRO	0.99	-2.24	4.67	1363
Chesapeake Growth Fund	CPGRX	GRO	0.89	309.15	39.54	617
Wasatch Funds:Micro Cap Fund	WMICX	SCG	0.85	-16.41	13.64	753
Kemper Global Discovery Fund/S	SGSCX	EGS	0.83	-14.04	-13.33	32
Kemper Target 2010 Fund	KRFAX	EPR	0.80	-21.87	-9.32	1
Salomon Brothers Investors Fund	SAIFX	GRI	0.78	-7.78	-7.37	583
State Street Research:Global Resources Fund	SSBGX	NTR	0.75	3.75	-29.47	62
TIP Funds:Turner Small Cap Growth Fund	TSEX	SCG	0.66	95.65	35.43	503
Dreyfus Founders Funds:Growth & Income	FRMUX	GRI	0.6	-13.9	-10.18	956
Brandes Intl International Equity Fund	BIIEX	EIG	0.49	179.54	11.55	369
ASAF Janus Overseas Growth Fund	JOGAX	EIG	0.44	508.58	-15.57	458
Dreyfus Founders Funds:Worldwide Growth	FWWGX	EGG	0.43	-31.13	-18.63	200
Strong Advisor US Value Fund	SEQIX	ING	0.41	28.45	-3.81	208
State Street Research:Emerging Growth Fund	SCGBX	SCG	0.34	29.62	-20.58	689
Salomon Brothers Capital Fund	SACPX	GRO	0.33	-3.95	1.07	820
Bridgeway Fund:Ultra Small Company Portfolio	BRUSX	SCG	0.17	558.95	31.83	486
State Street Research:Growth Fund	SCFBX	GRO	0.1	-6.97	3.84	1352
Dreyfus Founders Funds:International Equity	FOIEX	EIG	0.08	17.65	8.81	456
State Street Research:International Equity	SSNBX	EIG	0.07	-13.2	-17.16	435
Dreyfus Premier Large Company Stock Fund	DEIRX	GRI	0.04	67.26	26.79	712
Bridgeway Fund:Aggressive Growth Portfolio	BRAGX	AGG	0.02	57.02	7.27	226

TABLE 3

Table 3 provides Sharpe and Treynor ratios for the funds that closed and did not reopen for the twelve months before closing and the twelve months after closing. We also show the Sharpe and Treynor ratios for peer funds in the same category for the twelve months before the fund's closing and the twelve months after closing.

FUND TICKER	OBJ	SAMPLE FUNDS				COMPARABLE FUNDS			
		PRE-CLOSE SHARPE	POST-CLOSE SHARPE	PRE-CLOSE TREYNOR	POST-CLOSE TREYNOR	PRE-CLOSE SHARPE	POST-CLOSE SHARPE	PRE-CLOSE TREYNOR	POST-CLOSE TREYNOR
FMAGX	GRO	1.8136	0.2321	0.2746	0.0511	1.8311	-0.1208	0.2740	-0.0265
JANSX	GRO	1.6841	-1.7102	0.3146	-0.3594	1.2612	-1.9074	0.2207	-0.3899
JAWWX	EGG	1.8943	-1.2999	0.4296	-0.2938	0.9841	-1.1781	0.1782	-0.2686
RSEGX	SCG	3.0911	-0.9257	1.0422	-0.2300	2.3857	-0.7010	0.6123	-0.1655
JAGLX	EGX	0.9730	-0.1483	1.8097	-0.0489	1.8616	-0.8033	0.3444	-0.1838
JAOLX	GRO	1.5920	-1.2742	0.4227	-0.2892	0.8401	-0.8833	0.1377	-0.1960
SLAFX	ELT	-0.3850	-0.1442	-0.1018	-0.0301	-0.4896	-0.2084	-0.1253	-0.0418
JAOSX	EIG	1.2314	0.1055	0.1906	0.0340	0.7557	-0.0381	0.1165	-0.0106
PRIDX	EIS	6.8159	-1.9242	1.8066	-0.4936	4.5871	-2.2569	1.1770	-0.6140
LACWX	SCG	1.7981	0.0902	0.2913	0.0204	1.2789	0.9440	0.2297	0.2321
FDISX	SCG	1.1611	-1.2317	0.2918	-0.2813	1.2212	-0.8902	0.3001	-0.2000
DRELX	SCG	0.8921	-0.0293	0.2229	-0.0075	0.8755	0.0256	0.2114	0.0060
GESSX	GRI	-0.3559	-0.8114	-0.0900	-0.1772	-0.4577	-0.8260	-0.1005	-0.1766
FRGRX	GRO	1.5740	-0.9459	0.2543	-0.2005	1.3916	-0.5062	0.1975	-0.0984
FMILX	GRO	3.5765	0.6720	0.3392	0.1132	3.8134	0.9772	0.2219	0.1457
MONTX	SCG	-0.8550	0.1691	-0.1046	0.0187	0.2492	0.8811	0.0223	0.0890
FPSSX	EIS	2.4784	-0.7849	0.6042	-0.3362	3.6853	-0.7046	0.8772	-0.2290
BSCVX	SCG	0.7501	1.5868	0.2201	0.5050	2.6744	-0.9196	0.5569	-0.2278
FRINX	BAL	-1.1921	-0.6468	-0.2299	-0.1264	0.5478	-0.2560	0.0784	-0.0519
MSAVX	SCG	2.1532	0.0108	0.3817	0.0034	1.6557	1.2188	0.2835	0.3046
MUIFX	GRI	3.8447	0.3162	0.5612	0.0779	2.2819	0.2217	0.3113	0.0518
DSCVX	SCG	2.1542	-0.5172	0.4631	-0.1295	2.1884	-0.5278	0.3999	-0.1241
DRTHX	GRO	2.4583	0.7580	0.3779	0.1453	2.2820	0.8168	0.3300	0.1529
MPSCX	SCG	0.8074	0.9466	0.0974	0.1162	0.0121	2.0958	0.0013	0.2391
VSSCX	SCG	0.3151	-0.2351	0.0804	-0.0517	0.1091	-0.5000	0.0261	-0.1098
LOMCX	GRO	3.2588	0.0003	0.3011	0.0000	1.9585	-0.1725	0.1345	-0.0168
SCFBX	AGG	0.2429	0.9227	0.0575	0.1568	0.3688	1.8768	0.0855	0.3180
SRFSX	GRO	1.3921	0.3045	0.2180	0.0698	1.8394	-0.0572	0.2764	-0.0128
MNDAX	AGG	2.3663	-0.5251	0.6354	-0.1242	2.2831	-1.1051	0.5406	-0.2546
WEHIX	GRO	3.1189	0.3275	0.6812	0.1059	0.5287	0.4332	0.0694	0.1015
SSRMX	FLX	0.1693	0.3620	0.0397	0.0614	0.4572	0.3701	0.1050	0.0581
IGLBX	EGG	1.5147	-2.1513	0.3896	-0.4473	0.9605	-2.0841	0.1868	-0.4397
PCGEX	SCG	2.2331	-0.0205	0.4142	-0.0071	1.2226	0.2877	0.2195	0.0716
SSMVX	SCG	1.4965	0.5707	0.3910	0.1886	0.8564	-0.5236	0.1929	-0.1298
COAGX	FLX	3.9300	0.0987	-6.4383	-0.0776	0.4645	0.2444	0.0613	0.0574
SITBX	GRI	1.0322	0.6568	0.2380	0.1035	0.5486	0.2913	0.1261	0.0460
SDSCX	SCG	0.3390	0.8706	0.0525	0.2071	0.8172	0.8751	0.1116	0.1811
TWNOX	GRO	3.8964	0.2243	0.7915	0.0604	1.4829	0.0191	0.2124	0.0049
CPGRX	GRO	0.5038	1.0711	0.0669	0.0995	-0.4210	3.8114	-0.0437	0.2254
WMICX	SCG	2.6140	0.6254	1.0485	0.1945	2.6744	-0.9196	0.5569	-0.2278
SGSCX	EGS	1.8482	-0.0363	0.3306	-0.0088	0.9523	-0.4279	0.1583	-0.1061
KRFAX	EPR	0.4942	-0.9296	0.0970	-0.4168	0.7610	-1.4927	0.1524	-0.3825
SAIFX	GRI	3.4032	1.6394	0.3663	0.2684	1.9380	1.6825	0.1875	0.2723
SSBGX	NTR	-1.1535	0.1299	-0.3597	0.0854	-0.9156	0.8063	-0.2672	0.2935
TSCEX	SCG	0.7025	-0.6934	0.1151	-0.1595	1.5220	-0.8491	0.2583	-0.1972
FRMUX	GRI	0.6649	-1.1019	0.1134	-0.2197	0.7626	-0.3351	0.1114	-0.0754
BIEX	EIG	0.3690	2.2186	0.0931	0.4879	-0.0814	2.4405	-0.0223	0.4880
JOGAX	EIG	3.3486	-2.2311	0.8098	-0.5394	2.1934	-2.2799	0.3740	-0.5606
FWWGX	EGG	2.1785	-0.9872	0.4238	-0.2374	1.9347	-0.9309	0.3005	-0.1946
SEQIX	ING	0.1271	-1.1835	0.0271	-0.2926	0.0678	-0.7979	0.0239	-0.1931
SCGBX	SCG	-0.2466	1.3503	-0.0587	0.2486	-0.1998	1.1595	-0.0465	0.2231
SACPX	GRO	3.1434	1.9864	0.3723	0.3427	1.3422	1.4260	0.1301	0.2322
BRUSX	SCG	0.2260	0.8239	0.0388	0.2274	-0.0718	1.1159	-0.0128	0.1925
SGFBX	GRO	0.6270	1.4638	0.1467	0.2491	0.6179	0.9497	0.1416	0.1464
FOIEX	EIG	2.4676	-0.8474	0.4851	-0.2621	2.2300	-1.4118	0.4018	-0.3444
SSNBX	EIG	0.9356	1.8920	0.2765	0.4263	0.3562	1.5018	0.0990	0.2803
DEIRX	GRI	1.4649	1.0163	0.2331	0.2323	1.3351	0.6167	0.2079	0.1412
BRAGX	AGG	1.0163	0.6925	0.2181	0.1752	1.0776	0.5533	0.1626	0.1301

Table 3 shows the Sharpe and Treynor ratios for all closed funds that did not reopen along with their time-matched peer averages for these ratios. In each case, fund performance measures were computed before and after closing.

The Sharpe ratios indicate that forty-five of fifty-eight funds, or 78 percent, had a higher Sharpe ratio before closing than after. This percentage is statistically greater than 50 percent, based on a standard binomial proportions test ($p < 0.0001$). Interestingly, the performance for peer funds was similar. Forty-four of the fifty-eight time-matched peer funds also had a higher average Sharpe ratio before the reference fund closed. This result suggests that, at least for this measure, the performance of closed funds is not that different from that of peer funds that don't close.

When we looked at the closing funds' performance compared with their peers', we found that thirty-nine of the fifty-eight funds, or 67 percent, outperformed their peers before closing. After closing, the number of closed funds that had a higher Sharpe ratio than their peers dropped to thirty-one, or about half. Nine funds never outperformed their peers, while twelve outperformed their peers both before and after close. Thus, while more than half of the funds outperformed their peers before closing, only about one-half were able to maintain that performance afterward. It appears that while the performance of the peer group declined when the matched fund closed, the performance of the closing fund declined more.

We found similar results using the Treynor ratio. Thirty-five of fifty-eight funds had a Treynor ratio greater before closing than after ($p < 0.0001$). For peer funds, the Treynor ratio was higher before the closing date for forty-one of fifty-eight peer groups. Forty-five funds outperformed their peers before closing while thirty did so after closing. Twenty-four outperformed their peers both before and after closing while seven never outperformed their peer group. Again, these results suggest that while funds may outperform their peers before closing, they do not maintain that superior performance after closing.

We next computed Jensen's alpha for our sample funds; the results are shown in table 4. Only thirteen of the estimates for Jensen's alpha were significant at the 10-percent level, and five of these alphas were negative.

TABLE 4

This table shows Jensen's alpha, the market model (MM) dummy alpha equal to zero when the fund is open and otherwise equal to one, the Fama-French (FF) alpha, and the Fama-French dummy variable equal to zero when the fund is open and otherwise equal to one. The regressions are estimated for twelve months before closing and twelve months after closing. The results shown are for the funds that closed and did not reopen.

TICKER	JENSEN'S ALPHA	MM DUMMY	FF ALPHA	FF DUMMY
FMAGX	-0.002	0.0027	0.0026	0.0017
JANSX	0.0077	-0.0192*	0.0145**	-0.0261**
JAWWX	0.0281**	-0.0407*	0.0231***	-0.0300***
RSEGX	0.0522	-0.0619	0.0252*	-0.0018
JAGLX	0.0489	-0.0374	0.017	0.0075
JAOLX	0.0298*	-0.0499**	0.0208*	-0.0298*
SLAFX	0.0095	0.0006	0.0048	-0.0125
JAOSX	-0.0057	0.001	-0.0011	0.0009
PRIDX	0.0798***	-0.1022***	0.0618***	-0.0647***
LAGWX	0.0024	-0.0082	0.0069	-0.0075
FDISX	0.0217	-0.0198	0.0322	-0.0138
DREXL	0.0128	0.0004	0.0088	0.0088
CESSX	0.0066	-0.008	0.0088**	-0.003
FRGRX	0.002	-0.0138	0.0022	-0.0024
FMILX	0.0077	-0.0154	-0.0015	0.0016
MONTX	-0.0139**	0.0144	0.0011	0.0012
FPSSX	0.0353	-0.0508	0.0263*	-0.0303
BSCVX	0.0045	0.0284*	0.0166	0.0061
FRINX	-0.0161***	0.0155*	-0.0133**	0.0155
MSAVX	0.0048	-0.0086	0.0094	-0.0129
MUIFX	0.0078	-0.0083	0.0095*	-0.0089
DSCVX	-0.0122	-0.0121	-0.0091	0.0141*
DRTHX	0.004	-0.0002	0.0080*	-0.0002
MPSCX	0.0068	-0.0113	0.005	-0.0053
VSSCX	0.0141	-0.0025	0.0234**	-0.0098
LOMCX	0.0056	-0.0048	-0.0058	0.0041
SCFBX	-0.0129	0.0131	-0.0067	0.0052
SRFSX	-0.0047	0.005	0.0017	-0.002
MNDAX	0.0302	-0.0159	0.0173	0.0107
WEHIX	0.0305**	-0.0301*	0.0356***	-0.0302*
SSRMX	-0.006	0.004	-0.0005	0.0004
IGLBX	0.0191	-0.0322	0.0176*	-0.0291**
PCGEX	0.0119	0.0065	0.0089	0.0141
SSMVX	0.0216	0.0036	0.0233*	-0.0065
COAGX	0.0264***	-0.0206**	0.0282***	-0.0231**
SITBX	0.0036	-0.0056	0.0056*	-0.0045
SDSCX	-0.0108	0.007	-0.0007	0.0019
TWNOX	0.012	0.0238	0.0248	0.0081
CPGRX	0.0115	-0.0315	0.0161*	-0.0233
WMICX	0.0256	0.0047	0.0091	0.0325**
SGSCX	-0.0085	-0.0016	0.0003	0.0029
KRFAX	0.0067	-0.0038	0.008	0.0006
SAIFX	0.0108**	-0.0105**	0.0120***	-0.0155***
SSBGX	-0.0707**	0.0673	-0.0529	0.0762
TSCEX	-0.0279**	0.0152	0.0077	-0.009
FRMUX	-0.007	-0.0026	-0.0038	0.0019
BIEX	0.0012	0.0072	0.0068	0.0104
JOGAX	0.0466***	-0.0781***	0.0274**	-0.0385**
FWWGX	0.0148	-0.0251	0.0127*	-0.0145
SEQIX	0.0016	-0.0035	0.0067**	0.0003
SCGBX	-0.0303**	0.0422**	-0.01	0.0152
SACPX	0.0119**	-0.0078	0.0122***	-0.0150***
BRUSX	-0.0106	0.0029	0.01	-0.0057
SCFBX	-0.003	0.0092	0.0004	0.0024
FOIEX	0.023	-0.0306	0.0195**	-0.0193
SSNBX	0.0042	0.0156	0.0106	0.0043
DEIRX	0.0016	0.0003	0.0048**	-0.0021
BRAGX	-0.0124	0.0146	0.0083	0.0098

* significant at 10% **significant at 5% ***significant at 1%

For the dummy alphas measuring the change in excess return when the fund is closed, eleven were statistically significant, with eight dummy alphas significant and negative. Perhaps more interesting is the number of negative alphas overall. Only seventeen of the fifty-eight Jensen's alphas were negative. However, when we examined the dummy alphas, we found that thirty-four, or more than half, were negative after closing, indicating a decline in excess returns.

We also show the Fama-French alphas in table 4. Twenty-four of these were significant at the 10-percent level before closing, with only one significant and negative. Twelve of the Fama-French dummy alphas were significant, and ten of those were significantly negative. Overall, thirty-one of the dummy Fama-French alphas were negative after closing, again indicating that more than half the funds declined in performance.

Taken together, the regression results corroborate the results for the Sharpe and Treynor measures. It appears that funds that close typically perform better before they close and worse afterward. Thus, even though the commonly stated objective for closing a fund is to maintain some competitive advantage, the evidence suggests that funds generally are unable to do so. At a minimum, nothing significant indicates that funds are able to improve their performance by closing. Thus, we see no evidence that existing fund shareholders benefit from closings; if anything, they might be worse off. Also, management companies forgo the fees that would have been generated by new fund assets, so they don't appear to benefit from closing either.

Funds that reopened

Our sample of funds that closed and subsequently reopened included twenty funds. Five of these funds are load funds. None of the funds changed their load structure between closing and reopening. Four funds decreased the expense ratio, one fund kept a constant expense ratio, and fifteen funds increased the expense ratio. The average increase in the expense ratio for these funds was seventeen basis points. Again, no fund decreased its 12b-1 fee, while two funds increased the 12b-1 fee while closed.

As with our previous group of funds, we limited our sample to those that had at least twelve months of

returns before closing and at least twelve months of returns after reopening. This left a sample of only twenty funds that closed and subsequently reopened during our sample period. We examined these funds using the same methods as in our previous section.

Table 5 shows the relative size, standardized fund flows, and peer-group size of the funds in our sample. Nineteen of the twenty funds were larger than their peers when they closed to new investors and remained larger than their peers when they reopened. Eight of the twenty funds, however, were relatively smaller when they reopened than at close.

Eighteen funds had a positive fund flow in the twelve months before closing. Consistent with our previous sample, fourteen funds had a net outflow while closed. Only one fund had a greater inflow after closing than before closing. After reopening, nine funds had positive fund flows in the next twelve months, while eleven funds had negative fund flows.

The smallest peer group for funds in this sample had five funds, while the largest peer group had 1,170 funds. The average peer-group size for this sample was 466 funds.

Table 6 shows the Sharpe and Treynor ratios for the reopened fund sample. For thirteen funds, the Sharpe ratio decreased when the fund closed. For five funds, the Sharpe ratio decreased at each step, from opened, to closed, to reopened. Perhaps most interesting is that for seventeen of the funds, the Sharpe ratio declined when the fund reopened. Twelve funds had greater Sharpe ratios than the peer groups before closing, ten funds had greater Sharpe ratios than the peer groups while closed, and only seven had greater Sharpe ratios when reopened. Four funds had greater Sharpe ratios than the peer groups during all three periods, while two funds had lower Sharpe ratios during the three periods.

The Sharpe ratios for the peer-group funds also exhibited declining performance during this period. Thirteen of the peer groups had lower Sharpe ratios after the matched fund closed, and eleven peer groups had a decline when the matched fund reopened.

For thirteen funds, the Treynor ratio decreased when the fund closed. For six funds, the Treynor ratio decreased at each step, from opened, to closed, to reopened. The Treynor ratio declined for seven funds when they closed,

TABLE 5

This table shows the relative size, standardized inflows, and the number of peer-group funds for the funds that closed and reopened. The relative size is the size of the fund divided by the average size of all funds in the category in the month of closing. The relative size at close is the relative size when the fund closed, and the relative size at reopen is the relative size of the fund when it reopened. The fund flows columns show the flows to the fund relative to the fund size for each period. Fund flows are shown for the twelve-month period before fund closure, the period the fund is closed, and the twelve-month period after the fund reopened. The peer fund column shows the number of funds used for the peer-group analysis.

FUND NAME	TICKER	OBJ	RELATIVE	RELATIVE	FUND FLOWS	FUND FLOWS	FUND FLOWS	PEER FUNDS
			SIZE	SIZE	BEFORE	WHILE	AFTER	
			AT CLOSE	AT REOPEN	CLOSE	CLOSED	REOPEN	
Fidelity Contrafund	FCNTX	GRO	75.42	74.21	-0.84	-12.85	-8.02	1163
Fidelity Growth & Income Portfolio	FGRIX	GRI	50.36	47.89	17.69	-26.13	-5.33	769
Vanguard Specialized Fund:Health Care	VGHCX	HLT	30.36	31.28	54.27	-2.71	10.72	38
Acorn Invest Trust:International	ACINX	EIS	20.60	11.09	1927.03	-10.84	15.32	5
Janus Investment Fund:Twenty Fund	JAVLX	AGG	12.97	15.27	92.77	-33.57	4.96	71
Vanguard Capital Opportunity Fund	VHCOX	AGG	9.78	10.33	685.02	-0.01	5.32	272
PBHG Growth Fund	PBHGX	SCG	8.85	14.58	169.60	18.71	137.06	292
Vanguard PRIMECAP Fund	VPMCX	GRO	8.54	45.18	97.39	159.24	-4.43	684
Oakmark Small Cap Fund	OAKSX	SCG	5.90	4.36	526.55	-18.97	-27.70	486
Neuberger & Berman Genesis Fund	NBGNX	SCG	5.51	7.93	214.59	46.36	-36.69	519
Longleaf Partners Fund	LLPFX	GRO	5.22	7.64	115.05	15.34	8.98	694
Fremont Mutual Fds:US Micro Cap Fund	FUSMX	SCG	4.61	4.84	253.42	-12.92	-7.35	753
Munder Funds: NetNet	MNNAX	TEC	4.26	3.31	238.52	-22.27	-14.24	188
Third Avenue Value Fund	TAVFX	GRO	4.04	3.55	57.02	-7.74	-25.77	1170
Strong Common Stock Fund	STCSX	SCG	3.54	8.78	315.73	-3.72	4.60	155
PBHG Select Equity Fund	PBHEX	AGG	2.52	1.76	565.32	-31.26	-36.74	173
SSgA: Small Cap Fund	SVSCX	SCG	2.35	1.48	211.48	-41.02	1.00	601
Oppenheimer Enterprise Fund	OENAX	SCG	1.89	2.61	124.48	37.99	-12.66	694
Van Kampen Aggressive Growth Fund	VAGAX	AGG	1.73	1.98	150.17	16.00	23.94	258
Polynous Growth Fund	PAGFX	GMC	0.02	0.05	-33.13	-34.70	-6.35	335

TABLE 6

Table 6 shows Sharpe and Treynor ratios for the funds that closed and reopened for the twelve months before closing, the entire period while closed, and the twelve months after reopening. It also shows the Sharpe and Treynor ratios for all funds in the same category for the twelve months before the fund's closure, the entire period while closed, and the twelve months after reopening.

TICKER	OBJ	SAMPLE FUNDS						COMPARABLE FUNDS					
		PRE-CLOSE	CLOSED	REOPEN	PRE-CLOSE	CLOSED	REOPEN	PRE-CLOSE	CLOSED	REOPEN	PRE-CLOSE	CLOSED	REOPEN
		SHARPE	SHARPE	SHARPE	TREYNOR	TREYNOR	TREYNOR	SHARPE	SHARPE	SHARPE	TREYNOR	TREYNOR	TREYNOR
FCNTX	GRO	2.4297	0.5133	-1.0023	0.3476	0.1714	-0.2591	2.5698	0.2054	-0.7788	0.3517	0.0648	-0.167
FGRIX	GRI	2.9359	0.2686	-0.9351	0.412	0.0906	-0.2126	2.637	-0.0126	-0.607	0.3567	-0.0042	-0.1311
VGHCX	HLT	1.6944	0.2224	4.7153	0.4115	0.0347	3.3678	0.5067	0.0871	1.753	0.1226	0.0224	0.7945
ACINX	EIS	5.0369	-0.9264	2.7279	0.6708	-0.1742	0.4556	4.4732	-1.1338	1.8962	0.713	-0.2089	0.2884
JAVLX	AGG	-0.1385	0.6835	2.5144	-0.0127	0.1079	0.2934	0.4698	1.3911	0.8827	0.0429	0.2253	0.1094
VHCOX	AGG	6.2276	-0.9397	-0.5314	1.8068	-0.1856	-0.1043	2.2831	-1.5188	-0.408	0.5406	-0.2971	-0.0781
PBHGX	SCG	0.3482	3.1479	0.1786	0.0544	0.356	0.0329	0.3649	1.8624	0.9555	0.0402	0.1222	0.1526
VPMCX	GRO	1.8529	2.8885	-0.4285	0.1854	1.3145	-0.0837	0.5592	1.4	-0.4948	0.0519	0.5667	-0.0924
OAKSX	SCG	1.8255	0.364	-0.5106	0.3254	0.0755	-0.1427	-0.0718	0.4815	0.0241	-0.0128	0.0858	0.006
NBGNX	SCG	3.1737	-0.1817	-0.8088	0.6705	-0.0247	-0.2144	1.3758	0.2394	-0.5278	0.2879	0.024	-0.1241
LLPFX	GRO	1.055	1.3013	0.8729	0.0985	0.4099	0.1802	1.5953	1.2029	1.9462	0.1348	0.3307	0.2961
FUSMX	SCG	7.3329	-1.0626	-0.0634	2.1961	-0.2815	-0.015	2.6744	-0.5666	-0.267	0.5569	-0.1161	-0.0603
MNNAX	TEC	1.8619	-1.1492	-1.1435	0.47	-0.2579	-0.2022	3.365	-1.0757	-1.0142	0.8875	-0.2374	-0.1787
TAVFX	GRO	0.9062	-1.5175	1.1409	0.164	-0.2634	0.2145	1.3864	-0.7263	1.9462	0.1957	-0.1236	0.2961
STCSX	SCG	1.0234	3.2508	-0.0696	0.0954	1.5149	-0.0141	-0.0887	1.5881	-0.3097	-0.0079	0.788	-0.0608
PBHEX	AGG	1.8586	-0.4862	0.571	0.2214	-0.0652	0.0945	0.6392	0.3993	0.6827	0.0679	0.0507	0.106
SVSCX	SCG	-0.1724	-0.1828	-0.4743	-0.0286	-0.0654	-0.1198	-0.1349	0.6975	-0.5236	-0.0222	0.2442	-0.1298
OENAX	SCG	0.8091	1.0686	-1.6877	0.2088	0.3013	-0.3874	-0.3069	1.4742	-1.1766	-0.0741	0.3646	-0.2597
VAGAX	AGG	4.174	0.6141	-1.0907	0.6726	0.1928	-0.2862	2.0989	0.7019	-0.9113	0.3125	0.1256	-0.2066
PAGFX	GMC	-0.7785	0.2615	-0.2422	-0.3312	0.0808	-0.053	1.5113	0.0627	0.463	0.2318	0.0172	0.095

and declined for seven funds when they reopened. Twelve funds had greater Treynor ratios than the peer group before closing, eleven funds had greater Treynor ratios than the peer group while closed, and only seven had greater Treynor ratios than the peer groups when reopened. Three funds had greater Treynor ratios than the peer group during all three periods, while four funds had lower Treynor ratios during the three periods.

For the peer groups, twelve had lower Treynor ratios after the matched fund closed, while thirteen had lower Treynor ratios when the matched fund reopened.

The Sharpe and Treynor ratios indicate that the average closed-fund performance declines from the pre-close to close to reopen period. However, it also appears that the sample-fund performance deteriorated more than that of the matched-peer set.

Table 7 shows Jensen's alpha and the Fama-French alpha for the funds that reopened. Five of the Jensen's-alpha estimates were significant at the 10-percent level, of which only one was significantly negative. During the closed period, five of the dummy alphas were significantly

negative, and one of the alphas was significantly positive. More interestingly, five of the six significant dummy alphas after reopening were negative, and another fourteen funds in all had negative alphas after reopening. Ten of the Fama-French alphas were significant and positive, while six of the Fama-French dummy alphas were significant and negative during the closed period. Only one Fama-French dummy alpha was positive and significant while the fund was closed. After reopening, seven Fama-French dummy alphas were significant and negative, while fourteen more dummy alphas were negative but not significant.

Comparisons with peer funds provide results indicating deterioration in fund performance relative to peers. Only two of the twenty dummy alphas, whether Fama-French or Jensen's, were negative for the peer set. In contrast, the funds that closed and reopened generated numerous negative dummy alphas.

Despite the small sample size, it appears that funds that close and subsequently reopen earn positive excess returns before closing. After they close, this perfor-

TABLE 7

Table 7 shows Jensen's alpha, the market model (MM) dummy alpha equal to zero when the fund is open and equal to one while the fund is closed, and a second dummy equal to one when the fund reopened. The Fama-French (FF) alpha is also shown, along with the Fama-French dummy variable equal to one when the fund is closed, and a second Fama-French dummy equal to one when the fund reopened. The regressions are estimated for twelve months before closure, during the entire period the fund is closed, and twelve months after reopening. The results shown are for the funds that closed and reopened.

TICKER	JENSEN'S ALPHA	MM CLOSED DUMMY	MM REOPEN DUMMY	FF ALPHA	FF CLOSED DUMMY	FF REOPEN DUMMY
FCNTX	0.002	0.0024	-0.0044	0.008	-0.0025	-0.0021
FGRIX	0.0076	-0.0056	-0.0097	0.0093***	-0.0056	-0.0028
VGHGX	0.0162*	-0.0153	0.0222*	0.0176*	-0.014	0.0234*
ACINX	0.0309***	-0.0394***	-0.0230***	0.0306***	-0.0362***	-0.0204**
JAVLX	-0.0075	0.0025	0.0078	0.0004	0.0002	0.0062
VHCOX	0.0549***	-0.0424**	-0.0609***	0.0503***	-0.0332***	-0.0673***
PBHGX	-0.0036	0.0214	-0.011	0.0057	0.0220*	-0.0096
VPMCX	0.0084	-0.0047	-0.0118	0.0140**	-0.0049	-0.0201**
OAKSX	0.0088	-0.0184	-0.0275*	0.0128**	-0.0163**	-0.0210**
NBGNX	0.0138	-0.0319*	-0.0364***	0.0114	-0.0226*	-0.0151
LLPFX	-0.0017	0.0003	-0.0012	0.0022	-0.0017	0.0026
FUSMX	0.0750***	-0.0983***	-0.0582**	0.0471***	-0.0352**	-0.0549***
MNNAX	0.0171	-0.0543	-0.0441	-0.0007	-0.0106	-0.0392*
TAVFX	-0.0034	-0.0216	0.0042	-0.0016	0.0037	0.0085
STCSX	0.0041	-0.0023	0.0011	0.0037	0.002	-0.0051
PBHEX	0.0082	-0.0576***	-0.0221	0.0154*	-0.0420**	-0.0121
SVSCX	-0.0115	0.0032	0.0222	-0.0019	0	0.003
OENAX	0.0026	0.0199	-0.0234	0.0222*	-0.0122	-0.0368*
VAGAX	0.0432	0.0085	-0.0625	0.0375**	-0.0001	-0.0372
PAGFX	-0.0355*	0.0558**	0.0371	-0.0208	0.0354	0.0022

* significant at 10% **significant at 5% ***significant at 1%

mance diminishes. After reopening, these funds perform relatively poorly, and they perform worse than peer-matched funds for the same time period.

Conclusion

We examined mutual funds that closed their doors to new investors. Using Sharpe ratios, Treynor ratios, Jensen's alphas, and Fama-French alphas, we found that mutual funds that closed to new investors performed well in the twelve months before closing. Before closing, these funds tended to have higher Sharpe ratios and Jensen's alphas than their peers, as well as positive alphas. After closing, the performance of a fund tended to decline relative to its previous performance as well as its peers'.

We also examined a small number of funds that closed and subsequently reopened. While the performance of these funds does not appear to have declined as rapidly upon closure as the first sample, the performance did decline when the funds reopened to new investors. Additionally, these funds performed significantly better than their peer groups before closing, but worse while closed and even worse after reopening.

These results are consistent with previous research about performance persistence in mutual funds, which finds that the best performing funds are unable to maintain their performance. Overall, our results suggest that while funds may close to protect a perceived competitive advantage, that advantage, if it exists, tends to diminish or disappear. In other words, even for funds that close, past performance is no guarantee of future results.

ENDNOTES

1. For example, see K. Damato and L. Jereski, "Fidelity's 34-Day offer to Jump into Magellan Fund Probably Should be Ignored, Many Advisers Assert," *The Wall Street Journal* (August 28, 1997): C1.
2. H. Manakyan and K. Liano, "Performance of Mutual Funds Before and After Closing to New Investors," *Financial Services Review* 64 (1997): 257-269.
3. Eugene F. Fama and Kenneth R. French, "Common Risk Factors in the Returns on Bonds and Stocks," *Journal of Financial Economics* 33 (1993): 3-53.
4. The Fama-French factors were obtained from the World Wide Web at <http://mba.tuck.dartmouth.edu/pages/faculty/ken.french>, which contains detailed information concerning the construction of these factors.