Efficiency With Costly Information: A Study of Mutual Fund Performance, 1965-1984

Richard A. Ippolito

The Quarterly Journal of Economics, Vol. 104, No. 1. (Feb., 1989), pp. 1-23.

THE
QUARTERLY JOURNAL OF ECONOMICS

Vol. CIV February 1989 Issue 1

EFFICIENCY WITH COSTLY INFORMATION: A STUDY OF MUTUAL FUND PERFORMANCE, 1965–1984*

RICHARD A. IPPOLITO

If information is costly to collect and implement, then it is efficient for trades by informed investors to occur at prices sufficiently different from full-information prices to compensate them for the cost of becoming informed. This notion is tested by evaluating investment performance in the mutual fund industry over a 20-year period. The study finds evidence that is consistent with optimal trading in efficient markets. Risk-adjusted returns in the mutual fund industry, net of fees and expenses, are comparable to returns available in index funds; and portfolio turnover and management fees are unrelated to fund performance.

I. INTRODUCTION

This paper tests for efficiency in capital markets when information is costly to obtain. If information is free, then market efficiency implies that security prices incorporate all available information [Fama, 1970]. But if information is costly to collect and implement, then it is efficient for the arbitrage function to be incomplete: trades by informed investors occur at prices sufficiently different from full-information prices to compensate them for the cost of becoming informed [Grossman, 1976; Grossman and Stiglitz, 1980]. If trades are made at prices that reflect full information, the market is overefficient: it is so well-informed that it cannot compensate the information-gathering function, a clearly unstable condition.

These ideas are tested using mutual fund data over a 20-year

*I am indebted to Marshall Blume, William Sharpe, Larry Summers, Susan Woodward, and the referee for helpful comments; Tom Steinmeier for econometric help; and Dennis Logue for many productive discussions. I owe a special debt of gratitude to Robert A. G. Monks, who got me interested in this subject and provided personal and institutional support to do the study. The views expressed in this paper do not reflect the position of the Pension Benefit Guaranty Corporation.

period from 1965 to 1984. Investors have the option of enrolling in index funds that are characterized by low fees and turnover: they are the essence of passive investments. In contrast, most mutual funds are actively managed, charging fees that average 50 basis points per year and incurring turnover of almost 70 percent annually. If the market is efficient, then mutual funds should make trades and therefore hold portfolios that earn risk-adjusted returns sufficiently higher than index funds to pay for the extra expenses. Testing this hypothesis is the central focus of this paper.

Following a seminal study of mutual funds using data from the 1950s by Friend et al. [1962], a series of papers appeared during the 1960s using mutual fund data to illustrate the implications of the Capital Asset Pricing Model (CAPM) developed by Sharpe [1964] and others (these mutual fund studies included Friend, Blume, and Crockett [1970], Jensen [1968], Sharpe [1966], and Treynor [1965]). The popularity of these studies waned during subsequent periods as more space in the literature was devoted to reporting anomalies to CAPM (e.g., Blume and Friend [1973], Jensen [1978], Tinic and West [1986], and to testing models challenging CAPM for its dominant role in modern portfolio theory (e.g., Roll [1977], Ross [1976]).

Other studies of mutual funds have since appeared, but their focus has been on testing the robustness of various risk-adjusted models in ranking mutual funds' performance, not on evaluating efficiency in the industry (e.g., Lehman and Modest [1985], Grinblatt and Titman [1986]). This has left the impression given by the first generation of papers that mutual funds do not earn rates of return sufficient to offset the costs of their operation (see especially Friend et al. [1970], Jensen [1968], and Sharpe [1966]).

In this paper these results are reconsidered using a similar model and similar data as the first-generation papers, except that a more recent and generally longer period of performance is used. Using selection criteria articulated below, 143 mutual funds are studied over the period 1965–1984. By employing the CAPM model and the Wiesenberger database [Wiesenberger, annual], the results are directly comparable to those reported in Jensen [1968], who studied mutual fund performance over the period 1955–1964 for 115 funds and 1945–1964 for 56 funds.

Virtually the entire literature on mutual fund performance has concentrated on identifying superior performance of particular fund managers. Given the amount of variation in portfolio rates of return over time, this has proved to be a difficult, and perhaps an impossible burden to place on any model of the risk-return tradeoff; and perhaps explains the loss of enthusiasm for mutual fund studies.

This paper departs from this tradition: its purpose is to evaluate the overall efficiency of the mutual fund industry. The question asked is whether a random selection of mutual funds has yielded a rate of return equal to that available in a virtually costless index fund. Whether it was possible over the period studied to find a fund that yielded superior performance; or whether a strategy of fund selection could have been found to "beat the market," are questions essentially ignored in this study.

This does not mean that individual mutual fund "alphas" are not estimated. These calculations are made and compared with findings of earlier studies; and they are used as a weak test of overall performance and efficiency in the industry. Particular attention, however, is given to the role of turnover and fees in fund performance.

Previous studies have implicated management fees in inferior mutual fund performance (for example, Jensen [1968], Sharpe [1966]). Turnover, however, was not available to most of the early studies: Wiesenberger began reporting these data in 1971. In light of the virtual explosion of turnover in mutual funds over the past 15 years and the dramatic variation in turnover policies across funds (see below), it is reasonable to ask whether observed trading strategies are efficient; that is, whether trading represents sufficiently profitable arbitrage to cover research and execution expenses.

Readers who believe in the overall efficiency of the market and the adequacy of CAPM to explain performance will be encouraged by the results reported below. Estimated alphas for the mutual fund industry are significantly greater than zero, a result which contradicts the notion that mutual fund managers do not add value to portfolio management. On average, however, the alphas are not sufficiently large to offset load charges that are not reflected in the data.

In addition, little or no evidence is uncovered that turnover, fees, and expenses are correlated with inferior returns, net of fees and expenses. And load funds generally earn sufficiently higher rates of return compared with no-load funds to pay for the extra charges. These results are consistent with a model of equilibrium that incorporates the expenses of research and trading [Grossman, 1976; Grossman and Stiglitz, 1980].

II. Alphas in the Mutual Fund Industry

A. Sample Selection

The goal in the sample selection procedure is to include mutual funds for which sufficient historical data are available to estimate credible betas and to test for the stability of betas over time. I set a criterion of twenty years of data. One way to satisfy this criterion is to include every mutual fund included in the 1985 edition of *Investment Companies* [Wiesenberger] with a reported inauguration date of 1964 or earlier. While this method follows the selection method used by Jensen [1968], it has a clear survivor bias. Instead, I included every mutual fund for which return data were reported in the 1965 edition of Wiesenberger and followed these funds through 1984. In all, 143 mutual funds were included in the sample, accounting for approximately 85 percent of all mutual fund assets in 1965.

Of these, 106 funds survived the entire period. No funds terminated as such, but 37 were merged into other mutual funds. Fourteen merged with other funds in the sample; 23 merged with funds not in the sample. In these cases, I assumed that investments in the original sample of funds were transferred to the merged funds; that is, I treated the merged funds as if they were continuations of the original funds.

B. CAPM Equations, 1965–1984

For each of the 143 funds, the following Jensen equation was estimated:

$$(1)\quad R_t - R_{Ft} = a + B[R_{Mt} - R_{Ft}] + \text{error}, \qquad t = 1965\text{–}1984,$$

where R_t is the total rate of return for the fund in year t. This variable is taken directly from Wiesenberger: it is inclusive of all earnings and capital gains and net of all fees and expenses except load charges. The variable R_{Ft} is the risk-free rate of return in year t, approximated by the one-year return on U. S. Treasury Bills [Ibbotson, 1986]; and R_{Mt} is the rate of return available in year t on a broad market portfolio. The alpha and beta coefficients are denoted by a and B.

The main results reported in this paper are based on a market portfolio comprised of the S&P 500 as reported in Ibbotson [1986]. This will make the results directly comparable with those reported in Jensen [1968]. A common criticism of CAPM is that the results may be sensitive to a market portfolio less comprehensive than one encompassing all assets available to portfolios in the economy [Roll, 1977; Stambaugh, 1982]. To partly accommodate this concern, the results reported in the paper are also estimated using a New York Stock Exchange index and an equally weighted stock-bond portfolio. In addition, the results were run using the Sharpe measure of performance [Sharpe, 1966]. None of the qualitative results were changed by the use of these indices compared with those based on the S&P 500 index.

There are at least two problems with estimating equation (1), both involving the risk parameter, beta. First, even if each mutual fund manager strives to attain a target beta, if some managers can forecast overall market returns accurately, they may adjust risk upwards or downwards to take advantage of these movements. Jensen [1968] showed that if this ability exists, it will tend to show itself in positive alphas, albeit at the cost of higher standard errors on the coefficients. Subsequent papers using unbiased maximum likelihood estimation techniques have found little or no evidence of successful market timing by mutual funds; and thus empirically there appears to be little bias inherent in the Jensen equation from this source (see Chang and Lewellen [1984], Kon and Jen [1979], and Henriksson [1984]).

Second, some mutual fund managers may systematically change the target beta for the fund, especially over long periods of time; thereby violating the integrity of the estimating equation in (1). Based on a simple test reported below, the data generally do not contradict the assumption of constant target betas in funds over the period under study.

The estimates of the Jensen equation in (1) and the results of subsequent work in this paper are based on annual, not quarterly or monthly, data. This makes the results comparable with those found in the first generation mutual fund studies. More importantly, a focus of this paper is on the role of active management on investment performance, with particular emphasis on turnover. This relation is difficult to measure using short observation periods.

If an informed trade is made, its impact on performance occurs sometime between the purchase and sale of the security. There is no reason to believe either that the fund will purchase a security the moment before information becomes public or that it will sell a security the moment a capital gain is realized. If the sale occurs in the quarter following the capital gain, and the purchase occurs in the quarter prior to the capital gain, the correlation between observed turnover and performance is lost with quarterly data.

Without an elaborate model, a test of turnover hypotheses requires the use of fairly lengthy observation periods. Since the average fund generally turned over at least 50 percent of its portfolio per year, it is reasonable to believe that a period of performance covering a full year is adequate to provide a fair measurement of the turnover-return relation. Turnover measures over periods longer than one year are included in some of the analyses below to capture any relation that may be severed by cutting off the period of performance at one year.

C. Results

The equation in (1) was estimated for the 143 mutual funds in the sample using annual data over the period 1965–1984. Recall that Wiesenberger reports the rate of return realized by the investor; it is the return *after* the mutual fund subtracts its expenses and the management fee. The first question asked of the data is whether there is any evidence that mutual funds either failed to earn rates of return available in an index fund or earned returns that "beat" the market. This is determined by testing for significant negative or positive alpha coefficients in the estimating equation.

Based on a 95 percent level of confidence, Jensen [1968] found that of the 115 mutual funds he studied over the period 1945–1964, 98 were characterized by alphas that were insignificantly different from zero, 3 by significantly positive alphas and 14 by significantly negative alphas (see Table I, second row). Since there are expected to be between five and six significant positive alphas and the same number of negative alphas just by chance at this level of confidence, Jensen concluded that there was some evidence in favor of the notion that mutual funds, on average, could not earn rates of return that justified the expenses of operating the fund.

TABLE I
ALPHAS FOR INDIVIDUAL MUTUAL FUNDS

	Zero[a]	Positive	Negative	Total	Mean alpha	Mean beta
Current study, 1965–1984	127	12	4	143	0.81	0.88
Jensen, 1945–1964[b]	98	3	14	115	−1.1	0.84

a. Alphas as classified as zero if the absolute t-values on the estimated alpha coefficients are less than 2.10, denoting the 95 percent confidence level, 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.

The results based on similar methodology and data over the ensuing 20-year period—1965–1984—give the opposite impression. Of the 143 funds evaluated, 127 were characterized by alphas that were insignificantly different from zero, 4 by significantly negative alphas, and 12 by significantly positive alphas. Approximately seven funds are expected to have significantly positive and negative alphas by chance in this sample size.

These equations are estimated under the assumption that the target betas in each fund do not change systematically upward or downward over time. The hypothesis that fund betas are stable over the 20-year period under study was tested by effectively separating the time period in two and testing for the presence of significantly changing betas. The results showed that in 15 out of 143 funds, the hypothesis of a stable beta could not be accepted.[1] For the sake of consistency with CAPM, the remaining analyses are done excluding these 15 funds, though none of the qualitative results are altered by their inclusion: this leaves 128 funds in the remainder of the study. (Only one of these funds had an alpha significantly different from zero as reported in Table I.)

D. Average Industry Alpha

The inferences based on the tests reported in Table I are appropriate if the question considered is whether some mutual funds exhibit the ability to outperform the market. The question of central concern to this essay is whether random investments in the mutual fund industry result in risk-adjusted returns commensurate with those available in an index fund. For this purpose, the tests reported in Table I are inefficient because they ignore information embedded in the alphas of the majority of funds.

This information is incorporated by calculating the mean value of alpha for all the funds: this turns out to be 83 basis points for the 128 funds remaining in the sample, with a standard error of 20. (The alpha weighted by mean asset size, where size across years is indexed to the 1984 NYSE index, is 101 basis points; the alpha for all 143 funds is 81.) The significantly positive alpha in the industry is quite robust across mutual fund types and using different market return indices.

1. The following version of equation (1) was run for each fund in the sample: $R_t - R_{Ft} = a = B[R_{Mt} - R_{Ft}] + cD(1975\text{–}1984) + d[R_{Mt} - R_{Ft}]\,D(1975\text{–}1984) +$ error, where $D(1975\text{–}1984)$ is a zero-one dummy variable equal to unity for the years 1975–1984. If the coefficient d is significantly different from zero, then the hypothesis that the fund's beta is stable cannot be accepted. For this purpose, a 90 percent level of confidence was used (absolute t-value equal to 1.73).

First, consider the results using either the New York Stock Exchange common stock index or an equally weighted S&P 500 stock-Salomon Brothers long-term bond market index. The average alphas using these indices turned out to be 87 and 248 basis points, both significantly different from zero. The results were also calculated using the Sharpe performance measure: excess rate of return divided by the standard deviation of returns over the 20-year period, divided by a similar measure for the S&P 500 index. This measure turns out to be the equivalent of 257 basis points with a standard error of 90 (see Table II).

The results also were run separately by type of mutual fund. Funds were separated by their beta value, average stock share over the 20-year period 1965–1984, and their Wiesenberger mutual fund classification. These results are shown in Table III. All the alphas in the table are positive; six of the nine are significantly positive at the 90 percent level. It is interesting that contrary to previous studies (e.g., Black et al. [1972]), there is no evidence in the table that alphas are related to beta; nor is there evidence that alphas are significantly different depending on stock share in the fund or Wiesenberger type.

Caution must be used before inferring from these results that mutual funds as a group are "beating" the market. While Wiesenberger rates of return are net of turnover costs, management fees, and other expenses, they are gross of load charges. Approximately

TABLE II
MARKET INDICES[a]

Index	Alpha	Beta
S&P 500	0.83	0.88
	(4.01)	(42.75)
NYSE	0.87	0.91
	(4.20)	(45.51)
S&P-Salomon	2.48	1.11
	(11.80)	(55.05)
Sharpe measure[b]	2.57	—
	(2.79)	

a. Numbers in parentheses are t-values.
b. The Sharpe measure is converted to basis points by subtracting unity and multiplying by the standard deviation of returns on the S&P 500 index over the 20-year period.

TABLE III
ALPHAS, BY MUTUAL FUND TYPE

Mutual fund type	Observations	Alpha	t-value
Beta			
Less than 0.77	39	0.86	2.15
0.77–1.02	63	0.85	3.26
More than 1.02	26	0.75	1.41
Stock share			
Less than 65%	28	0.44	1.30
65–90	62	0.99	3.53
More than 90	38	0.88	1.93
Wiesenberger type			
Capital appreciation	13	0.82	0.88
Long-term growth	47	1.28	3.45
Growth and income	37	0.45	1.36
Balance funds and income funds	31	0.62	2.01

half the funds in the sample were load funds in 1984. A load fund assesses a sales charge upon purchase of shares from the fund: except for very large clients, sales charges typically amount to 8.5 percent of asset value. A no-load fund imposes no sales charge. The impact of load charges on annualized rates of return depends on the length of time that monies are held in the fund. If an investor has equal monies in all funds in the sample, a positive alpha equal to 0.83 (see Table II) will offset the load charges after a holding period of approximately five years.

E. Qualifications

It is appropriate to use these alpha calculations for the purpose of comparison with earlier studies that used the same methodology and data source. That is, early studies suggest that mutual funds add no value, and hence after expenses, underperform index funds. These conclusions should be reevaluated in light of the results reported in Tables I through III. As an absolute test of efficiency in the mutual fund industry, however, these calculations may not be entirely appropriate.

First, depending on the version of CAPM, a zero alpha does not necessarily indicate efficiency: efficiency may imply a positive alpha (e.g., see Black et al. [1972]). Second, while I tried various market indices, none accounted for small firm stocks; and it has been demonstrated that use of such indices will tilt the alpha toward positive values (e.g., see Grinblatt and Titman [1986]). And third, my mutual fund sample evinces a beta less than unity (0.88); and it has been shown that low betas tend to be affiliated with positive alphas [Black et al., 1972], though it is not obvious from Table III that this problem is important in my database.

These issues suggest that other tests should be used to evaluate efficiency in the mutual fund industry. One way to do this is to exploit conditions that ought to characterize efficient equilibrium, and to test for these conditions across mutual funds and over time.

III. Efficiency of Mutual Funds

A. *Efficiency Concepts*

The specification of efficiency conditions in the mutual fund industry has changed subtly but importantly over the past 20 years. During the period of the first-generation mutual fund papers, the Efficient Market Theory (EMT) was in its infancy, and it was commonly asserted that EMT meant that stock prices reflected all available information [Fama, 1970]. Within this framework mutual funds through research and trading cannot improve on this information and thus are destined to lose money as they expend resources with no possibility of beating a "fully efficient" market.

The problem with this depiction of equilibrium is that, if information is costly to obtain and implement, a full-information equilibrium makes it impossible for the market to compensate the information-gathering activity. Ipso facto, equilibrium cannot be characterized by prices that reflect all available information. In some sense, a "fewness" condition on the number of informed traders is required to generate a wedge between trade prices and full-information prices. This wedge must be sufficient to compensate the market arbitrage function [Grossman, 1976].

In this model passive investors essentially pay informed traders (through trades favoring informed investors) a sufficient amount to pay for the information-gathering activity. Informed traders "beat the market" before expenses but make no excess returns after netting out the expense of gathering information (otherwise, it pays more participants to become informed). Thus, in equilibrium there is no incentive to favor either an actively managed fund or a passive index fund.

This notion suggests a basis to test if mutual funds (evinced by expenses, fees, and turnover that greatly exceed those in passive funds) expend monies rationally; whether, after expenses and fees, investors in these funds can expect to earn a risk-adjusted rate of return commensurate with an index fund; and whether funds with higher expense ratios, higher fees, and higher turnover earn sufficiently higher rates of return, gross of expenses, to pay for these additional costs. If mutual funds are essentially uninformed investors, then their returns, adjusted for risk and expenses, will be lower than returns available in a passive index fund; and funds with higher fees and turnover will perform systematically worse compared with mutual funds that charge lower fees and do less trading.

B. Expense Data, 1965–1984

There was concern in the early studies that mutual fund expenses were already "too high" during the late 1960s. But as evinced by data shown in Table IV, overall fund expenses have increased dramatically over the past 20 years. Turnover in the early 1980s was at least 50 percent higher than in the early 1970s (the earliest dates for which data are available). Peculiarly, turnover did not increase markedly after deregulation of fixed commissions in 1975; its dramatic increase did not begin until 1980 and thereafter.

Similarly, management fees and expenses as a percent of assets under management have increased by 20 percent since the late 1960s. It is easy to be suspicious that these increases in activity and associated expenses could be detrimental to mutual fund performance, net of expenses.

The question whether performance in the mutual fund industry is sufficient to offset expenses has been answered in part in

TABLE IV
TURNOVER, MANAGEMENT FEES, AND EXPENSES, 1965–1984

Period	Turnover[a] (percent)	Management fee[b] (basis points)	Expense ratio (basis points)
1965–1970	N/A	49.6	65.2
1971–1974	40.3	51.2	71.3
1975–1977	34.8	53.1	79.2
1978–1981	47.9	56.4	80.5
1982–1984	63.4	59.6	84.0
Average	45.8	52.9	73.9

Source. Wiesenberger [annual].
a. Turnover is the lower of annual purchases or sales in the fund during the year divided by average assets.
b. In case of a fee schedule the highest fee is included (see note 4 in text).

Table II. There is no evidence over the period 1965–1984 that, net of risks and expenses, mutual funds underperformed an index fund. For reasons discussed above, however, it is desirable to go beyond this to find verification of these inferences. This can be done by considering more carefully, the role of turnover in mutual fund performance.

C. Empirical Specification

To pursue this notion, I want to use all the data in the sample, and thus I shall pool all the cross-section and time series observations. This is an efficient procedure in the sense that it uses all available information to test my hypothesis. But technical problems emerge using pooled data because the residuals will not necessarily be independent. Positive correlation in the residuals can seriously underestimate the standard errors on the estimates.

If these residuals are correlated across funds in complex ways, it may be difficult in many circumstances to circumvent the problem (see Gibbons [1982]). For the most part, however, there are two likely avenues for the problem to emerge: (1) residuals are correlated serially for particular funds (e.g., positive alpha funds usually have positive residuals); and (2) residuals are correlated in particular years for all funds, (e.g., owing to the small stock effect, market values of mutual funds all change proportionally more than the S&P 500 index over time). These problems can be accommodated simply by including dummy variables for each mutual fund and each year (except one) in the regression.[2]

A slightly more complicated residual problem also can be accommodated. Some funds may react to random temporal shocks differently, so that residuals will be correlated among groups of funds (e.g., if bond values decrease in a particular year; this will affect balanced and income funds in relation to the S&P 500 index, but not necessarily stock funds). This problem can be accommodated by running the regression separately for types of funds that are likely to share a common reaction to random disturbances.

2. Unfortunately, inclusion of these dummy variables eliminates almost all of the variation in my management fee and expense variables, and thus reduces their power in distinguishing among hypotheses. Sufficient variation remains in the turnover variable (and also in the load variable), however, to permit more powerful tests, as will be demonstrated below. More particularly, after inclusion of fund and year dummy variables, less than 2 percent of the variation in my expense and fee variables remain, resulting in large standard errors on their coefficients. About 25 percent of the variation in the turnover variable remains, however, and 10 percent of the variation in the load variable. Estimation of the coefficients without including the fund and year dummy variables did not alter the qualitative results reported below.

Turnover data became available only in 1971; thus, the pooled regression is estimated over the period 1971–1984. Since the betas were previously estimated with six more annual observations (back to 1965), I imposed the estimated betas from equation (1). Thus, the main regression I use to test for market efficiency takes the following form:

$$(2) \quad R_{it} - R_{Ft} = bB_i[R_{Mt} - R_{Ft}] + cE_{it} + dMF_i + eY_t + \text{error}, \qquad i = 128 \text{ and } t = 1971\text{–}1984,$$

where B_i has been estimated from equation (1). Thus, the coefficient b should be insignificantly different from unity. (I also ran the equation in a form that estimated the betas simultaneously with the expense variables: none of the qualitative results were altered.[3])

The variables MF_i and Y_t are vectors of mutual fund and year dummies (d and e are the corresponding vectors of coefficients), and E_{it} represents measures of mutual fund expenses. Measures of mutual fund expenses include portfolio turnover, management fees,[4] and expenses ratios. Since Wiesenberger reports performance net of these expenses, then if mutual funds expend resources efficiently (they generate higher gross returns sufficient to offset these expenses), these variables should be insignificantly different from zero.

A dummy variable was also included to denote a load fund. Rational investors will not participate in load funds if they do not generate returns greater than those available in no-load funds. Since Wiesenberger rates of returns are gross of load charges, this variable should be significantly positive, showing that these funds earn higher returns to offset these charges.

Recall that 14 funds merged into other funds already in the sample. To prevent double counting of turnover and other expense effects in these 14 funds, duplicate data were excluded from the analysis (none of the results changed when the duplicate data were included). The results of estimating equation (2) are reported in column 1 of Table V.

3. To do this, 128 interaction terms between fund dummy variables and the excess market return variable are included, instead of the term $B_i[R_{Mt} - R_{Ft}]$. This approach yields noisier estimates of beta, but accommodates potential bias if the expense variables (omitted from equation (1)) are correlated with the market return variable in equation (1). I reestimated equation (2) using this alternative and found virtually the same results as those reported in Table V.

4. Fees are usually reported in ranges based on client size. I used the highest fees reported. Low fees are often quoted for client sizes that dramatically exceed the size of the mutual fund, and thus are unlikely to be representative of actual transactions fees. The high fees typically include clients up to \$50,000–\$1,000,000 size range, and hence are representative of most clients, excluding some large institutional clients (e.g., pensions).

TABLE V
IMPACT OF TURNOVER, EXPENSES, AND FEES ON PERFORMANCE, 1971–1984

Variable	Mean	(1)	(2)
$B_i[R_{Mt} - R_{Ft}]$	2.26	0.91 (14.19)	0.91 (14.18)
Load[a]	0.70	3.42 (2.69)	3.48 (2.66)
Management fee (%)[b]	0.55	−5.06 (1.39)	−5.11 (1.40)
Expense ratio	0.78	1.18 (0.46)	−1.96 (0.38)
Turnover ratio[b]	0.46	0.80 (0.86)	—
Turnover categories:			
25–49%	0.37	—	0.60 (0.45)
50–74%	0.29	—	−0.38 (0.30)
75–99%	0.16	—	−0.56 (0.46)
greater than 100%	0.08	—	0.71 (0.45)
Mutual fund and year dummy variable[c]		X	X
R^2		0.778	0.779
Observations		1,351	1,351

Mean of the dependent variable is 2.89; numbers in parentheses are t-values.
a. Load is a dummy variable equal to unity for funds with load charges.
b. See notes to Table IV.
c. Includes a dummy variable for each mutual fund and one for each year except 1971.

D. Results

The results are consistent with the notion that mutual funds invest monies efficiently. The coefficients on the turnover, management fee, and expense ratio variables are insignificantly different from zero: funds with higher turnover, fees, and expenses apparently earn risk-adjusted returns that are sufficient to offset the higher charges. The estimated coefficient on the load charge variable is positive and significant at the 95 percent level of confidence, suggesting that load funds earn rates of return that plausibly offset the load charge. Though the 95 percent bounds on this coefficient are quite large, the result is consistent with the notion that an 850 basis point sales charge would be offset after a holding period of five–six years.

These results are verified in column 2 of the table. The turnover measure is divided into five categories: less than 25 percent turnover (omitted), between 25–50 percent, 50–75 percent, 75–100 percent, and greater than 100 percent. None of the turnover variables are significantly different from zero, and thus there is no evidence that the overall turnover result hides nonlinear relations.

IV. Turnover and Performance: Further Tests

In this section the turnover results reported above are tested for robustness. The results are reestimated using different subsamples of the data and different model specifications.

A. Time Periods

The insignificance of the turnover effect is not specific to a particular subperiod in the data. The equation estimated in Table V was reestimated for four subperiods separately. One pre-May Day period was chosen, 1971–1974; one post-May Day period, 1975–1977; and two subsequent periods from 1978 through 1984. The estimated coefficients on the turnover variables are reported in Table VI with their accompanying t-statistics. Two of the signs are positive, and two are negative: none are significantly different from zero.

B. Turnover Impact Across Funds

The insignificance of the turnover effect is also consistent across different kinds of funds. The regression reported in Table V, column 1, was rerun separately for funds characterized by different values of beta, stock share, and Weisenberger fund categories. The results which are reported in column 1 of Table VII, show that the turnover impact is insignificantly different from zero in all but one case: the coefficient for funds with relatively little stock (less than 65 percent on average) is significantly positive at the 90 percent level.

TABLE VI
TURNOVER EFFECTS, BY TIME PERIOD

Period	Coefficients
1971–1974	−2.17
	(0.83)
1975–1977	3.91
	(1.44)
1978–1981	1.33
	(0.71)
1982–1984	−1.72
	(0.75)

Numbers in the table are coefficients on the turnover variable when the equation in Table V, column 1, is run during each subperiod.
Numbers in parentheses are t-values.

TABLE VII
TURNOVER EFFECTS, BY FUND TYPE

Fund type	Coefficient on turnover
Beta	
Less than 0.77	−1.35
	(0.87)
0.77–1.02	0.57
	(0.45)
More than 1.02	2.97
	(1.40)
Stock share	
Less than 65%	2.89
	(1.67)
65–90	0.60
	(0.50)
More than 90	−1.84
	(0.87)
Wiesenberger type	
Capital appreciation	2.42
	(0.74)
Long-term growth	−2.23
	(1.26)
Growth and income	−0.15
	(0.10)
Balance funds and income funds	0.44
	(0.39)

See notes to Table VI.

C. Different Market Indices

The results in Table V also were checked for robustness using different market portfolio indices. All fund betas were reestimated using market rates of return on New York Stock Exchange common stocks; and an equally weighted mix of the S&P 500 stock index and the Salomon high grade, long-term bond index [Ibbotson, 1986]. The CAPM regression was rerun using the new betas and the NYSE and mixed market portfolio returns. The regression was also rerun using the Sharpe measure of performance. The results, presented in Table VIII, are qualitatively the same as those reported in Table V.

D. Lagged Turnover

If all informed purchases occurred just prior to information becoming public and sales occurred just after such announcements,

TABLE VIII
TURNOVER RESULTS USING DIFFERENT MARKET INDICES

Variable	NYSE Index (1)	Stock-bond market index (2)	Sharpe measure (3)
Market returns[a]	0.90	0.97	1.22
	(14.34)	(10.90)	(11.03)
Load	3.36	3.33	0.153
	(2.58)	(2.47)	(2.06)
Management fee	−5.28	−2.85	−0.29
	(1.45)	(0.76)	(1.41)
Expense ratio	−1.07	−1.67	−0.02
	(0.42)	(0.64)	(0.10)
Turnover ratio	0.83	1.04	0.444
	(0.89)	(1.09)	(0.84)
Mutual fund and year dummy variables	X	X	X
R^2	0.779	0.736	0.767
Observations	1,351	1,351	1,351

The dependent variable in columns 1 and 2 is $R_{it} - R_{Ft}$; the dependent variable in column 3 is the Sharpe index. Numbers in parentheses are t-values.

a. In column 1 this variable is the market return times the estimated beta based on a NYSE common stock total rate-of-return index; in column 2 it is the market return times the estimated beta based on equally weighted stock-bond market performance index as reported in Ibbotson [annual]; in column 3 it is the Sharpe index for the S&P 500.

the turnover-performance relation could be measured using data covering any period of time. But it is conceivable that 100 percent turnover will occur in quarter 1, followed by capital gains in quarter 2 as information becomes public, followed by a 100 percent turnover in quarter 4. In this case, use of quarterly data would generate a negative relation between performance and turnover, even though all trades are profitable (the highest rates of return are observed in quarters 2 and 3 when turnover is zero).

Full-year data are less likely to separate the turnover measure from its effect on performance; but they do not eliminate the problem: trades in the previous year could result in higher rates of return in the current year. To test this, the performance equation was reestimated incorporating turnover in period t and turnover in period $t - 1$ in the regression. I also ran a straight cross section for the 128 mutual funds in the sample using averages of all variables over the sample period.

The results are shown in columns 1 and 2 of Table IX. The results in column 1 show that performance is independent of turnover and lagged turnover. There is also no relation between turnover or expenses with performance using the cross-section regression, though the coefficient on load factor is also insignificant.

E. Type of Turnover

An attempt was made to determine whether the turnover effect was different for different types of turnover. In particular, the issue was considered whether trading securities to alter the stock-bond ratio in the fund—perhaps in an effort to "time" the market—resulted in better or worse performance than turnover of securities within the stock and bond portions of the portfolios.

Market-timing turnover was measured by calculating the share of stock in the portfolio at the start of the year and projecting its value at the end of the year based on market returns to stocks and bonds during the year. The absolute difference between this projected stock share and actual end-of-year stock share is a measure of the fund manager's attempt to alter the stock-bond components of the portfolio: call this "market-timing turnover." In column 3 of Table IX, the results are reported, including the market-timing turnover variable and the traditional turnover variable. The coefficient on the timing variable is significantly positive, though it is very small. The result suggests that 100 percent market-timing turnover would result in an increase in rate of return equal to 0.23

TABLE IX
PERFORMANCE IMPACT OF DIFFERENT TURNOVER MEASURES

Variable	(1)	(2)	(3)
$B_i[R_{Mt} - R_{Ft}]$	(0.92	—	0.97
	(13.86)		(14.61)
Load	3.93	0.19	2.65
	(2.85)	(0.33)	(1.95)
Management fee	−6.38	−0.65	−4.35
	(1.55)	(0.26)	(1.13)
Expense ratio	−0.47	−0.81	−2.18
	(0.17)	(0.64)	(0.77)
Turnover	0.82	0.22	0.39
	(0.79)	(0.26)	(0.40)
Turnover_{t-1}	0.28	—	—
	(0.26)		
Turnover for market timing[a]	—	—	0.23
			(2.12)
Mutual fund and year dummy variables	X	1.54[b]	X
		(1.29)	
R^2	0.785		0.78
Observations	1,203	128	1,283

The dependent variable is $R_{it} - R_{Ft}$ in columns 1 and 3, and alpha in column 2; numbers in parentheses are t-values.
a. The calculation of this variable is given in the text.
b. This coefficient is the intercept value.

percent. On average 6.8 percent of the sample portfolios were turned over each year to switch between stock and bonds. Notwithstanding its small magnitude, it is a finding that suggests benefits of further inquiry.

F. Power of the Turnover Tests

None of the results support the notion that portfolio turnover is negatively related to performance net of turnover and other costs. Do the results also support the hypothesis that turnover T is positively related to performance, gross of turnover expenses, R_δ That is, in the equation $R_\delta = a + bT$, is b significantly greater than zero? This question can be answered from the data with some knowledge of trading cost.

In particular, the performance regressions reported above are of the nature, $R_\delta - c = a + (b - c)T$, where c is the cost of turnover (in percentage terms). In the main regression in Table V, column 1, for example, the estimated coefficient $b - c$ was 0.8 with a standard error of 0.9. Turnover costs are not reported separately in the performance data but, from other sources, we know that the minimum value of c is 0.7 percent which for all intents and purposes can be considered a constant.[5] Roll [1984] puts the spread as high as 1.74 percent with a tiny standard error, which increases to 2.1 percent after commission costs.[6] Given the small error on these estimates, the standard error on the value of b is virtually identical to the error on the estimated coefficient, $b - c$. Thus, my implicit estimate of b is in the range 1.5–2.9 percent, 1.67 to 3.22 times its standard error.

V. Summary and Concluding Remarks

This paper presents results of a study of performance for 143 mutual funds over the period 1965–1984. The technology and data are comparable to several "first-generation" mutual fund studies published between 1962 and 1970. The central focus of the paper was to test the hypothesis that conditions characterizing the mutual fund industry satisfy conditions for efficient markets. The main results are as follows:

A. Overall Industry Results

Mutual funds, net of all fees and expenses, except load charges, outperformed index funds on a risk-adjusted basis; these results contrast with results reported in first-generation studies that tended to find evidence of negative alphas [Friend et al., 1962; Friend, Blume, and Crockett, 1970; Jensen, 1968; Sharpe, 1966].

5. The commission costs for large block trades is roughly 16 cents for a round-trip [Berkowitz and Logue, 1986]. The minimum bid-ask spread is ⅛ or 12.5 cents. On a $40 stock (the average for a stock traded on the NYSE) this amounts to a total cost of 0.7 percent.

6. In reality, the bid-ask spread on anything but small lots will exceed ⅛. Roll [1984] estimates bid-ask spreads by calculating serial covariances of returns on all stocks on the CRSP tapes during the period, 1963–1982. Using daily data, he estimates a spread consistent with the minimum estimate (0.3 percent) with a standard error equal to 0.01 percent. Using weekly data, he estimates the spread to be 1.74 percent with a standard error equal to 0.02 percent. Adding the commission costs to these numbers, the range of trade costs in Roll's estimates range from 0.7 percent to 2.1 percent.

The industry alpha, though significantly positive, is not sufficiently large to overcome the load charges that characterize the majority of funds in the sample. Thus, on balance, the evidence is consistent with the notion that expenses and charges affiliated with mutual funds are offset by superior results, a condition that characterizes efficient markets in the presence of costly information.

B. Comparative Fund Results

An attempt was made to characterize efficient equilibrium across mutual funds and over time. The hypothesis was tested that mutual funds that followed more active policies (as evinced by higher expenditures in the form of turnover costs, management fees, and other expenses) generated returns sufficiently high to pay for the higher expenses.

The results showed that mutual funds with higher turnover, fees, and expenses earn rates of return sufficiently high to offset the higher charges. These results are consistent with the notion that mutual funds are efficient in their trading and information-gathering activities [Grossman, 1976; Grossman and Stiglitz, 1980]. In addition, load funds earned rates of return sufficiently high to offset their sales charges compared with no-load funds. These results persisted in the face of numerous model specifications and fund subsamples.

More reliable empirical work could be done if tractable models of informed trading were available. At present, there is no way of knowing the length of time between the purchase, the subsequent capital gain, and the sale of the security. This problem was circumvented in this paper by relying on full-year performance data. The use of shorter performance periods would in principle permit more efficient estimates of the turnover impact. But given the stage of the theory, this strategy could raise significant problems.

Two equilibrium conditions might help resolve the integrity of a quarterly data base. First, when mutual funds make their informed purchases—then if they fully exploit their information—they ought to purchase stock until they push the new price to the point where it reflects the new information. This suggests that price effects should occur during the purchase period.

Second, if not, arbitrage should ensure the result. That is, if mutual funds purchase "too little" so that they, themselves, do not increase prices to fully reflect the new information, arbitrageurs could simply await announcement of mutual fund portfolios (which must be publicly reported quarterly); and ape their portfolios: this would cause prices to adjust fully in the ensuing quarter. These arguments suggest that turnover impact ought to be observed during the quarter the trading occurs, or at the latest, in the subsequent quarter.

Finally, while studies of mutual funds have now been done for over 20 years, performance of other institutional investors have not received such close attention. For example, pension plans could own half of all corporate securities by the year 2000 [Ippolito, 1986]. Yet, little has been done to test efficiency conditions in these markets.[7] The extension of these results to other traders also represents as interesting direction of future research in investment performance.

PENSION BENEFIT GUARANTY CORPORATION

REFERENCES

Berkowitz, Stephen A., and Dennis E. Logue, *Investment Performance of Corporate Pension Plans*, report submitted to the U. S. Department of Labor, 1986.
Black, Fisher, Michael Jensen, and Myron Scholes, "The Capital Asset Pricing Model: Some Empirical Tests," in Michael Jensen, ed., *Studies in the Theory of Capital Markets* (New York: Praeger, 1972).
Blume, Marshall, and Irwin Friend, "A New Look at the Capital Asset Pricing Model," *Journal of Finance*, XXVIII (1973), 19–34.
Chang, Eric C., and Wilbur G. Lewellen, "Market Timing and Mutual Fund Performance," *Journal of Business*, LVII (1984), 57–72.
Fama, Eugene F., "Efficient Capital Markets: A Review of Theory and Empirical Work," *Journal of Finance*, XXV (1970), 383–417.
Friend, Irwin, Marshall Blume, and Jean Crockett, *Mutual Funds and Other Institutional Investors* (New York: McGraw Hill, 1970).
Friend, Irwin, F. E. Brown, Edwin S. Herman, and Douglas Vickers, *A Study of Mutual Funds* (Washington, DC: U. S. Government Printing Office, 1962).
Gibbons, Michael R., "Multivariate Tests of Financial Models: A New Approach," *Journal of Financial Economics*, X (1982), 3–27.
Grinblatt, Mark, and Sheridan Titman, "Comparison of Measures of Abnormal Performance on a Sample of Monthly Mutual Fund Returns," UCLA Working Paper, 1986.
Grossman, Sanford, "On the Efficiency of Competitive Stock Markets When Trades Have Diverse Information," *Journal of Finance*, XXXI (1976), 573–85.
——, and Joseph E. Stiglitz, "On the Impossibility of Informationally Efficient Markets," *American Economic Review*, LXX (1980), 393–408.
Henriksson, Roy D., "Market Timing and Mutual Fund Performance: An Empirical Investigation," *Journal of Business*, LVII (1984), 73–96.
Ibbotson Associates, *Stocks, Bonds, Bills and Inflation 1986 Yearbook* (Chicago: Ibbotson Associates Capital Management Research Center, 1986).
Ippolito, Richard A., *Pensions, Economics and Public Policy* (Homewood, IL: Dow-Jones-Irwin, 1986).
——, and John Turner, "Turnover, Fees and Pension Plan Performance, 1977–1983," *Financial Analysts Journal*, XLIII (1987), 16–26.
Jensen, Michael C., "The Performance of Mutual Funds in the Period 1945–1964," *Journal of Finance*, XXIII (1968), 389–416.

7. Some recent exceptions include Berkowitz and Logue [1986] and Ippolito and Turner [1987]; also see Voorheis [1976).

——, ed., "Symposium on Some Anomalous Evidence Regarding Market Efficiency," *Journal of Financial Economics,* VI (1978), 93–330.
Kon, Stanley J., and Frank C. Jen, "The Investment Performance of Mutual Funds: An Empirical Investigation of Timing, Selectivity and Market Efficiency," *Journal of Business,* LII (1979), 263–89.
Lehmann, Bruce N., and David M. Modest, "Mutual Fund Performance Evaluation: A Comparison of Benchmarks and Benchmark Comparisons," First Boston Working Paper Series, Columbia Graduate School of Business, 1985.
Roll, Richard W., "A Critique of the Asset Pricing Theory's Tests: On Past and Potential Testability of the Theory," *Journal of Financial Economics,* IV (1977), 129–76.
——, "A Simple Implicit Measure of the Effective Bid-Ask Spread in an Efficient Market," *Journal of Finance,* XXXIX (1984), 1127–39.
Ross, Stephen A., "The Arbitrage Theory of Capital Asset Pricing," *Journal of Economic Theory,* XIII (1976), 341–60.
Sharpe, William F., "Capital Assets Prices: A Theory of Market Equilibrium Under Conditions of Risk," *Journal of Finance,* XIX (1964), 425–42.
——, "Mutual Fund Performance," *Journal of Business,* XXXIX (1966), 119–38.
Stambaugh, Robert F., "On the Exclusion of Assets from Tests of the Two-Parameter Model," *Journal of Financial Economics,* X (1982), 237–68.
Tinic, Seha, and Richard West, "Risk, Return and Equilibrium: A Revisit," *Journal of Political Economy,* XCIV (1986), 126–47.
Treynor, Jack L., "How to Rate Management of Investment Funds," *Harvard Business Review,* XLIII (1965), 63–75.
Voorheis, Frank L., "How Well Do Banks Manage Pooled Pension Portfolios?" *Financial Analysts Journal,* XXXII (1976), 35–40.
Wiesenberger, Arthur, *Investment Companies* (New York: Arthur Wiesenberger & Company, various years).