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Chase J. Stewart
Gettysburg College
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Abstract
Investors have the ability to choose between two different management styles in the mutual fund industry. These two management styles differ in both the investment strategy type the fund executes and management costs, which are charged to the funds’ investors. First, investors may invest their funds in index funds, which employ a passive investment strategy. Here, investors expect to earn a rate of return equivalent to the market index—minus a small management fee—which the fund seeks to track. Alternatively, investors may choose active fund management. The returns of these mutual funds rely on stock selection ability of portfolio managers. Active portfolio managers perform securities research and obtain information in an attempt to distinguish between undervalued and overvalued securities—allowing them to outperform the market. To compensate for the cost of this research, these funds generally charge a higher management fee which is paid by individual mutual fund investors. In 2004, the average actively managed fund expense ratio was approximately 140 basis points, while the majority of index funds charge fees ranging from 10 basis points to 50 basis points. A expense ratio of 140 basis points would mean that $140 of every $10,000 invested by an individual in a fund will go to the portfolio manager in order to compensate them for their research and management. Some funds carry further expenses in the form of load charges. They take a percentage of an investors initial investment as a sales commission, as these funds are distributed directly by the fund management company. Much debate within the investment community has revolved around the question of whether the fees charged by actively managed mutual funds are justified with higher returns. [excerpt]

Keywords
Mutual fund, equity fund, investment returns, investment strategy, investment portfolio, stock market

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Efficiency of the Mutual Fund Industry:  
an Examination of U.S. Domestic  
Equity Funds: 1995-2004  

By Chase Stewart

I. INTRODUCTION

Investors have the ability to choose between two different management styles in the mutual fund industry. These two management styles differ in both the investment strategy type the fund executes and management costs, which are charged to the funds’ investors. First, investors may invest their funds in index funds, which employ a passive investment strategy. Here, investors expect to earn a rate of return equivalent to the market index—minus a small management fee—which the fund seeks to track. Alternatively, investors may choose active fund management. The returns of these mutual funds rely on stock selection ability of portfolio managers. Active portfolio managers perform securities research and obtain information in an attempt to distinguish between under-valued and overvalued securities—allowing them to outperform the market. To compensate for the cost of this research, these funds generally charge a higher management fee which is paid by individual mutual fund investors. In 2004, the average actively managed fund expense ratio was approximately 140 basis points, while the majority of index funds charge fees ranging from 10 basis points to 50 basis points. A expense ratio of 140 basis points would mean that $140 of every $10,000 invested by an individual in a fund will go to the portfolio manager in order to compensate them for their research and management. Some funds carry further expenses in the form of load charges. They take a percentage of an investors initial investment as a sales commission, as these funds are distributed directly by the fund management company. Much debate within the investment community has revolved around the question of whether the fees charged by actively managed mutual funds are justified with higher returns.

In a model where information is costly to obtain and use during the stock selection and market timing process, it is efficient for trades made by informed investors to compensate them for their research [Grossman and Stiglitz,1980]. Thus, it should be found that active mutual fund managers will provide investors
with returns higher than that of their index fund counterparts—offsetting the higher fees paid for their management. And, in equilibrium, management fees will be exactly equal to the cost born by management to obtain trading information. This type of model can be contrasted with a situation in which stock information is free. In this situation, Fama [1970] states that security prices will incorporate all available information. Under this form of the Efficient Markets Hypothesis (EMH), investors would be irrational to invest in active funds, as efficiency in the market would make it impossible for them to outperform passive index funds. In effect, investors would be paying portfolio managers to gather information already imbedded in the market.

It will be the main focus of this paper to test for market efficiency in the mutual fund industry under the conditions of costly information. The paper will first begin with an overview of the Capital Asset Pricing Model (CAPM) and the Sharpe Ratio and review relevant studies on mutual fund performance. Next, the CAPM and the Sharpe Ratio will be estimated for the funds in our sample and compared to the overall market. From this analysis, it will be evaluated whether active equity funds on average have had the ability to “beat the market” over the period 1995-2004. This will be followed by a further analysis of industry cost efficiency—updating previous studies by testing the effect of management fees and load charges on fund returns with the most recently available data. This analysis will be used to test for inefficiencies in our chosen model of market efficiency. Last, the findings of this research will be summarized, and concluding statements regarding its implications for rational investors will be made.

II. PORTFOLIO THEORY AND LITERATURE REVIEW

The beginnings of modern portfolio theory came about in the early 1960s. The following section will review two models of portfolio returns that have been developed since that time. In addition, relevant studies on portfolio returns will be examined.

A. The Capital Asset Pricing Model and the Sharpe Ratio

The Capital Asset Pricing Model (CAPM) was developed by Sharpe [1964] and others over the course of the 1960s. This model explains portfolio and security returns with the following equation:

\[ E(R_i) = RFR + b(R_M - RFR) \]
Here, a portfolio’s or security’s expected return is equal to the return of the risk-free rate (RFR) and its correlation with the return of the market (RM)—defined by its Beta. The CAPM assumes that no other factors affect a portfolio’s expected return—thus the CAPM expects no abnormal return. Typically, the CAPM is used in empirical research in the following form developed by Jensen [1968]:

$$\hat{R}_t - RFR_t = \alpha + b (R_{M_t} - RFR_t)$$

The constant term is often referred to as “Jensen’s Alpha.” Alpha is the measure of abnormal return in this form of the CAPM equation (again, expected to be zero). Jensen [1968] found, using data on all mutual funds from 1945-1964, that the mean alpha of funds was negative—leading him to conclude that the majority of mutual funds could not on average “beat the market.” However, Ippolito [1989] found contradicting evidence, as the mean alpha for funds in his study was positive—leading him to conclude that it was possible for a random selection of funds to outperform the market. In addition, Ippolito [1989] used regression analysis to further support his findings, finding that expenses did not have a statistically significant relationship with fund returns. Using the same time period and methodology, Elton et al. [1993] found contradictory findings to that of Ippolito when adding a proxy variable for non-S&P500 stocks into the model.

The first section of this paper will update these previous studies with data on all domestic mutual funds (ex-specialty funds) over the ten year period 1995-2004. Both the CAPM equation and the Sharpe Ratio of risk-adjusted returns will be used to test whether active funds have the ability to outperform the market. While very similar, Jensen’s alpha and the Sharpe Ratio differ in their definition of risk. The CAPM equation defines risk as volatility from the market portfolio—systematic risk. On the other hand, the Sharpe Ratio uses a portfolio’s standard deviation as its proxy for risk, which measures total risk. The Sharpe Ratio is defined by the equation:

$$SR = \frac{\bar{R}_t - RFR_t}{\sigma}$$

The numerator is the average portfolio return in period t minus the average risk-free rate of return over period t. The denominator of the equation is the standard deviation of those returns—resulting in a composite measure of portfolio performance indicating the risk premium earned per unit of total risk. By comparing the Sharpe Ratio of a fund to that of the market portfolio, one can gauge the superiority or inferiority of that fund’s returns [Reilly and Brown, 2003].
**B. The Role of Costs in Mutual Fund Performance**

Previous studies have found contradictory evidence in regards to the role of management fees on fund performance. Early studies by Friend et al. [1970], Jensen [1968], and Sharpe [1966] all found that mutual funds do not earn rates of return high enough to offset their expenses. More recently, Bogle [1998] found similar results by testing over a ten year period ending in 2001 and a five year period ending in 1997. In our model of efficiency, these results would lead us to assume that the mutual fund industry is not in equilibrium. Other studies, however, have found that funds do achieve returns that are sufficient enough to offset their costs. As discussed above, the most notable of these studies was done by Ippolito [1989]. Like the work of Ippolito, the main focus of this paper will be to update previous studies and test for market efficiency in the mutual fund industry using CAPM methodology. In addition, the Sharpe Ratio will be used to further examine the nature of returns and costs in the mutual fund industry.

**III. ANALYSIS OF RISK-ADJUSTED RETURNS**

**A. Sample Selection**

The sample used throughout this paper includes all U.S. domestic equity funds (ex-specialty funds). All historical data was obtained from the Morningstar, Inc. Premium Mutual Fund Screener, which holds up to ten years of historical data for currently existing funds. As with Jensen [1968], this sample suffers from survivorship bias, as only funds still existing currently are available to be selected in the sample. To meet the sample selection criteria, a fund had to have ten years of available historical data. In addition, all index funds and institutional funds were removed from the sample. Using the selection criteria, 962 funds were included in the sample. Information on returns, expense ratios, and load fees were all obtained from the Morningstar, Inc. Premium Mutual Fund Screener database. Other variables used in this section and those that follow are derived or calculated from this data.

**B. Jensen’s Alpha, 1995-2004**

For each fund in the sample set, Jensen’s form of the CAPM equation was estimated:

\[
R_t - RF_t = \alpha + b(R_{mt} - RF_t) + \epsilon_t, \ t = 1995-2004,
\]
where \( R_t \) is the rate of return for the fund in year \( t \). This return is net of all management fees except load charges. The variable \( RFR_t \), is the risk-free rate of return in year \( t \), as measured by the return of U.S. Treasury Bills [Damodaran, 2005]. The rate of return in year \( t \) of the market portfolio, defined here as the S&P 500, is denoted \( R_{M_t} \) [Damodaran, 2005]. Remember that the CAPM has an \( E[\alpha] = 0 \); however, superior portfolio managers who have market timing ability or can consistently select undervalued securities will earn higher risk premiums than the CAPM predicts. In terms of the regression, superior portfolio managers will have consistently positive random error terms—resulting in a positive constant term, or alpha. Consistent inferior performance in turn would lead to a negative alpha [Reilly and Brown, 2003].

Based on the 95 percent level of confidence, it was found that of the 962 mutual funds analyzed, 905 were characterized by alphas statistically indistinguishable from zero, 12 by statistically significant positive alphas, and 45 by statistically significant negative alphas. These results are summarized in TABLE I with the findings of Jensen [1968] and Ippolito [1989]. The mean alpha for the sample was -0.17 percent, indicating that the funds in the sample, on average, had inferior performance compared to the overall market. These results were similar to those found by Jensen [1968].

<p>| TABLE I |
|-------------------|-----------|-----------|---------|--------|--------|</p>
<table>
<thead>
<tr>
<th></th>
<th>Zero(^a)</th>
<th>Positive</th>
<th>Negative</th>
<th>Total</th>
<th>Mean Alpha</th>
<th>Mean Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Study, 1995-2004</td>
<td>905</td>
<td>12</td>
<td>45</td>
<td>962</td>
<td>-0.17</td>
<td>0.83</td>
</tr>
<tr>
<td>Ippolito, 1965-1984</td>
<td>127</td>
<td>12</td>
<td>4</td>
<td>143</td>
<td>0.81</td>
<td>0.88</td>
</tr>
<tr>
<td>Jensen, 1945-1964(^b)</td>
<td>98</td>
<td>3</td>
<td>14</td>
<td>115</td>
<td>-1.1</td>
<td>0.84</td>
</tr>
</tbody>
</table>

\(^a\) Alphas are classified as zero if the absolute t-values of the estimated alpha coefficients are less than 2.306, which entails the 95% confidence interval, two-tail test

\(^b\) Fifty-six funds in the Jensen study were based on annual data from 1945-1964; the remaining results were based on annual data from 1955-1964

**FIGURE I**

- **Current Study, 1995-2004**:
  - Positive 1%
  - Negative 5%
  - Zero 94%

- **Ippolito, 1965-1984**:
  - Positive 8%
  - Negative 3%
  - Zero 90%

- **Jensen, 1945-1964**:
  - Negative 12%
  - Positive 3%
  - Zero 85%
C. Sharpe Ratio, 1995-2004

Similar to the section above, a Sharpe Ratio was calculated for each of the 962 funds in the sample. The Geometric Sharpe Ratio, denoted in the following equation, was used:

\[
SR = \frac{\bar{R}_t - \bar{RFR}_t}{\sigma_t}, \quad t = \text{ten year period ending Dec. 31, 2004},
\]

where \( \bar{R}_t \) is the compound annual growth rate (CAGR), or geometric rate of return, for each mutual fund from 1995-2004; and \( \bar{RFR}_t \) is the CAGR for U.S. treasury bills over the same period. The variable \( \sigma_t \) is the geometric standard deviation of fund returns over the ten year period. The results on this analysis are found in Table II.

The Sharpe Ratio for the market (S&P 500 index), is approximately 0.21. Under portfolio theory, this figure represents the risk-adjusted return falling on the Capital Market Line [Reilly and Brown, 2003]. Thus, a fund with a higher Sharpe Ratio would have earned a risk-adjusted return in excess of the market.

For the 962 funds, only 384 were able to earn returns above the Capital Market Line. This represents approximately 40 percent of the mutual funds in the sample. The mean Sharpe Ratio was 0.17654, approximately 0.035 below the return obtained by the S&P 500 market index. This result is similar to that found using Jensen's alpha—revealing that the funds in the sample failed to “beat the market” on risk-adjusted terms.

### TABLE II
Sharpe Ratio for U.S. Domestic Equity Funds

<table>
<thead>
<tr>
<th>Sharpe Ratio of S&amp;P 500</th>
<th>Funds Outperforming</th>
<th>Funds Underperforming</th>
<th>Total</th>
<th>Mean Sharpe Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Study, 1995-2004</td>
<td>0.2109878</td>
<td>384</td>
<td>578</td>
<td>962</td>
</tr>
</tbody>
</table>

IV. Cost Efficiency of U.S. Domestic Equity Mutual Funds

A. Model of Mutual Fund Cost Efficiency

In the model of efficiency tested in this paper, costs play the central role. Under forms of the Efficient Markets Hypothesis (EMH) where security prices reflect all available information, there is no possible way for informed (active) portfolio managers to outperform the market. Thus, investors placing their savings in actively managed mutual funds are playing a loser’s game, as they are
paying fees to reimburse mutual fund managers for collecting and trading on information that is already reflected in market prices. Ippolito [1989] asserts that this type of market equilibrium is flawed. If information is costly to obtain and implement, then equilibrium, in which securities reflect all information, makes it impossible for the market to compensate for information-gathering activities. Thus, if the mutual fund industry is occupied by rational investors, active funds would eventually cease to exist as investors would recognize this impossibility.

Instead of assuming that the existence of active funds is irrational, we assume a different model of efficiency in the mutual fund industry which is used by Ippolito [1989]. In this model, Ippolito [1989] supposes that there are a certain number of informed traders that are able to generate a wedge between trade prices and full-information prices by gathering information. In equilibrium, passive investors essentially pay informed traders a sufficient amount to compensate for the market arbitrage function [Grossman, 1976]. Thus, informed traders “beat the market” before expenses, but make no excess returns after netting out the costs borne during the information-gathering activity (if this were not the case and informed traders “beat the market” after netting out expenses, it would pay for more investors to become informed). So, in equilibrium, there is no incentive to favor an actively managed fund or a passively managed index fund.

To test this model of efficiency, OLS methodology will be used to examine whether expense ratios and load fees have any impact on the risk-adjusted rate of return earned by all funds in the sample.

B. Specification

As with our earlier analysis, both Jensen’s CAPM equation and the Geometric Sharpe Ratio will be used. For the CAPM, the following OLS equations will be used:

\[
R_i - R_{FRi} = \beta_i (R_{M0} - R_{FRi}) + cE_i + dL_i + eMF_i + fY_i + e_i, \quad t = 1995-2004
\]

where \(\beta_i\) is the fund beta estimated from equation one. Thus, coefficient of this variable should be statistically insignificant from one. The variable \(E_i\) denotes the fund’s expense ratio as of Dec 31, 2004; and \(L_i\) is a dummy variable indicating whether a mutual fund charges a load fee.

It should be noted that this regression uses panel data derived from our original sample. Thus, each fund has ten observations, one for each year of the sample period. The variables \(MF_i\) and \(Y_i\) are vectors of mutual fund and year dummies. These vectors are used to account for correlations between the
residual across funds and years [Ippolito, 1989]. Due to constraints of our estimation capabilities of our available statistical software, the sample size had to be reduced. A random sampling of 750 funds was selected from the original 962. It is assumed that this sampling has little to no effect on the empirical results of the regression analysis.

Similar regressions are run using the Geometric Sharpe Ratio. The return measure used in the equation is the ratio of the fund minus that of the S&P 500 index:

\[
SR_i - SR_{S&P500,i} = a + bE_i + cL_i + e_i, \quad t = 1995-2004
\]

The entire sample of 962 funds was used for this regression. The results of both regressions are shown in TABLE III and TABLE IV.

D. Empirical Results of Cost Efficiency

The results from the OLS regressions indicate that mutual funds are not cost efficient as the theoretical model suggests. For cost efficiency to hold, one would expect the coefficients on the expense ratio variable in the regressions to be insignificant from zero; however, this only held true using equation 5. In all other instances, there was a strong negative relationship between a fund’s expense ratio and its return. The estimated coefficients on the expense variable suggest that for each unit increase in \( E_i \), the fund’s return decreased anywhere from 0.86 to 2.5 percent from its expected value in the CAPM.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (3)</th>
<th>(41.03)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \beta_t[R_{Mt} - RFR_t] )</td>
<td>8.159</td>
<td>1.00</td>
</tr>
<tr>
<td>Expense Ratio</td>
<td>1.420</td>
<td>-1.65</td>
</tr>
<tr>
<td>Load(^a)</td>
<td>0.405</td>
<td>10.33</td>
</tr>
<tr>
<td>Mutual fund and year dummy variables(^b)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>0.73</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>7500</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) Load is a dummy variable equal to one for funds with load charges

\(^b\) Includes a dummy variable for each mutual fund and one for each year
It is unclear whether those funds charging loads earn returns sufficient to offset the additional fee charged to investors. By law, a mutual fund may charge up to an 8.50 percent load charge [Ippolito, 1989]. The results obtained by equation 3 indicate that such a fee would be offset typically within one to five years of the purchase of the fund. On the other hand, the results obtained by equation 4 indicate that funds charging a load fee do not earn returns higher or lower than no-load funds.

**TABLE IV**

Effect of Expenses and Load fees on Performance

\[
\text{[Sharpe}_{\text{fund}} - \text{Sharpe}_{\text{S&P500}}\], 1995-2004
\]

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expense Ratio</td>
<td>1.431</td>
<td>-0.15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(16.35)</td>
</tr>
<tr>
<td>Load(^a)</td>
<td>0.395</td>
<td>-0.018</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.49)</td>
</tr>
<tr>
<td>Constant</td>
<td>X</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.25)</td>
</tr>
<tr>
<td>(R^2)</td>
<td></td>
<td>0.22</td>
</tr>
<tr>
<td>Observations</td>
<td>962</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) Load is a dummy variable equal to one for funds with load charges

**V. CONCLUSION**

This paper examined cost efficiency in mutual fund industry using a model in which it is costly for portfolio managers obtain information about securities. The data and methodology are similar to that of several papers ranging in time from the 1960s to the 1990s, most notably that of Ippolito [1989] and Jensen [1968]. The CAPM and Sharpe Ratio were used to analyze the risk-adjusted returns of 962 U.S. domestic equity mutual funds over the period 1995-2004.

It was found that actively managed funds failed to meet their objective and outperform the market, defined by this study as the S&P 500 index, on a risk-adjusted basis. The overall mean alpha for the mutual fund industry was -0.17, with 45 funds characterized by statistically significant negative alphas, and only 12 funds with statistically significant positive alphas. In addition, only 40 percent of funds in the sample were found to outperform the Capital
Market Line over the ten year period when using the Sharpe Ratio as a proxy of risk-adjusted returns. The results found using the CAPM were similar to that of Jensen [1968], but contradictory to those found by Ippolito [1968]. The presence of such contradictory results should lead to future research to find why the industry alpha in the mutual fund industry changes over time or differs depending on the sample period.

Following the methodology of Ippolito [1989], OLS regression analysis was also used to assess cost efficiency in the mutual fund industry. In the equilibrium of the model tested, portfolio managers were assumed to be able to outperform the market by an amount exactly equal to the cost required to obtain and use the information which they used to trade—thus, investors earn the same return in index funds and active funds. Results, using OLS methodology, did not support evidence that the mutual fund industry was in equilibrium during the sample period, or even perhaps that such a model governs the mutual fund industry. It was found that funds with higher expense ratios, on average, earned lower rates of return after expenses. Thus, these funds did not earn rates of return that were sufficient to offset the higher management fees they charge investors. From the analysis presented in this paper, it is unclear whether funds charging load fees did earn rates of return that were sufficient to offset their sales charges. The regression based off of the CAPM showed that a load charge would be offset by higher returns within a one to five year period on average. However, the regression using the Sharpe Ratio indicated that load funds earn returns that are insignificantly different from no-load funds.

These results suggest that rational investors should take expense ratios into account when making mutual fund investment decisions, and might consider cheap passive portfolio management as a superior option to that of active fund management. Although, it should be reiterated that the results presented in this paper are in alignment with some past studies, while contradictory to others. This suggests that studies on mutual fund efficiency may be dependent on both the methodology and, more importantly, the time periods used in the study. Future research using multiple long-term time periods might shed more light on the effects of costs on mutual fund returns.
REFERENCES


Appendix A: DATA DEFINITIONS

Listed below are the data definitions of all fund variables obtained from the Morningstar Premium Fund Screener database:

**Expense Ratio**

The expense ratio of a mutual fund expresses the percentage of assets deducted each fiscal year for fund expenses. These expenses include 12b-1 fees, management fees, administrative fees, operating costs, and all other asset-based cost incurred by the fund. The expense ratios used in this analysis are those reported as of December 31st of 2004 by each fund. It should be noted that these expense ratios for trailing returns-as year by year expense ratio data was not available. Therefore, it is an implicit assumption of this analysis that the expenses of these equity funds have either all stayed the same for the past five years or have all changed up or down by the same proportion over the various time periods.

**Fund Returns**

Annual total returns are calculated on a calendar-year basis. This return includes both income, given in the forms of dividends, and capital gains or losses. Morningstar, Inc. calculates total return by taking the change in the fund’s NAV, assuming reinvestment of all income and capital gains distributions during the period, and then dividing by the initial NAV. These returns are adjusted for expenses included in a fund’s expense ratio.

**No-Load Funds**

No load funds are sold to do-it-yourself investors and thus carry no sales charge. Because of the variety and complexity of possible sales charges and marketing fees, it is difficult to create hard and fast rules that separate load and no-load funds. Morningstar currently defines no-load funds as those offerings that have no front-end or deferred load, and a 12b-1 fee less than or equal to 0.25% per year.

**Other Data Issues—Survivorship Bias**

Like many other studies dealing with mutual funds, this analysis must deal with fund survivorship. For this study, only funds which still exist today will be
included-as data for funds that have closed were not available. This issue also creates another issue for analyzing past returns of funds. Since poor performers tend to drop out while strong performers continue to operate, this cause an overestimation of past returns. This is known as survivorship bias. Assuming that more active funds drop out over time (as poor performance is usually defined by trailing a benchmark/index), it may be appropriate to keep in mind that the overall average returns for active funds is overstated in this study. For example, the Wall Street Journal reported in 1997 that during the time period 1982-1992 mutual funds reported average returns of 18.1%. When survivorship bias was taken into account, average fund returns were taken down to 16.3%.