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Mutual Fund Attributes and Performance

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Abstract

This paper investigates the relationship between mutual fund attributes and performance. Funds in the same investment objective category are classified into two portfolios according to mutual fund attributes, including load/no-load, size, turnover, expense, and past performance. The stochastic dominance approach is used to test whether a specific characteristic of mutual funds is efficient relative to its counterpart. We find that the relationship between mutual fund attributes and performance differs among mutual funds with different objectives.

JEL classification: G11; G20

Keywords: Mutual fund; Attributes; Stochastic dominance

1. Introduction

Understanding the relationships between mutual fund attributes and performance can help investors make informed mutual fund investment decisions. These relationships have been widely studied by scholars and practitioners. Grinblatt and Titman (1989, 1994) found that small mutual funds perform better than large ones and that performance is negatively correlated to management fees, but not to fund size or expenses. Hendricks, Patel, and Zeckhauser (1993), Goetzmann and Ibbotson (1994), and Brown and Goetzmann (1995)

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present evidence of persistence in mutual fund performance. Grinblatt and Titman (1992), and Elton, Gruber, and Blake (1996) show that past performance is a good predictor of future performance. Sharpe (1992) argues that mutual fund returns can be explained effectively in terms of investment style. Taylor and Yoder (1994a) and Wermers (2000) show that high-turnover mutual funds dominate low-turnover mutual funds and the Vanguard Index 500 fund, respectively. Carhart (1997) provides evidence that the differences in expense, turnover, load, and persistence can explain the predictability in mutual fund returns.

In their studies of bond mutual funds, Blake, Elton, and Grubber (1993), Detzler (1999), and Philpot, Hearth, Rimbey, and Schulman (1998) find that performance is negatively correlated to fund expense, and that past performance does not predict future performance. However, Philpot, Hearth, and Rimbey (2000) provide evidence of short-term performance persistence in high-yield bond mutual funds. In their studies of money market mutual funds, Domian and Reichenstein (1998) find that the expense ratio is the most important factor in explaining net return differences. Christoffersen (2001) shows that fee waivers matter to performance.

Many of the studies on mutual funds examine funds across investment objectives. Results obtained from the entire sample may not be applicable to any particular mutual fund category. Other studies examine only specific mutual fund categories. For example, Blake et al. (1993) restrict their attention to bond mutual funds; Grinblatt and Titman (1993), to equity mutual funds, and Domian and Reichenstein (1998), to money market funds. In this study, we examine all of the mutual funds that appear in the Center for Research in Security Prices (CRSP) Survivor-Bias Free U.S. Mutual Fund Database. This allows us to investigate the relationship between mutual fund attributes and performance among all United States mutual funds, regardless of investment objective.

We adopt the stochastic dominance approach to compare the impact of various fund attributes on performance. This approach circumvents the limitations of a specific asset-pricing model, and the requirements of reliable benchmarks.[1] In addition, the works of Bawa (1982) and Levy (1992) point out that the stochastic dominance rule performs well in portfolio choice when the decision problem is preference for a single asset. Researchers have used the stochastic dominance approach to differentiate efficient from inefficient portfolios: work in this vein includes Levy and Lermans' (1985) equity study and Taylor and Yoders' (1994a) mutual fund study. Our results show that the relationship between mutual fund attributes and performance varies depending on fund objective. Therefore, one cannot characterize the performance/attribute relationship without focusing on a specific investment objective.

In particular, we show that when investors are risk-averse no-load funds dominate load funds in the balanced category, five bond categories (high quality, high yield, global, government, and high-quality municipal), Ginnie Mae funds, and three money market categories (tax-free, government, and taxable). On the other hand, load funds dominate in high-yield money market funds, and four "other" fund categories (total return, sector, special, and utility funds).

Fund size is an advantage among money market funds, balanced funds, and in two equity fund categories (aggressive growth and growth and income). On the other hand, investors

should prefer small funds to large ones in two bond categories (high-yield bonds and global bonds) and special funds.

High-turnover funds do better than low-turnover funds only among Ginnie Mae funds. On the contrary, low-turnover funds outperform high-turnover funds in the international equities and high-yield money market categories. Expense ratio is an important factor differentiating the performance characteristics in two equity fund categories (global and international equity), balanced funds, bond funds, Ginnie Mae funds, money market funds, sector funds, special funds, and total return funds.

Performance persists over a one-year period in most equity and money market funds, including aggressive growth funds, long-term growth funds, income funds, international equity funds, tax-free money market funds, government securities money market funds, and taxable money market funds. However, poor one-year performance leads to a performance rebound in most bond categories, including high quality bonds, global bonds, government securities, high quality municipal bond funds, and single-state municipal bond funds.

The rest of this paper is organized as follows. Section 2 describes the methodology and the data. Section 3 presents the results. Section 4 provides the conclusions.

2. Methodology and data

We measure return for each fund on a year-to-year basis, and then relate these figures to annual data on fund attributes. Specifically, we first calculate the compound annual returns based on the monthly returns.[2] Second, we divide the mutual funds into portfolio using five binary attributes: load status (load/no-load), size (large/small), turnover (low/high), expense (low/high), and past one-year performance (winner/loser). Note that we assign only two values to each attribute because otherwise the number of mutual funds in some portfolios would be too small. Third, we calculate the equally weighted annual returns. Finally, we apply the stochastic dominance test to identify the efficient and inefficient portfolios.

The advantage of the stochastic dominance approach is that it does not require us to use a specific asset-pricing model and reliable benchmarks to distinguish efficient from inefficient portfolios. Many studies have shown that the sample distributions of mutual fund return are inconsistent with normally distribution random variables [see, e.g., Taylor and Yoder (1994b)]. Moreover, normality tests on the return of portfolios constructed by total net assets are rejected at the 5% significance level. Normality tests on the return of portfolios classified by both load/no-load and past performance are also rejected at the 10% significance level.[3] Therefore, inferences drawn from adjusted return based on regression analysis would be biased.

First degree stochastic dominance (FSD) is applied in situations where investors have no systematic preference with respect to risk.[4] No restrictions are placed on investors' utility functions beyond the assumption that they are non-decreasing with respect to wealth. Let F_x and G_y denote the cumulative distributions of the return on two risky assets X and Y, and $Q_F(p)$ and let $Q_G(p)$ be the Pth order quantiles of the distributions F and G. Then X dominates Y in the FSD sense if and only if

$$Q_F(p) \geq Q_G(p), \tag{1}$$

for all p, where a strict inequality holds for at least one value of p. Eq. (1) states that the probability that the return on asset X will exceed a given level is no smaller than the probability that the return on asset Y will exceed that same level. In other words, asset X dominates asset Y because the return on asset X is greater than asset Y in any state.

Second degree stochastic dominance (SSD) is applied in situations where investors are risk averse and non-satiable. X dominates Y in the SSD sense if and only if

$$\int_0^p [Q_F(t) - Q_G(t)]dt \geq 0, \tag{2}$$

for all p where a strict inequality holds for at least one value of p. Eq. (2) claims that the cumulative probability that the return on asset X will exceed a given level is no smaller than the cumulative probability that the return on asset Y will exceed that same level. That is, over time, asset X has a greater likelihood than asset Y of earning a given return.

When a risk-free asset exists, first degree stochastic dominance with risk-free rate (FSDR) can be applied to investors who prefer more return to less, and second degree stochastic dominance with risk-free rate (SSDR) can be used for risk averse and non-satiable investors. Given a risk-free asset whose return is r, investors can create a new portfolio by investing a portion of their wealth in the risk-free asset. Namely, let $X' = (1-\alpha)r + \alpha X$ and $Y' = (1-\beta)r + \beta Y$, where α and β are the weights invested in assets X and Y. Let $F_{x'}$ and $G_{y'}$ denote the cumulative distributions of the return on the risky assets X' and Y', and $\{F_{x'}\}$ and $\{G_{y'}\}$ be the sets of distributions of all possible mixes of X and r as well as Y and r, respectively. X' dominates Y' in the FSDR sense if and only if

$$\underset{0<p<p_o}{INF}\ \delta(p) \geq \underset{p_o<p<1}{SUP}\ \delta(p), \tag{3}$$

where $\delta(p) \equiv [Q_G(p) - r]/[Q_F(p) - r]$ and p_0 is determined by the equation $\int_0^{p_0}[Q_F(t) - r]dt = 0$. X′ dominates Y' in the SSDR sense if and only if

$$\underset{0<p<p_o}{INF}\ \gamma p \geq \underset{p_o<p<1}{SUP}\ \gamma p, \tag{4}$$

where $\gamma(p) \equiv \int_0^p [Q_G(t) - r]dt / \int_0^p [Q_F(t) - r]dt$.

Our data were taken from the CRSP Survivor-Bias Free U.S. Mutual Fund Database over the 1961 through 2000 period.[5] The sample includes 16,435 funds, of which 4,230 are dead funds. We include the dead funds in our study until they disappear. Standard & Poor's Micropal separates the funds into 24 categories according to the funds' investment strategy: aggressive growth (AG), balanced (BL), high-quality bonds (BQ), high-yield bonds (BY), global bonds (GB), global equity (GE), growth and income (GI), Ginnie Mae funds (GM), government securities (GS), international equities (IE), income (IN), long-term growth (LG), tax-free money market fund (MF), government securities money market fund (MG), high-quality municipal bond fund (MQ), single-state municipal bond fund (MS), taxable money market fund (MT), high-yield money market fund (MY), option income (OI), Precious metals (PM), sector funds (SF), special funds (SP), total return (TR), and utility funds (UT).

Table 1 gives the average profiles of funds in each group. We group similar funds

Table 1
Summary statistics

Sample	Total number	Total number with no load	Average total asset value (millions)	Average turnover (%)	Average total load (%)	Average expense ratio (%)	Average annual return (%)	Description of the sample
All	16,435	7,824	359.68	82.61	4.38	1.006	9.157	All samples
Panel A. Equity funds								
AG	1,433	679	277.59	109.84	5.09	1.231	14.335	Aggressive growth
GI	1,528	707	553.21	60.54	5.76	0.932	12.121	Growth and income
LG	2,548	1131	389.23	81.59	5.42	1.085	14.287	Long-term growth
IN	250	114	595.29	64.06	4.18	1.058	11.104	Income
GE	440	151	419.39	96.05	4.07	1.522	13.905	Global equity
IE	1,465	636	239.05	80.70	4.02	1.435	10.821	International equities
Panel B. Balanced funds								
BL	460	224	360.49	90.35	4.21	1.050	10.336	Balanced
Panel C. Bond funds								
BQ	1,073	593	232.53	157.91	3.56	0.805	4.972	High quality bonds
BY	350	113	382.49	106.14	3.81	1.033	5.843	High yield bonds
GB	491	187	151.53	207.72	3.60	1.176	4.630	Global bonds
GS	738	354	147.66	176.06	3.54	0.860	4.702	Government securities
MQ	701	252	258.21	59.20	3.54	0.822	4.408	High quality municipal bond fund
MS	1,673	396	102.68	40.64	3.54	0.822	4.564	Single-state municipal bond fund
Panel D. Mortgage-backed market funds								
GM	306	114	415.75	153.33	3.53	0.904	4.549	Ginnie Mae funds
Panel E. Money market funds								
MF	603	585	345.78	N/A	3.24	0.605	2.566	Tax-free money market fund
MG	571	551	581.38	N/A	3.44	0.571	4.036	Government securities money market fund
MT	758	671	1,217.93	N/A	3.72	0.654	4.022	Taxable money market fund
MY	70	19	542.27	46.11	3.76	0.929	4.467	High-yield money market fund
Panel F. Other funds								
OI	3	3	40.51	72.00	N/A	1.000	10.132	Option income (write covered options)
PM	37	10	89.16	88.69	4.01	1.425	−1.253	Precious metals
SF	463	173	286.05	217.49	3.89	1.338	16.660	Sector funds
SP	17	10	26.61	15.95	1.94	0.899	1.716	Special funds (unclassified)
TR	374	144	249.47	96.65	4.11	1.192	10.403	Total return
UT	107	29	268.90	56.85	3.76	1.104	12.047	Utility funds
Panel G. Funds classified by current status								
Live	12,205	5,819	411.44	83.18	4.33	0.920	9.824	Live funds
Dead	4,230	2,005	98.59	80.59	4.98	1.041	5.729	Dead funds

The table presents time-series averages of annual cross-sectional averages from 1961 to 2000. N/A represents not available.

together. The equity funds, balanced funds, bond funds, mortgage-backed market funds, money market funds, and "other" funds are displayed in Panels A to F. We classify funds live/dead status in Panel G. Columns 2 and 3 show the number of funds and the number of no-load funds in each category. Of the 16,435 funds listed in CRSP, only 7,824 are no-load

funds; among the remaining funds the average load fee is 4.38%. Column 4 gives the average total net asset value. The average total net asset for the entire sample is $359.68 million, of which an average of 82.61% was traded. Columns 5 through 8 give the average turnover, total load, expense ratio, and annual return. The average expense ratio for the entire sample is 1.006%, and the average annual return is 9.157%.

3. Empirical results

The results of our study allow us to characterize the relationship between fund attributes and performance for specific investment objectives. The attributes we examined include load status, size, turnover, expense, and past performance.

3.1. Load status

Table 2 compares load and no-load funds for performance.[6] The SSD tests reveal that risk-averse investors prefer no-load funds to load funds for balanced funds (BL), five of the bond funds (BQ, BY, GB, GS, and MQ), mortgage-backed market funds (GM), and three of the money market funds (MF, MG, and MT).[7] On the other hand, it shows that load funds are preferable to no-load funds in one of the money market funds (MY) and four other funds (SF, SP, TR, and UT).

When investors can borrow and lend money at a risk-free rate,[8] the SSDR tests reveal that no-load funds are preferable to load funds in balanced funds (BL), all categories of bond funds (BQ, BY, GB, GS, MQ, and MS), mortgage-backed market funds (GM), three of money market funds (MF, MG, and MT), and precious metals funds (PM). On the other hand, load funds dominate no-load funds for the growth and income equity funds (GI), high-yield money market funds (MY), sector funds (SF), special funds (SP), total return funds (TR), and utility funds (UT). If we take the entire sample, we find that load funds are more attractive than no-load funds given the availability of a risk-free asset. Ippolitto (1989) obtains similar results for a sample that combines funds with different investment objectives. We must, however, restrict our attention to a specific mutual fund category before deciding whether there is a significant difference in performance between load and no-load funds.

3.2. Size

We use total asset value as a proxy for mutual fund size. Table 3 shows the results of the SSD and SSDR tests, which we use to distinguish efficient from inefficient portfolio among small and large mutual funds. Funds that exceed the median CRSP fund size are designated "large"; the remainder are designated "small." Risk-averse investors prefer large funds to small ones for two categories of equity funds (AG and GI), balanced funds (BL), and all among money market funds (MF, MG, MT, and MY). Small funds in two categories of bond funds (BY and GB) and special funds (SP), on the contrary, are more attractive than their large counterparts.

Table 2
Stochastic dominance results for load status attribute

Sample	Average returns		SSD		SSDR		Description of the sample
	Load	No-load	Load	No-load	Load	No-load	
All	0.0894	0.0819	-	-	YES	NO	All samples
Panel A. Equity funds							
AG	0.1191	0.1203	-	-	-	-	Aggressive growth
GI	0.1080	0.1024	-	-	YES	NO	Growth and income
LG	0.1180	0.1174	-	-	-	-	Long-term growth
IN	0.1104	0.1146	-	-	-	-	Income
GE	0.1201	0.1352	-	-	-	-	Global equity
IE	0.0947	0.0952	-	-	-	-	International equities
Panel B. Balanced funds							
BL	0.0982	0.1039	NO	YES	NO	YES	Balanced
Panel C. Bond funds							
BQ	0.0504	0.0523	NO	YES	NO	YES	High quality bonds
BY	0.0767	0.0802	NO	YES	NO	YES	High yield bonds
GB	0.0457	0.0512	NO	YES	NO	YES	Global bonds
GS	0.0477	0.0490	NO	YES	NO	YES	Government securities
MQ	0.0464	0.0469	NO	YES	NO	YES	High quality municipal bond fund
MS	0.0477	0.0500	-	-	NO	YES	Single-state municipal bond fund
Panel D. Mortgage-backed market funds							
GM	0.0415	0.0490	NO	YES	NO	YES	Ginnie Mae funds
Panel E. Money market funds							
MF	0.0217	0.0255	NO	YES	NO	YES	Tax-free money market fund
MG	0.0326	0.0396	NO	YES	NO	YES	Government securities money market fund
MT	0.0306	0.0401	NO	YES	NO	YES	Taxable money market fund
MY	0.0494	0.0487	YES	NO	YES	NO	High-yield money market fund
Panel F. Other funds							
PM	−0.0003	0.0103	-	-	NO	YES	Precious metals
SF	0.1565	0.1396	YES	NO	YES	NO	Sector funds
SP	−0.0059	−0.0013	YES	NO	YES	NO	Special funds (unclassified)
TR	0.0990	0.0854	YES	NO	YES	NO	Total return
UT	0.1121	0.1089	YES	NO	YES	NO	Utility funds

Second degree stochastic dominance (SSD) and second degree stochastic dominance with risk-free rate (SSDR) are used to test the efficiency of load and no-load funds. A period signifies that both the load and no-load portfolios are efficient. When one portfolio is inefficient relative to its counterpart, the efficient portfolio is labeled "YES", and the inefficient portfolio is labeled "NO."

The SSDR test yields more definitive conclusions: large funds dominate small ones in most categories, including three categories of equity funds (AG, GI, and IN), balanced funds (BL), three categories of bond funds (BQ, GS, and MQ), mortgage-backed market funds (GM), and all money market funds (MF, MG, MT, and MY). Small funds, however, dominate their large counterparts among high-yield bond funds (BY), global bond funds (GB), precious metal funds (PM), and special funds (SP). Large funds dominate small ones for the sample as a whole. These results contradict those of Grinblatt and Titman (1994) and Carhart (1997), who find that size is not significantly correlated to the cross-section of performance for equity funds. However, our results show that a risk-averse investor prefers large funds to small ones in the aggressive growth (AG) and growth and income (GI) categories.

Table 3
Stochastic dominance results for size attribute

Sample	Average Returns		SSD		SSDR		Description of the sample
	Small	Large	Small	Large	Small	Large	
All	0.09215	0.08463	-	-	NO	YES	All samples
Panel A. Equity funds							
AG	0.12177	0.12306	NO	YES	NO	YES	Aggressive growth
GI	0.11069	0.11313	NO	YES	NO	YES	Growth and income
LG	0.12357	0.12256	-	-	-	-	Long-term growth
IN	0.11895	0.12492	-	-	NO	YES	Income
GE	0.13253	0.13548	-	-	-	-	Global equity
IE	0.11025	0.10419	-	-	-	-	International equities
Panel B. Balanced funds							
BL	0.11387	0.11589	NO	YES	NO	YES	Balanced
Panel C. Bond funds							
BQ	0.05452	0.05778	-	-	NO	YES	High quality bonds
BY	0.08905	0.08460	YES	NO	YES	NO	High yield bonds
GB	0.06018	0.04894	YES	NO	YES	NO	Global bonds
GS	0.05050	0.05311	-	-	NO	YES	Government securities
MQ	0.05144	0.05233	-	-	NO	YES	High quality municipal bond fund
MS	0.05397	0.05408	-	-	-	-	Single-state municipal bond fund
Panel D. Mortgage-backed market funds							
GM	0.04665	0.04878	-	-	NO	YES	Ginnie Mae funds
Panel E. Money market funds							
MF	0.02598	0.02669	NO	YES	NO	YES	Tax-free money market fund
MG	0.04053	0.04177	NO	YES	NO	YES	Government securities money market fund
MT	0.04041	0.04253	NO	YES	NO	YES	Taxable money market fund
MY	0.04887	0.05622	NO	YES	NO	YES	High-yield money market fund
Panel F. Other funds							
PM	0.00689	−0.00018	-	-	YES	NO	Precious metals
SF	0.16375	0.15408	-	-	-	-	Sector funds
SP	0.02324	0.00118	YES	NO	YES	NO	Special funds (unclassified)
TR	0.10796	0.10900	-	-	-	-	Total return
UT	0.12307	0.11581	-	-	-	-	Utility funds

Second degree stochastic dominance (SSD) and second degree stochastic dominance with risk-free rate (SSDR) are used to test the efficiency of small and large total net asset funds. A period signifies that both the small and large size portfolios are efficient. When one portfolio is inefficient relative to its counterpart, the efficient portfolio is labeled "YES," and the inefficient portfolio is labeled "NO."

3.3. Turnover

Turnover is consistently used as a proxy for the level of trading activity. A fund is labeled high turnover if its turnover exceeds the median turnover; otherwise, it is designated low turnover. Table 4 identifies the efficient portfolios among all samples for the 24 objective categories, based on the SSD and SSDR tests.

We find that high-turnover funds outperform low-turnover funds among mortgage-backed market funds (GM), whereas low-turnover funds outperform their high-turnover counterparts among international equity funds (IE) and high-yield money market funds (MY). SSDR tests

Table 4
Stochastic dominance results for turnover attribute

Sample	Average Returns		SSD		SSDR		Description of the sample
	Low	High	Low	High	Low	High	
All	0.08479	0.09880	-	-	NO	YES	All samples
Panel A. Equity funds							
AG	0.11009	0.12576	-	-	NO	YES	Aggressive growth
GI	0.11297	0.10372	-	-	-	-	Growth and income
LG	0.11873	0.13462	-	-	NO	YES	Long-term growth
IN	0.11908	0.11969	-	-	-	-	Income
GE	0.12954	0.13123	-	-	-	-	Global equity
IE	0.08959	0.08403	YES	NO	YES	NO	International equities
Panel B. Balanced funds							
BL	0.09170	0.09150	-	-	-	-	Balanced
Panel C. Bond funds							
BQ	0.05514	0.05537	-	-	-	-	High quality bonds
BY	0.07938	0.08593	-	-	-	-	High yield bonds
GB	0.04830	0.05260	-	-	NO	YES	Global bonds
GS	0.05000	0.04932	-	-	-	-	Government securities
MQ	0.04956	0.05036	-	-	NO	YES	High quality municipal bond fund
MS	0.05161	0.05246	-	-	-	-	Single-state municipal bond fund
Panel D. Mortgage-backed market funds							
GM	0.04228	0.04918	NO	YES	NO	YES	Ginnie Mae funds
Panel E. Money market funds							
MF	N/A	N/A	N/A	N/A	N/A	N/A	Tax-free money market fund
MG	N/A	N/A	N/A	N/A	N/A	N/A	Government securities money market fund
MT	N/A	N/A	N/A	N/A	N/A	N/A	Taxable money market fund
MY	0.05400	0.05040	YES	NO	YES	NO	High-yield money market fund
Panel F. Other funds							
PM	0.02439	−0.01275	-	-	YES	NO	Precious metals
SF	0.12244	0.16485	-	-	NO	YES	Sector funds
SP	0.00029	0.00426	-	-	NO	YES	Special funds (unclassified)
TR	0.10461	0.10604	-	-	-	-	Total return
UT	0.10575	0.12452	-	-	-	-	Utility funds

Second degree stochastic dominance (SSD) and second degree stochastic dominance with risk-free rate (SSDR) are used to test the efficiency of low and high turnover funds. A period signifies that both the low and high turnover portfolios are efficient. When one portfolio is inefficient relative to its counterpart, the efficient portfolio is labeled "YES," and the inefficient portfolio is labeled "NO." Some funds are not available (N/A) because turnover data is not available.

reveal that high-turnover funds dominate low-turnover funds among two categories of equity funds (AG and LG), two categories of bond funds (GB and MQ), mortgage-backed market funds (GM), sector funds (SF), and special funds (SP). On the other hand, low-turnover funds are preferable to their high-turnover counterparts among international equity funds (IE), high-yield money market funds (MY), and precious metal funds (PM). When a risk-free asset is available, the high-turnover funds dominate low-turnover funds in the entire sample test. Taylor and Yoder (1994a) and Wermers (2000) show that high-turnover funds can benefit the investor. However, our results show that the applicability of these findings depends upon the specific investment objective.

Table 5
Stochastic dominance results for low and high expense funds

Sample	Average Returns		SSD		SSDR		Description of the sample
	Low	High	Low	High	Low	High	
All	0.07660	0.09689	-	-	YES	NO	All samples
Panel A. Equity funds							
AG	0.12040	0.11122	-	-	YES	NO	Aggressive growth
GI	0.10988	0.10554	-	-	-	-	Growth and income
LG	0.12241	0.12211	-	-	-	-	Long-term growth
IN	0.10313	0.10180	-	-	-	-	Income
GE	0.13465	0.11346	YES	NO	YES	NO	Global equity
IE	0.10203	0.08785	YES	NO	YES	NO	International equities
Panel B. Balanced funds							
BL	0.10515	0.09713	YES	NO	YES	NO	Balanced
Panel C. Bond funds							
BQ	0.04895	0.04818	YES	NO	YES	NO	High quality bonds
BY	0.04858	0.06602	NO	YES	NO	YES	High yield bonds
GB	0.04916	0.04549	YES	NO	YES	NO	Global bonds
GS	0.05358	0.04316	YES	NO	YES	NO	Government securities
MQ	0.04965	0.03721	YES	NO	YES	NO	High quality municipal bond fund
MS	0.05314	0.04354	YES	NO	YES	NO	Single-state municipal bond fund
Panel D. Mortgage-backed market funds							
GM	0.05655	0.03796	YES	NO	YES	NO	Ginnie Mae funds
Panel E. Money market funds							
MF	0.02688	0.02407	YES	NO	YES	NO	Tax-free money market fund
MG	0.04128	0.03761	YES	NO	YES	NO	Government securities money market fund
MT	0.04550	0.03989	YES	NO	YES	NO	Taxable money market fund
MY	0.05411	0.04435	YES	NO	YES	NO	High-yield money market fund
Panel F. Other funds							
PM	0.01280	−0.00588	-	-	YES	NO	Precious metals
SF	0.15402	0.15029	YES	NO	YES	NO	Sector funds
SP	0.01514	0.03199	NO	YES	NO	YES	Special funds (unclassified)
TR	0.09387	0.06739	YES	NO	YES	NO	Total return
UT	0.10881	0.11341	-	-	-	-	Utility funds

Second degree stochastic dominance (SSD) and second degree stochastic dominance with risk-free rate (SSDR) are used to test the efficiency of low and high expense funds. A period signifies that both the low and high expense portfolios are efficient. When one portfolio is inefficient relative to its counterpart, the efficient portfolio is labeled "YES," and the inefficient portfolio is labeled "NO."

3.4. Expenses

Table 5 compares the efficiency of low expense and high expense funds using SSD and SSDR tests. Samples are classified as low expense or high expense in relation to the median expense for all samples. We find that risk-averse investors prefer low expense to high expense funds among two equity categories (GE and IE), balanced funds (BL), five bond categories (BQ, GB, GS, MQ, and MS), the mortgage-backed market categories (GM), all money market categories (MF, MG, MT, and MT), and two "other" categories (SF and TR). However, the same investor also prefers high expense to low expense funds in high yield bond funds (BY) and special funds (SP).

When investors can borrow and lend at a risk-free rate, SSDR tests show that most low

expense funds dominate high expense funds. This holds in three equity categories (AG, GE, and IE), the balanced category (BL), five bond categories (BQ, GB, GS, MQ, and MS), the mortgage-backed market categories (GM), all of the money market categories (MF, MG, MT, and MY), and three "other" categories (PM, SF, and TR). These results confirm the relative efficiency of low expense bond funds as reported in Blake et al. (1993), who show that a percentage-point increase in expense leads to a percentage-point decrease in performance among bond mutual funds. On the other hand, SSDR showed that high expense funds in high yield bond funds (BY) and special funds (SP) dominate their low expense counterparts. SSDR shows that in the sample as a whole, low expense funds dominate their high expense counterparts.

3.5. Performance persistence

We rank all of the funds for their lagged one-year raw returns, and divide them into winner and loser portfolios at the median return. We hold these two portfolios for one year and then compute their equally weighted raw returns.

Table 6 presents the SSD and SSDR results. We find that risk-averse investors prefer winners in four equity categories (AG, LG, IN, and IE), the balanced categories (BL), three money market categories (MF, MG, and MT), and two "other" categories (SF and SP). On the contrary, losers dominate their winner counterparts among five bond categories (BQ, GB, GS, MQ, and MS), the mortgage-backed market categories (GM), and utility funds (UT) funds. Among CRSP funds as a whole, winners dominate losers.

When investors can borrow and lend at a risk-free rate, we find that winners dominate losers in the SSDR sense among five equity categories (AG, GI, LG, IN, and IE), the balanced categories (BL), three money market categories (MF, MG, and MT), and four "other" categories (PM, SF, SP, and TR). On the other hand, losers dominate winners for most bond categories (BQ, GB, GS, MQ, and MS), the mortgage-backed market category (GM), and one "other" category (UT). These results are consistent the finding of Hendricks et al. (1993), Goetzmann and Ibbotson (1994), and Brown and Goetzmann (1995), who found strong performance persistence in equity mutual funds. However, our results also reveal that the performance of the growth and income (GI) equity mutual fund does not persist. Moreover, performance reverses among other types of funds. For example, the losers dominate the winners in most bond funds among risk-averse investors.

4. Conclusions

Investors can benefit from investing in mutual funds if they understand the relationship between mutual fund attributes and performance within specific fund categories. However, most available studies are of limited practical value, either because they focus on equity and bond mutual funds or they group all funds into a single sample, regardless of investment objective.

In this study, we examine all the funds appeared in the CRSP Survivor-Bias Free U.S. Mutual Fund Database. This allows us to investigate the attribute/performance relationship

Table 6
Stochastic dominance results for past performance attribute

Sample	Average Returns		SSD		SSDR		Description of the sample
	Winner	Loser	Winner	Loser	Winner	Loser	
All	0.10693	0.08031	YES	NO	YES	NO	All samples
Panel A. Equity funds							
AG	0.13814	0.09877	YES	NO	YES	NO	Aggressive growth
GI	0.12373	0.11034	-	-	YES	NO	Growth and income
LG	0.14640	0.11185	YES	NO	YES	NO	Long-term growth
IN	0.12842	0.10625	YES	NO	YES	NO	Income
GE	0.14249	0.11474	-	-	-	-	Global equity
IE	0.12377	0.08128	YES	NO	YES	NO	International equities
Panel B. Balanced funds							
BL	0.11988	0.10143	YES	NO	YES	NO	Balanced
Panel C. Bond funds							
BQ	0.05203	0.05959	NO	YES	NO	YES	High quality bonds
BY	0.08441	0.08341	-	-	-	-	High yield bonds
GB	0.04468	0.05600	NO	YES	NO	YES	Global bonds
GS	0.04301	0.05516	NO	YES	NO	YES	Government securities
MQ	0.04702	0.05277	NO	YES	NO	YES	High quality municipal bond fund
MS	0.05128	0.05415	NO	YES	NO	YES	Single-state municipal bond fund
Panel D. Mortgage-backed market funds							
GM	0.04318	0.04877	NO	YES	NO	YES	Ginnie Mae funds
Panel E. Money market funds							
MF	0.02735	0.02410	YES	NO	YES	NO	Tax-free money market fund
MG	0.04188	0.03811	YES	NO	YES	NO	Government securities money market fund
MT	0.04282	0.03770	YES	NO	YES	NO	Taxable money market fund
MY	0.05208	0.05227	-	-	-	-	High-yield money market fund
Panel F. Other funds							
PM	0.00059	−0.00256	-	-	YES	NO	Precious metals
SF	0.17741	0.12622	YES	NO	YES	NO	Sector funds
SP	0.01404	0.01101	YES	NO	YES	NO	Special funds (unclassified)
TR	0.11226	0.09301	-	-	YES	NO	Total return
UT	0.11728	0.11857	NO	YES	NO	YES	Utility funds

Second degree stochastic dominance (SSD) and second degree stochastic dominance with risk-free rate (SSDR) are used to test the efficiency of winner and loser funds. A period signifies that both the winner and loser portfolios are efficient. When one portfolio is inefficient relative to its counterpart, the efficient portfolio is labeled "YES," and the inefficient portfolio is labeled "NO."

among United States mutual funds in each of 24 objective categories. The stochastic dominance approach is employed to compare the performance among portfolio pairs defined by five attributes: load status, size, turnover, expense, and past performance. The advantage of stochastic dominance is that we need not adopt a specific asset-pricing model or reliable benchmarks. Our results show that the attribute/performance relationship differs with the objective category. For example, risk-averse investors prefer no-load funds to load funds among three money market funds (MF, MG, and MT), but prefer load funds to no-load funds in the fourth money market fund (MY). As a result, we cannot confirm the attribute/performance relationship until we restrict the investment within a specific fund objective category. Clearly, investors who select mutual funds based on attributes should be alert to the dependence of the attribute/performance relationship to objective category.

Notes

1. Grinblatt and Titman (1994) found that the choice of benchmark could have a significant effect on inferences about performance. They also introduced a new performance measurement that does not require benchmarks. See Grinblatt and Titman (1993).
2. To avoid the survivor-bias problem, we need to study all mutual funds that appear in the CRSP Survivor-Bias Free US Mutual Fund Database. However, dead funds in the database have no data other than annual return data.
3. Normality tests based on the work of Shapiro and Wilk (1965) are employed. The results are not shown in the paper, but are available upon request.
4. The theory and algorithms of stochastic dominance are taken from Levy (1992) and Levy and Sarnat (1984).
5. The latest data available are for June 2000.
6. Because dominance by FSD and FSDR imply dominance by SSD and SSDR, respectively, and SSD and SSDR provide a sharper decision relative to FSD and FSDR, respectively, we don't present the FSD and FSDR results to save space in the paper. FSD and FSDR results are available upon request. Option income funds (OI) are not examined because of the small number of funds (3).
7. The reader must be cautions about these results, because the annual returns are not adjusted for load costs.
8. We want to thank Kenneth French for providing return data on risk-free asset, which can be downloaded from his Web site at web.mit.edu/Kfrench.

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