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Mutual Fund Management Fees and Returns: A Stochastic Dominance Analysis

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Abstract

Using stochastic dominance approach of Lim, Maasouimi, and Martin (2006) and Linton, Maasoumi, and Whang (2005), I find that mutual funds with low management fees, regardless of the growth or value strategy they follow, stochastically dominate the S&P500 index. High fee funds, on the other hand, fail to stochastically dominate the S&P500 index. Collectively, these results suggest that the historical performance of mutual fund managers may not entirely align with the higher fees they typically charge.

Keywords

Stochastic Dominance, Mutual Fund Performance

1. Introduction

One of the main unresolved issues in the mutual fund industry is the question of whether, and to what extent, investment advisory firms can charge fees that are disproportionate relative to the services they provide. This puzzle dates back to 2004 when Elton, Gruber, and Busse (2004), along with Hortaçsu and Syverson (2004), documented a significant price dispersion among nearly identical S&P500 index funds. This discovery was perplexing because, in competitive markets, one would expect similar prices for almost identical products. However, in the realm of mutual funds, substantial deviations in fees could arise due to several factors:

1) The inability to arbitrage away such differences (i.e., the inability to short sell open-ended mutual funds with excessively high fees).

2) Investors not giving proper attention to fees.

3) Search frictions stemming from the vast number of available mutual funds.

4) Non-financial distinctions among these funds.

The earlier literature, primarily focused on index funds, arrived at the consensus that mutual fund markets are not perfectly competitive, and fees do indeed matter to investors. Later studies have consistently demonstrated that, on average, mutual funds underperform their benchmarks when accounting for management expenses. Despite this, investors continue to allocate significant capital to actively managed funds in the hopes of achieving superior performance (Kosowski et al., 2006; Hunter et al., 2014; Sheng, Simutin, and Zhang, 2023).

As highlighted by Kosowski et al. (2006), however, the cross-section of mutual fund returns, including their alphas, exhibits a multifaceted non-normal distribution. This complexity arises from two key factors: the diverse risk-taking behaviors among funds and the presence of non-normalities within the individual fund alpha distributions. The non-normality observed in the distribution of returns holds significant implications for the application of statistical methods often used in mutual fund performance evaluation studies, especially when analyzing adjusted returns through regression analysis. In addressing these issues, a non-parametric approach, such as the stochastic dominance approach developed by Linton, Maasoumi, and Whang (2005), can offer a more accurate perspective.

Motivated by the findings of these studies, in this paper, I examine two fundamental questions: First, do actively managed mutual funds' returns stochastically dominate those of non-managed funds, specifically the S&P500? If fund managers indeed possess the ability to select stocks successfully, managed mutual funds should exhibit stochastic dominance over non-managed portfolios, such as the S&P500. Second, empirical evidence has shown that the connection between mutual fund characteristics and their performance is subject to variation depending on the fund's specific investment objective. As a result, it's crucial not to make sweeping generalizations about the relationship between performance and attributes without taking the fund's particular investment goal into account. When assessing the stochastic dominance between two sets of mutual funds, it becomes imperative to give due consideration to the unique investment objectives associated with each group. Consequently, the formulation of my second hypothesis is intrinsically linked to the specific investment objective under consideration: In the event that fund managers charging higher fees can exhibit a consistent skill in stock selection, a managed mutual fund characterized by higher fees should exhibit stochastic dominance over mutual funds characterized by lower fees, provided that they share a common investment objective. When keeping the fund strategy constant, do funds with high management fees stochastically dominate those with low management fees? In other words, do they warrant their higher fees?

The findings to these questions are rather surprising. It appears that funds following long-term growth or value strategies and charging relatively higher fees do not stochastically dominate the S&P500. On the contrary, funds following growth or value strategies and charging relatively lower management fees seem to stochastically dominate the S&P500. These collective results raise con-

cerns about whether certain mutual fund managers' historical performances justify their higher fees. It suggests that investors might be better off investing in a non-managed fund, such as the S&P500, as investors might not receive sufficient compensation for paying management fees to these mutual funds. In the following section, I provide a brief literature review. In section 3, I summarize data, conduct the analysis, and present the results. The last section concludes.

2. Related Literature

In 2022, the combined net assets of mutual funds registered in the United States reached approximately 22.1 trillion U.S. dollars, marking a significant increase from the approximately 5.53 trillion U.S. dollars recorded in 1998 (Investment Company Institute (US), 2022). Over the past few decades, the mutual fund industry, both in the U.S. and globally, has experienced significant growth. Given the magnitude of the money management industry, extensive research has been conducted to investigate whether there is any persistence in fund performance and whether investors are willing to pay a premium for the superior stock-picking abilities of fund managers.

Around the time Elton, Gruber, and Busse (2004) and Hortaçsu and Syverson (2004) documented the striking price dispersion among nearly identical S&P 500 index funds, Berk and Green (2004) introduced an influential partial-equilibrium model of the mutual fund industry, commonly referred to as the neoclassical model of mutual funds. This model contends that percentage-based fees are immaterial because fund size will naturally adjust in equilibrium to ensure that net alphas (i.e., abnormal fund performance after fees) amount to zero. The apparent contradiction between the model's predictions and the empirical evidence regarding index funds has often been ascribed to issues surrounding the measurement of abnormal performance and the empirical focus on a specific subset of funds, namely passive index funds.

Wahal and Wang (2011) concluded that robust competition tends to drive down management fees and reduce fund inflows. Furthermore, In et al. (2014) conducted a comprehensive study on the influence of competition on socially responsible funds, particularly their performance. The results indicated that the specific segment of socially responsible funds may not adhere to the competitive market dynamics, as heightened competition actually bolstered the performance of these funds. Regarding the impact of competition on fees, In et al. (2014) found that fees, intended to cover fund marketing expenses, increased with greater competition, possibly due to additional costs incurred in attracting more investors. Parida and Tang (2018) meticulously analyzed the influence of market competition on fund fees and advanced the argument that since fees are determined by the managing institutions themselves, they should naturally decrease in response to increased competition. However, their findings deviated from this expectation, as funds operating in segments with greater competition were found to charge higher fees. Notably, the authors observed that larger funds ex-

hibited a more pronounced positive correlation between fees and competition compared to their smaller counterparts.

In a more recent study, Cooper et al. (2021) scrutinized the significance of management fees for investors and discovered fee disparities that persisted even after accounting for variables related to fund characteristics. They underscored that these disparities may signify a certain degree of inefficient pricing, as funds with comparable attributes were found to be charging different fees. The authors accentuated the economic impact on investors, revealing that percentage-based fees do indeed matter. In fact, the U.S. fund industry amassed a negative net aggregate value of 125 billion dollars over a span of 37 years, primarily attributable to exorbitant fees. Hunter et al., 2014, Kosowski et al., 2006, Upadhyaya and Chhetri, 2019, and more recently Sheng, Simutin and Zhang, 2023 argue that on average, mutual funds underperform their benchmarks after accounting for management costs.

3. Data and Analysis

I collect data from the CRSP Mutual Fund Database, specifically designed to support research on the historical performance of open-ended mutual funds while mitigating survivorship bias. This dataset is accessible through the Wharton Research Database System (WRDS) and includes comprehensive information such as each mutual fund's name, investment style, fee structure, holdings, asset allocation, monthly total returns, monthly total net assets, net asset values, dividends, expense ratios, and contact information for management companies.

I obtain data from CRSP survivor-bias-free us mutual fund database. My sample covers the time-period from 1998 January to 2021 December. I restrict my analysis to U.S. domestic equity mutual funds with "growth" or "value" investment objectives (crsp_obj_cd = EDYG or EDYI). I dropped mutual funds with missing expense ratios (8 funds) or expense ratios more than 10% (61 funds). The expense ratio is calculated as the ratio of total investment that shareholders pay for the fund's operating expenses, which include 12b-1 fees. Then, for each year, I split the sample into two parts, high or low expense funds, based on the average expense ratio in that year. **Table 1** lists the number of funds in four categories over years: 1) growth funds with low expense ratio (GL), 2) growth funds with high expense ratio (GH), 3) value funds with low expense ratio (VL), 4) value funds with high expense ratio (VH). **Table 2** reports the average monthly returns to these four funds and the SP500 index fund.

Next, I use the methodology described in the works of Lim, Maasoumi, Martin (2006) and Linton, Maasoumi, & Whang (2005), to estimation McFadden test statistics and stochastic dominance statistics for the initial three moments of return distributions.

Specifically, the stochastic dominance methodology described in Lim, Maasouimi and Martin (2006) and Linton, Maasoumi, and Whang (2005) is as follows. Consider two stationary time series of returns, $R_{i,t}$ and $R_{j,t}$, $t = 1, 2, \cdots, T$, with

Table 1. This table lists the number of funds included in the sample by investment strategy and expense ratio over the years.

	Growth Low	Growth High	Value Low	Value High	Total
1998	741	588	145	89	1563
1999	844	698	132	94	1768
2000	942	802	123	90	1957
2001	1189	1004	133	86	2412
2002	1273	1140	127	93	2633
2003	1347	1148	141	102	2738
2004	1377	1223	158	92	2850
2005	1337	1200	152	100	2789
2006	1416	1141	149	105	2811
2007	1770	1436	173	135	3514
2008	1738	1369	188	143	3438
2009	1740	1397	179	140	3456
2010	1765	1404	183	132	3484
2011	1711	1419	186	148	3464
2012	1661	1393	222	166	3442
2013	1681	1403	271	208	3563
2014	1744	1460	277	234	3715
2015	1817	1423	285	247	3772
2016	1750	1439	305	248	3742
2017	1781	1423	336	260	3800
2018	1774	1340	333	253	3700
2019	1676	1365	306	238	3585
2020	1654	1311	299	216	3480
2021	1709	1331	283	220	3543
Ave.	1518	1244	212	160	3134

cumulative probability density functions $F_i(w)$ and $F_j(w)$ over support *w*. The returns are not *iid* but they may exhibit dependency structures in their moments, i.e. clustering may exist. The null hypothesis that $R_{i,t}$ stochastically dominate $R_{j,t}$, for the first three orders can be defined as:

First order: $F_i(w) \le F_j(w)$

Second order: $\int_0^r F_i(t)\mathrm{d}t \le \int_0^r F_j(t)\mathrm{d}t$

Third order: $\int_0^r \int_0^t F_i(s)\mathrm{d}s\mathrm{d}t \le \int_0^r \int_0^t F_j(s)\mathrm{d}s\mathrm{d}t$

Under this specification, the alternative hypothesis is there is no stochastic

Table 2. Average monthly returns to these four funds and the S&P500 index fund. This table summarizes the monthly return of S&P500 as well as the average fund with investment objective and expense category (Growth fund with below average expense ratio, growth fund with above average expense ratio, value fund with below average expense ratio, and value fund with above average expense ratio) between 1998 and 2021.

	Growth Low	Growth High	Value Low	Value High	S&P500
Mean	0.0068	0.0058	0.0065	0.0054	0.0056
SD	0.0469	0.0481	0.0407	0.0400	0.0452
p25	−0.0187	−0.0206	−0.0164	−0.0171	−0.0185
p50	0.0127	0.0110	0.0108	0.0102	0.0106
p75	0.0358	0.0370	0.0310	0.0294	0.0349
Min	−0.1791	−0.1777	−0.1581	−0.1553	−0.1694
Max	0.1301	0.1318	0.1214	0.1206	0.1268

dominance. The test statistics for the above hypotheses are as follows:

For the first order, the null hypothesis test statistics (MacFadden Statistics) is $MF_1 = \min_{i\neq j}\left(SD_{1,i,j}, SD_{1,j,i}\right)$ where $SD_{1,i,j} = \sqrt{T}\left(\sup_t \hat{F}_i(w) - \hat{F}_j(w)\right)$ and $SD_{1,j,i} = \sqrt{T}\left(\sup_t \hat{F}_j(w) - \hat{F}_j(w)\right)$ and

$$\hat{F}_j(w) = \frac{1}{T}\sum_{t=1}^{T} I\left(R_{k,t} \le w\right), \quad I\left(R_{k,t} \le w\right) = \begin{cases} 1 : R_{k,t} \le w \\ 0 : R_{k,t} > w \end{cases}$$

For *m*th order, we need to replace the CDFs by pertinent integrated CDFs, i.e. compute *m*th order CDFs of asset return $R_{i,t}$ by $F_{m,i} = \frac{1}{T(m-1)!}\sum_{t=1}^{T} I\left(R_{k,t} \le w\right)\left(r - R_{i,t}\right)^m$ and calculate $S_{m,i,j}$ and $S_{m,j,i}$ to use in $MF_m = \min_{i\neq j}\left(SD_{m,i,j}, SD_{m,j,i}\right)$.

The outcomes of these analyses are presented in Table 3, which details the stochastic dominance results comparing the S&P500 index against portfolios comprising actively managed mutual funds. These portfolios were constructed based on the mutual funds' strategy classifications and their associated management fee levels. The central observation gleaned from Table 3 is that low fee funds (both the value and growth low expense fee funds) exhibit dominance over the S&P500 portfolios. The results also indicate that a non-managed portfolio appears to stochastically dominate high fee funds, both growth and value funds.

4. Conclusion

My findings underscore the significance of recognizing the non-normal nature of mutual fund returns. Employing the stochastic dominance approach as elucidated by Lim, Maasoumi, and Martin (2006), along with insights from Linton, Maasoumi, and Whang (2005), I document that 1) mutual funds with low management fees, regardless of the strategy they follow, stochastically dominate the

Table 3. S&P500 vs. Value and Growth Mutual Funds. This table summarizes the results of the first two stochastic dominance tests performed between series 1 (f) and series 2 (g). The first column reports the order of SD, the second column shows the null hypothesis being tested, and the third and fourth column discloses (f) and (g) mentioned in the null hypothesis. The rest of the columns report the test statistics, bootstrap generated bottom and top 5% levels, and *p*-values (third and fourth order tests are not reported for brevity).

Order of SD	Null Hypothesis	Series 1 (f)	Series 2 (g)	Statistics	Bottom 5%	Top 5%	PV
1	McFadden	Value-Low	S&P500	0.808	0.000	0.485	0.000
1	(g) dominates (f)	Value-Low	S&P500	0.808	0.000	0.485	0.000
1	**(f) dominates (g)**	**Value-Low**	**S&P500**	**0.866**	**0.121**	**0.849**	**0.000**
2	McFadden	Value-Low	S&P500	0.000	0.000	0.121	0.459
2	(g) dominates (f)	Value-Low	S&P500	0.000	0.000	0.121	0.459
2	**(f) dominates (g)**	**Value-Low**	**S&P500**	**6.062**	**0.243**	**1.576**	**0.000**
1	McFadden	Growth-Low	S&P500	0.231	0.121	0.243	0.408
1	(g) dominates (f)	Growth-Low	S&P500	0.231	0.121	0.243	0.408
1	**(f) dominates (g)**	**Growth-Low**	**S&P500**	**0.924**	**0.121**	**0.485**	**0.000**
2	McFadden	Growth-Low	S&P500	0.866	0.000	0.364	0.000
2	(g) dominates (f)	Growth-Low	S&P500	0.866	0.000	0.364	0.000
2	**(f) dominates (g)**	**Growth-Low**	**S&P500**	**3.060**	**0.000**	**0.849**	**0.000**
1	McFadden	Value-High	S&P500	0.866	0.121	0.364	0.000
1	(g) dominates (f)	Value-High	S&P500	0.924	0.121	0.485	0.000
1	(f) dominates (g)	Value-High	S&P500	0.866	0.121	0.728	0.000
2	McFadden	Value-High	S&P500	0.693	0.000	0.364	0.000
2	(g) dominates (f)	Value-High	S&P500	0.693	0.000	0.485	0.009
2	(f) dominates (g)	Value-High	S&P500	5.427	0.243	1.213	0.000
1	McFadden	Growth-High	S&P500	0.404	0.121	0.364	0.021
1	(g) dominates (f)	Growth-High	S&P500	0.404	0.121	0.485	0.064
1	(f) dominates (g)	Growth-High	S&P500	0.866	0.121	0.364	0.000
2	McFadden	Growth-High	S&P500	0.115	0.000	0.364	0.751
2	(g) dominates (f)	Growth-High	S&P500	3.406	0.000	0.606	0.000
2	(f) dominates (g)	Growth-High	S&P500	0.115	0.000	0.606	0.850

S&P500 index, and 2) high fee funds, on the other hand, fail to stochastically dominate the S&P500 index.

Future studies can improve on this work in a couple of dimensions. I constructed portfolios by considering both the management fee and the self-declared investment strategies of mutual funds. There exist several other factors that can exert an influence on the performance of mutual funds. These factors include fund size, the experience level of mutual fund managers, additional fees that may

not be explicitly accounted for in the direct management fee, and the competitive landscape within the mutual fund industry, among others. Exploring these additional attributes could provide deeper insights into the determination of which mutual funds truly merit higher management fees.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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