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New Paradigms for Evaluating Performance and Performance Persistency of Domestic and Globally Diversified Portfolios

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ABSTRACT

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Old Dominion University, 1995
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This manuscript reexamines performance evaluation of managed portfolios. Past measures of portfolio evaluation such as the Sharpe, Treynor, and Jensen measures are subject either to the inability to rank performance based on statistical significance, or are dependent on both a single factor CAPM return generating process and the selected market portfolio. Recent studies show performance ranking is sensitive to the selection of the market proxy when the security market line is used to evaluate performance. Additionally, CAPM based measures that appeared to work well in the 1960's no longer appear to function effectively. Many anomalies to CAPM have been documented since the 1970's and recently, Fama and French (1992) declared the CAPM beta to be dead.

To date, no agreement among scholars has been reached on the appropriate return generating process or the appropriate market proxy. Therefore, performance evaluation of managed portfolios is laden with ambiguity.

What is needed is a measure that can rank performance on a statistically significant basis, is applicable to a variety of return generation processes, is free of the requirement to observe the market portfolio or the true risk free proxy, and can bridge the gap between

theory and practice. This manuscript provides such a measure. The economic and legal rationale for portfolio manager behavior is reviewed, a method to detect if the differences in performance are statistically significant is provided, and a method to rank portfolios with statistically significant performance differences is provided.

The proposed methodology is tested empirically on open-end mutual funds for the period September 1981-94 and results of the new measure are compared with those of the traditional measures. Further, tests of performance persistency are conducted to detect if past relative performance can be a guide for predicting future relative performance. Finally, persistency test results for the four methods of evaluating performance are compared.

Results indicate that while performance and performance persistency exists for traditional measures, it is not evident with the proposed procedure. This supports the efficient market hypothesis and suggests that performance detected with traditional measures is merely a CAPM anomaly, not true differential performance.

Dedication

To my mother Evelyn, my wife Linda, and my children, Cynthia and Michael. Your

support and encouragement throughout this endeavor, and many others in the past, is greatly

appreciated. For your love, patience, and understanding, I am deeply indebted.

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Chapter One

Introduction

1.1: Introduction

"A CENTRAL PROBLEM IN FINANCE (and especially portfolio management) has been that of evaluating the 'performance' of portfolios of risky investments." Jensen (1968, p. 389). This has never been more true than today due to the growth of the investment company industry. The number of funds, and the size of assets under management, has grown decade by decade. The number of funds and assets under management has grown from 72 funds with $1.3 Billion under management in 1945 to roughly 3,000 funds with over $1,595 Billion in assets under management by the end of 1992[1].

The Investment Company Act of 1940 provides the Securities Exchange Commission (SEC) with regulatory authority over investment companies and it provides guidelines for their formation and regulation. An investment company is a corporation, or trust, which provides individual investors with the opportunity to invest in a large diversified portfolio of securities through the pooling of money with that of other investors. The act of 1940

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[1]Mutual Fund Factbook, Washington, D.C.: Investment Company Institute, 1984 and *the Virginian-pilot and Ledger-Star* October 18, 1993 (source: Investment Company Institute).

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states:

"investment companies are affected with a national public interest in that: the

securities they issue constitute a significant percentage of all securities

publicly offered; their process of issuing redeemable securities and their

redemption of those securities is continuous; and the investing, reinvesting

and trading of investment companies constitutes a significant percentage of

all transactions in the securities markets of the nation."

Investment companies are defined, under this act, as either unit investment trusts,

face amount certificate companies, or management investment companies. Management

companies are further subdivided into closed-end investment companies known as publicly

traded funds and open-end investment companies known as mutual funds. A similarity

between the two is that they manage portfolios of securities according to the investment

objectives stated in the prospectus. This manuscript is concerned with the evaluation of the

performance of the open-end investment companies known as mutual funds.

To qualify as a diversified investment company, three criteria must be met. These

criteria are: a minimum of 75% of total assets must be invested in securities not issued by

the investment company or affiliates; a maximum of 5% of total assets can be invested in any

single corporation; and a maximum of 10% of any corporations common stock may be held.

Open-end investment companies are restricted from unlimited borrowing by the act of

1940; borrowing is restricted by setting a maximum debt-to-asset ratio of 300%.

Additionally, they are prohibited from purchasing securities on margin and short selling

securities[2].

Investment companies must also register the securities it issues (the shares of the fund) with the SEC under the Securities Act of 1933. This two-part registration includes the prospectus, which must be provided to every purchaser of fund shares, and part two filed with the SEC. Part two must be made available for public inspection but need not be furnished to each purchaser of shares. Any changes to published bylaws or objectives must be approved by the shareholders through the voting of shares. These changes may include: changes in borrowing policies or limits (within the limits set by the act of 1940 or as amended), purchasing real estate, making loans, changing from open-end to closed-end or diversified to non-diversified, changing the investment policy (e.g., from growth to income), or changing sales load fees.

The portfolio manager (investment advisor) is required to be under written contract with the investment company by the act of 1940. This contract must also be approved annually, include a description of all compensation, and provide for termination with 60 days notice. The portfolio manager fee is typically a percentage of assets under management, or a combination of a percentage of assets under management and an incentive based on performance relative to some index.

Starks (1987) investigates portfolio manager compensation contracts and finds that contracts that reward managers for superior performance are in widespread use. That type of contract is termed a Symmetrical Performance contract.

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[2]Hedge funds short sell securities, however, they are organized as limited partnerships, not management companies.

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Investment companies also incur other expenses. A custodian is paid a fee for clerical duties of issuing and redeeming shares, and holding assets. The act of 1940 requires semiannual reports be prepared and presented to shareholders, investment companies be audited at least annually, and that the audited annual report be provided to shareholders. This is an additional source of expense to the investment company.

There are also sales and distribution costs for funds. These fall into two general categories, "load" and "no-load." No-load funds are sold directly to the public, bypassing underwriters and a commissioned sales force. No-load funds do not charge a sales charge and the distribution and sales costs are paid by the fund. Load funds use underwriters to prepare sales literature and market fund shares. In return, underwriters receive a percentage of sales fees. These fees are not part of the fund's expenses and are paid by the purchaser. The purchaser pays this fee either up front, known as front-end-load, upon redemption, known as back-end-load or contingent deferred sales charges, or through 12b-1 fees based on assets under management. Front-end load fees are limited to 8.5% by the act of 1940.

This organization illustrates that shareholders are buying a bundle of services and that there is room for performance differences to exist and persist. The origin could arise from: a superior stock-picker who can consistently spot bargains; a management team better able to contain costs through efficient deployment of assets than their competitors; a marketing strategy and development of distribution channels that are more efficient than the competitions; and a myriad of other possibilities. This has led to the use of portfolio theory to attempt to rate the performance of these managed portfolios.

1.2: Background

Harry Markowitz (1952) provides a theory about how investors should select securities for their investment portfolio given beliefs about future performance. He claims that rational investors consider higher expected return as good and high variability of those returns as bad. From this simple construct, he says that the decision rule should be to diversify among all securities which give the maximum expected returns. His rule recommends the portfolio with the highest return and lowest variance of those returns. He shows that the portfolio with the highest return is not the one with the lowest variance of returns and that there is a rate at which an investor can increase return by increasing variance. This is the cornerstone of portfolio theory as we know it.

His portfolio theory shows that an investor has a choice of combinations of return and variance depending on the percentage of wealth invested in various combinations of risky assets. From this, he shows that a plot of all possible combinations of wealth divided among possible combinations of securities will result in a circle. This circle will be plotted on an xy grid with return plotted on one axis and risk, as measured by variance on the other axis. The notion that investors desire to maximize return for a given risk gives rise to some combinations of securities dominating others in terms of risk and return characteristics. These dominant portfolios are said to lie on the "efficient frontier." When an asset with no risk is added as an investment option, he shows that investors can divide their wealth between the risk free asset and a portfolio of the risky assets.

If return is plotted on the vertical axis, variance on the horizontal axis, and the circle of all possible combinations of risky assets is plotted in return and variance space to obtain

the efficient frontier, a point can be plotted where the vertical distance represents the return on the riskless asset and the horizontal distance represents the risk (which is zero). A straight line can be drawn from this point so that it touches the highest point of the efficient frontier. This line is termed the "Capital Market Line" (CML). If investors can both borrow and lend money at the risk free rate of interest, they can select any level of return and variance they are most satisfied with on that line. Any point on that line will provide a higher return for the selected level of variance.

William Sharpe (1964) and John Lintner (1965) separately extend the work of Markowitz. They show that the theory implies that the rates of return from efficient combinations of risky assets move together perfectly (will be perfectly correlated). This could result from their common dependence on general economic activity. If this is so, diversification among risky assets enables investors to escape all risk except the risk resulting from changes in economic activity. Therefore, only the responsiveness of an assets return to changes in economic activity is relevant in assessing its risk. Investors only need to be concerned with systematic risk [beta], not the total risk proposed by Markowitz. This gave birth to the "Security Market Line" (SML). The difference between the CML and SML is the measure of risk used for the horizontal axis. The CML uses the variance of returns, whereas the SML uses the systematic risk termed beta. Beta is defined as the covariance between a security (or portfolio of securities) and the market as a whole, divided by the variance of the market. The market as a whole is considered the point of tangency between the SML and the efficient frontier. This is the foundation for the Capital Asset Pricing Model (CAPM). The CAPM is

$$R_i = R_f + \beta[R_{mt} - R_f] + \epsilon_i \quad (1.2.1)$$

where R_i is the return on security i, R_f is the return on the riskless asset, R_{mt} is the return on the market, β is the systematic risk, and ϵ_i is a random error term.

These pieces of seminal work have created a research industry for finance empiricists. Three separate measures of portfolio performance are derived directly from the preceding theories. They are the Treynor, Sharpe, and Jensen measures. These measures are fully described in chapter two and presented here only for clarity of exposition.

The Treynor Measure is:

$$T_p = \frac{E(r_p) - r_f}{\beta_p} \quad (1.2.2)$$

where, T_p is the Treynor measure, $E(r_p)$ is the expected return on the portfolio under investigation, r_f is the risk free rate of interest, and β_p is the beta of the portfolio calculated against the market proxy.

The Sharpe Measure is:

$$S_p = \frac{E(r_p) - r_f}{\sigma_p} \quad (1.2.3)$$

where, S_p is the Sharpe measure, $E(r_p)$ is the expected return on the portfolio under investigation, r_f is the risk free rate of interest, and σ_p is the variance of the portfolio.

The Jensen measure is derived by subtracting R_F from both sides of the CAPM equation to get

$$E(R_j)\text{-}R_F = \beta_j[E(R_M\text{-}R_F)]+\epsilon_i \quad (1.2.4)$$

where $E(R_j)$ is the expected return on portfolio j, R_F is the return to the risk free asset, β_j is

the systematic risk defined as the covariance of the portfolio with the market divided by the

variance of the market, and $E(R_M)$ is the expected return on the market portfolio. If the

intercept is not constrained to be zero, the equation can be written as

$$E(R_j)\text{-}R_F = \alpha + \beta_j[E(R_M\text{-}R_F)]+\epsilon_i \quad (1.2.5)$$

This formulation allows ordinary least squares regression techniques (OLS) to be used to

examine performance.

Fama and McBeth (1973) examine the returns of securities, using OLS techniques

and find that the CAPM, or market model, explains returns well. They examine three

testable implications of the market model: (1) the relationship between risk and return is

linear, (2) beta is a complete measure of risk, and (3) higher risk should be associated with

higher returns. They conclude that none of the three testable implications can be rejected.

The results are consistent with efficient markets and a sound asset pricing model, however,

the estimated intercept was somewhat higher than R_F.

Roll (1978) shows there is ambiguity when performance is measured by the SML.

The difficulty is that different market indices provide different rankings. While previous

work was mathematically, theoretically, and intellectually rigorous, we must not only define

this market portfolio but be able to estimate a covariance matrix with it. Theoretically, the

market portfolio is the composition of all investable assets. In practice, since this is not

measurable, some proxy must be used for the true market portfolio. The trouble is that even

an equally weighted and value weighted index of the same securities can produce

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conflicting performance results when used as the proxy for the market portfolio.

The ambiguity of the SML arises because a different beta can be generated for assets and portfolios by using different indices. Therefore, beta is not an attribute of the individual asset. Beta is a measure of the risk of an asset if included in a portfolio of risky assets consisting of the market portfolio and a riskless asset. Therefore, differences in portfolio selection ability cannot be measured by the SML criterion. If the index is ex-ante mean-variance efficient, it is impossible to discriminate between winners and losers. If the index is not ex-ante mean-variance efficient, designating winners and losers is possible, but another index can designate different winners and losers and there is no way to determine which one is correct.

Therefore, Roll criticizes CAPM by saying that: (1) the only valid test is if the index is efficient, (2) if an index that is ex-post efficient is chosen, every security will plot on a straight line, and (3) if the index is inefficient ex-post, abnormal returns can be detected and ranking is possible.

Despite Roll's critique, research using CAPM continued. Since both the Jensen and Treynor measure use a beta for the market portfolio, they are both subject to this problem of determining the true market portfolio and measuring it's returns.

This criticism is now far more troubling. Many anomalies to CAPM have been documented since the mid-1970's. Basu (1977) shows that low price to earnings ratio portfolios have greater risk adjusted returns than high P/E ratio portfolios. Banz (1981) finds that returns on common stocks with low market equity have greater risk adjusted returns than those stocks with high market equity. However, the "size effect" is not a linear explanatory

variable. Copeland and Mayers (1982) show that a portfolio of stocks denoted as "buy" by *Value Line* outperform a portfolio of "sell" stocks. Basu (1983) shows that the P/E ratio effect he presented in 1977 also existed after adjusting for the size effect reported by Banz (1981). Stickel (1985) shows that changes in *Value line* rankings are followed by abnormal returns and this effect is greater for smaller firms. De Bondt and Thaler (1985) test the "overreaction hypothesis" which claims investors overreact to news and overweight recent information. They conclude "loser" portfolios outperform "winner" portfolios by approximately 25%. Reinganum (1988) finds that price/book ratios explain stock returns. Further, portfolios of stocks with price/book ratios of less than one significantly outperform the S&P 500 index. Fama and French (1988) show that dividend yields can forecast future returns. Lehmann (1990) finds that "winners" and "losers" one week experience significant reversals the next week and that significant excess returns can be generated by buying "losers." Jegadeesh (1990) examines the return on individual securities and provides evidence of stock return predictability through a mean reversion process. Stocks that perform exceptionally well in one year perform poorly in the next year, whereas poorly performing stocks improve performance in the following year. Lo and MacKinlay (1990) also find contrarian trading rule profits.

Possibly the most compelling evidence is presented by Fama and French (1992). They find that book-to-market equity is the most significant explanatory variable for predicting security returns, and that portfolios with a low market-to-book value ratio have higher returns than predicted by CAPM. They find that the combination of market-to-book value and size explains returns and that beta is insignificant in a regression that includes all

three variables.

This multi-beta approach is somewhat related to the work of Roll and Ross (1976) who developed the Arbitrage Pricing Theory (APT). They use the statistical procedure of factor analysis to determine the relationship between factors thought to effect security returns and actual returns. APT is a rival of CAPM and its treatment is beyond the scope of this study. However, there is increasing support for theories other than a single factor CAPM.

1.3: Statement of the Problem

Recent empirical evidence casts doubt on the present ability to evaluate performance with the Jensen or Treynor measure. The combination of beta not explaining returns, the true index being unobservable, and that different proxies can provide different rankings is particularly troubling. The Sharpe measure also has shortcomings. First, it is sensitive to the proxy for the risk free rate. The ideal proxy would match the investment horizon with the maturity of the risk free asset. However, the investment horizon is often not known precisely. A second, and more severe problem is that the measure implicitly assumes that the point estimates of the return and variance are precise and invariant with respect to time. While this allows ranking to take place, it is not possible to detect if there are true differences in performance or whether the differences are minor and due solely to chance. Interval estimates to facilitate statistical testing are not utilized.

These issues have captured the attention of other scholars as well. Grinblatt and Titman (1989) investigate benchmarks and develop a P8 benchmark that does not exhibit

size or dividend biases. However, there is always the question of it's efficiency and whether it is a good proxy for the portfolio actually held by investors. Grinblatt and Titman (1992) use this benchmark to examine the persistency of performance and find that funds exhibit performance persistency. Grinblatt and Titman (1993) develop a portfolio change measure to evaluate whether mutual fund managers exhibit superior timing or selection ability. This study compares actual return to those an investor would have received from buying the assets reported as holdings in the quarterly statement and holding them instead of holding the actively managed fund. They find some evidence of managerial skill but the benefit was consumed by fees.

1.4: Objectives and Scope of the Study

This manuscript reexamines performance evaluation of managed portfolios. To date, no agreement among scholars has been reached on the appropriate return generating process for security returns or the appropriate market proxy. Therefore, performance evaluation of managed portfolios is laden with ambiguity. A recent article in the *Wall Street Journal*[3] reported that "No fewer than 636 mutual funds were declared No.1 performers last year, soothing the funds, confusing investors."

What is needed is a measure that can rank performance on a statistically significant basis, is applicable to a variety of return generation processes, is free of the requirement to observe the market portfolio, and can bridge the gap between theory and practice. This manuscript provides economic and legal rationale for the behavior of open-end mutual fund

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[3]The *Wall Street Journal*, October 5, 1993.

portfolio managers, provides a method to detect if within group differences in performance are statistically significant, provides a method to rank portfolios with statistically significant within group performance differences, and tests this methodology empirically. This leads directly to the ability to detect if significant superior performance persists. Performance persistency is also empirically investigated.

Empirical tests are carried out on open-end mutual funds from September 1981, through September 1994. Evidence is presented on whether there are statistically significant differences in the cumulative average returns of these funds within investment objective groupings while the difference in risk is insignificant. This is consistent with results obtained in previous studies of managed portfolios and would support Grossman and Stiglitz (1980) modified efficient market theory with costly information over the traditional efficient market theory.

1.5: Underlying Assumptions

To ameliorate the inability to observe the market index, this study compares assets thought to be of equal risk in terms of variance. This follows from Treynor (1965) which states

"Although there are varying institutional restrictions placed on the investment manager's decisions, by and large he competes directly with other investment managers, buying and selling securities in the same market."

Therefore, this comparison may prove more practical and provide a measurable

standard of reference. This implicitly assumes that variance is a more practical and observable measure of risk and that it is more easily interpreted by investors. This is not without foundation as Levy and Markowitz (1979) show that investors can maximize, or nearly maximize, satisfaction (utility) using only mean and variance. Mean-variance analysis has been criticized because of the required dependence on either normally distributed returns or investors having quadratic utility functions. This is due to returns deviating from normality and some absurd implications of quadratic utility functions shown by Pratt and Arrow. However, Levy and Markowitz (1979) show that quadratic utility functions can be used over a normal range of returns.

Assets are considered of equal risk if they share the same investment objective. This has both empirical and theoretical founding. Treynor (1965) shows that mutual funds appear to attempt to maintain a constant degree of volatility. Sharpe (1966) states

"... the mutual fund management selecting an attitude toward risk and expected returns and then inviting investors with similar preferences to purchase shares in the fund. ... in practice, involves merely a description of the general degree of risk planned for the fund's portfolio; the fund then simply attempts to select the efficient portfolio for that degree of risk (i.e., the one with the greatest expected return)."

"If mutual fund managers do not perform the second of the three tasks we have outlined (staying in a selected risk class), investors will find it difficult to arrange their over-all holdings in the most desirable manner.

Holders of mutual fund shares presumably expect that funds will show reasonable consistency over time with regard to the variability of returns."

McDonald (1974) investigates mutual fund performance of six investment objective groups and concludes that "stated objectives were significantly related to subsequent measures of systematic risk and total variability and to realized mean excess return." Klemkosky (1976) provides evidence that risk, as measured by beta, is homogeneous within investment objective groups and heterogeneous between them. Starks (1987) says that "Mutual funds can be classified by their investment objectives. . . . Studies have shown that these objectives (or classifications) tend to proxy the risk of the portfolio." Bogle (1991) also shows that risk is fairly constant within investment objective categories and different between them. He further says that

"When *professors* consider risk, they are usually talking about volatility, defined as the sensitivity of returns around a norm. They call this risk "beta," but it rarely differs statistically from other concepts of risk such as standard deviation of portfolio returns . . . But when *investors* consider risk, I believe that these concepts are far too sophisticated. An investor, ever practical, might say that risk is the chance of losing a significant amount of capital in a short period, or of having returns consumed by inflation over a long period, or the extent to which monthly returns fall short of the Treasury bill yield. And in fact it does not much matter because . . . they all pretty much track one another."

Grinblatt and Titman (1993) also find consistency of risk within investment objective groups, using β as a measure of risk.

These results are consistent in a world where the following conditions exist:

1. Management Company profits are a non-decreasing function of assets under management. This follows directly from them receiving a percentage of assets under management as compensation.

2. Portfolio manager compensation is a non-decreasing function of assets under management, or a combination of assets under management and a symmetric bonus plan. This is consistent with Starks (1987).

3. Assets under management are a function of the performance of a fund in relation to it's competitors in the same risk class. This is consistent with Markowitz (1952), and traditional finance theory that claims investors prefer higher returns for a given level of risk.

Assumptions one through three would encourage portfolio managers to maximize returns on the portfolio. However, this becomes a constrained maximization problem in a world where:

4. Investment objectives must be reported to investors, and a regulatory body, and may not be changed without the consent, via vote, of the majority of investors.

5. Portfolio composition must be reported to shareholders and regulatory authorities on a periodic basis.

6. Changes in risk levels can be detected by informed authorities who can change their perceived risk class, thereby putting the fund into competition with another

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group of competitors.

7. Restrictions exist on borrowing or lending, shortselling, purchasing on margin, the percent of any one firms common stock that can be held, and the percent of assets that can be invested in a single firm.

8. General restrictions exist on the relative percentage of various classes of securities held in the portfolio (e.g., the percent of common stock, preferred stock, bonds, and cash).

9. General restrictions exist on the composition of various classes of securities (e.g., small company stock, blue chip stock, technology sector, cyclicals, etc.)

10. Major changes in portfolio composition are difficult due to the size of assets controlled. A major restructuring would result in such large "block" transactions that the supply and demand schedules would be shifted, driving up the price of the shares the fund wants to purchase and driving down the price of the shares the fund wants to sell. This might result in a loss rather than a gain for the fund.

This could lead to portfolio managers maximizing return subject to maintaining risk within a target level.

Starks (1987) finds that "If the investment manager is compensated with a symmetric performance fee schedule . . . the manager will always choose the investor's optimal risk level."

Finally, returns are assumed to be approximately normally distributed. This assumption is testable on the sample of observed return data. Assumptions of the model and testability are further explored in chapter three.

1.6: Description of Chapter Divisions

Chapter two provides a review of the literature beginning with the three major seminal works that provide theoretical and empirical foundation for the three commonly used performance measures. These are termed the Sharpe, Treynor, and Jensen measures. The review continues with studies using these measures, critiques of these measures, new developments, and other related evidence. Following this review is a summary of the previous work. Chapter two concludes with the relationship of this study to previous studies. Chapter three describes the hypotheses to be tested, sources of data, data selection, classification, and identification procedures, computational procedures, a description of the model and assumptions, and appropriate tests of those assumptions. Chapter four presents the results of tests of assumptions of the model, tests of hypotheses, and the analysis of results. Chapter five provides the summary, conclusions, and limitations of this study along with recommendations for further study.

Chapter Two

Portfolio Performance Evaluation

2.1: Introduction

Performance evaluation of managed portfolios has evolved from simply comparing raw returns to adjusting returns for risk before evaluation. The development of the Capital Asset Pricing Model in the mid-1960's created a research industry for financial empiricists. Many scholars have sought to decide several basic issues that include: whether any managed portfolio can outperform the market, whether any managed portfolio can outperform another managed portfolio, if performance differences exist and persist, and whether performance differences are due to security selection ability or market timing ability.

These issues are vitally important to a diverse group of market participants. Investors desire to select investments that will maximize their returns for a selected level of risk. Therefore, both the issues of performance and performance persistency become central elements in their solution set. For investment companies, performance evaluation of portfolio managers is inexorably linked to risk adjusted performance results. Managers would like to know if performance results from timing or security selection, and determine the return on investment in information. Attempts by academics to resolve this issue have

resulted in many performance measures to compare risk adjusted returns.

2.2: Theoretical Development of Traditional Performance Measures

This section reviews the theoretical development of performance measures, and early empirical results using these measures. Four measures became a central focus for research in portfolio performance evaluation. These are the Treynor, Sharpe, Treynor-Mazuy, and Jensen measures.

Treynor (1965) realized that returns are highly variable and beyond the control of managers and he proposed a solution to performance evaluation known as the Treynor measure. This measure allows funds to be quantitatively compared in spite of market fluctuations and diverse risk policies.

Two risks occur from investing in managed portfolios of securities. The first is market or systematic risk and the second is firm specific or unsystematic risk. Two practical consequences arise from these risks. First, the portfolio managers affect on return is small compared to fluctuations in the general market. Volatile funds look good in bull markets and poor in bear markets because average returns are dominated by trends in the market. Second, raw return measures do not allow for investors' aversion to risk. A robust performance measure must effectively deal with both complications and remain constant if management performance is consistent.

Treynor believes that the first step to measure performance is to relate the expected return to a "suitable market average" using a "characteristic line." He created a characteristic

line by plotting fund returns on the vertical axis, market returns on the horizontal axis, and fitting a line using ordinary least squares regression techniques. Empirical results of four managed funds and the Dow Jones Industrial Average (DJIA) during the 1953-62 period indicated that the characteristic line was stationary, despite wide fluctuations in market returns. The characteristic line contains information on both expected return and risk. Risk is the slope of the line and shows the volatility or sensitivity to the market. He finds volatilities range from .5 to two and concludes that volatility denotes management policy and that the slope of the characteristic line will remain constant if management maintains the same level of risk. Empirical evidence from a sample of 54 funds indicated that 80% "demonstrate fairly clear-cut characteristic-line patterns, with correlation coefficients equal to or exceeding 90%."

A vertical shift in a characteristic line that retains the same slope is indicative of a change in the manager's performance. If several funds have the same volatility in terms of slope but different intercepts, the fund with the highest intercept exhibits superior performance in both bull and bear markets. Therefore, he concludes that relative performance can be determined from the characteristic line.

He also developed a second line termed the "portfolio possibility line" (PPL). The PPL allows investors to select the performance pattern they prefer from historical data if they infer that past performance suggests future performance. Creation of the PPL requires plotting the expected return of a portfolio on the vertical axis and volatility on the horizontal

axis. If investors can divide wealth between "money-fixed claims[4]" and "equity assets," achieving returns greater than that offered by fixed claims requires undertaking equity risk. By plotting the risk and return for each fund, a line can be drawn from the return on money-fixed claims through the return on each fund. Since the point of tangency between the investor's highest utility curve and the PPL maximizes utility, the PPL with the greatest slope will be preferred by all investors[5]. Therefore, slope of the PPL for a portfolio is "a direct measure of the desirability of the fund to the risk averse investor." This leads to a quantitative measure of performance[6]

$$tangent \ \alpha \ = \ \frac{\mu - \mu'}{\sigma} \qquad (2.2.1)$$

where μ is the expected portfolio rate of return for a given market rate of return, μ^* is risk-free rate, and σ is volatility.

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[4]He denotes this as "checking deposits, savings deposits; government, municipal, and corporate bonds" rather than the now more traditional T-bill rate.

[5]This fund provides the highest return per unit of risk undertaken.

[6]In this article, a small Treynor measure is superior to a larger one. This measure is commonly rearranged and standard presentation in investment texts [e.g., Haugen, (1990, p. 288) or Bodie, Zvi, Alex Kane, and Alan J. Marcus, (1993, p. 804)] is in the form presented below. Here, a large Treynor measure is superior.

$$T_p = \frac{E(r_p) - r_f}{\beta_p}$$

Here, T_p is the Treynor measure, $E(r_p)$ is the expected return on the portfolio under investigation, r_f is the risk free rate of interest, and β_p is the beta of the portfolio calculated against the market proxy.

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To plot a PPL, the expected returns of the fund and its risk are required. The characteristic line provides the risk measure (its slope) and the expected return given an assumed market return. While expected returns change with the return on the market, the rankings do not[7]. His general result is that while absolute performance can vary with the assumed market returns, the relative ranking of funds does not.

He suggests that this idea is best described by the number produced by his formula. Using the rankings of the 20 funds investigated during the 1953-62 period, he found that the difference in performance between the top and bottom ranked funds could be expected to be 7% for market returns of 10% and that the absolute difference remained constant. From this he concludes that the difference in return between funds ranked high and those ranked low was substantial.

Sharpe (1966) tested Treynor's work empirically to "evaluate its predictive ability" and compared the results with those using a performance measure he developed. Sharpe's measure also compares the risk-return relationship of portfolios since investors will select the efficient portfolio that has the desired risk return characteristics.

Sharpe believes that mutual funds select a risk class in which to compete and invite investors with similar risk preferences to purchase the shares. He also believes this involves merely "a description of the general degree of risk planned for the fund's portfolio."

Sharpe contends that ex-post performance differentials can be attributed to differences in variability of return (risk) by design, through inability in security selection, or due to ineffective diversification. Therefore, "major and persisting differences in the

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[7]He demonstrates this by ranking 20 funds during the 1953-62 period.

performance of different funds" may exist. One persisting difference can arise from securities research expenses. If the random walk theory is correct, expenditures on research may result in poorer net returns.

Sharpe used the expected return and predicted variability to evaluate portfolio performance. The measure of variability he used is the standard deviation of returns, σ_i. He assumes investors can borrow and lend at the risk-free rate of interest and have homogeneous expectations. Therefore, all efficient portfolios will plot on a straight line such as

$$E_i = p + b\sigma_i \qquad (2.2.2)$$

where p is the risk-free rate and b is the risk premium.

An investor can attain any point on the capital market line by borrowing or lending at the risk-free rate of interest. The capital market line is

$$E = p + \frac{(E_i - p)}{\sigma_i}\sigma \qquad (22.3)$$

This indicates that the best portfolio is "the one for which $(E_i - p)/\sigma_i$ is the greatest." In practice, since expectations cannot be measured, ex post values of average return and standard deviation are used for the return and risk. The implication for mutual fund performance evaluation is that all effectively diversified funds that only undertake positive NPV research projects will plot on the capital market line. Those funds improperly

diversified or spending improper amounts on information or administration will perform poorly, and this relative performance may persist.

He examined the returns of 34 open-end mutual funds for the 1954-63 period and found that funds with high average return have high standard deviation. However, some funds dominate others in terms of the risk-return relationship. To examine the persistency of performance, he used 1944-54 data to calculate R/V ratios and rank funds in order to predict R/V performance rankings for the 1954-63 period. Using Spearman's rank correlation coefficient and ordinary least squares regression (OLS) he found persistency for both good and bad performing funds. He used Treynor measures computed during the 1944-53 period to predict R/V ratios for the 1953-62 period and found that the Treynor measure was a better predictor of future R/V ratios than past R/V ratios were.

He hypothesized that past performance can be used to predict future performance due to either differential selectivity ability or differential expenses. To test his hypothesis, he ranked funds by the expense-to-assets ratio and found the best performing funds had the lowest expenses. He also found that fund size, as measured by net asset value, did not impact performance. This suggests that there is no benefit to investors from any economies of scale achieved by the fund company.

He also hypothesized that funds must remain in the same risk class to enable investors to arrange portfolios holdings. To test that hypothesis, he ranked funds during the 1944-53 period and then again for the 1954-63 period and found reasonably consistency but several "major shifts appear." He believes shifts may be due to "announced changes in management philosophy" and concludes that funds retain relative risk.

He then compared the performance of the 34 funds to that of the DJIA[8]. The R/V ratio for the DJIA was .667 compared to the funds R/V ratio of .633. Only 11 of the 34 funds beat the DJIA. When fees were added back to the funds, 19 of the 34 funds outperformed the DJIA. From this he concluded that fund managers select portfolios as good as the DJIA but net returns accruing to shareholders are poorer due to the costs associated with operating the fund.

Treynor and Mazuy (1966) investigated whether mutual fund managers can exploit predictions of future market returns by altering their portfolios. If mutual fund managers can predict large market movements, they could increase the volatility of the managed portfolio to exploit market increases and decrease volatility to mitigate downturns. If the return of a fund is plotted against the return of the market, several possibilities exist. First, lacking market timing, the characteristic line will be linear and the scatter small with good diversification. Second, in the presence of perfect timing, the characteristic line will be piecewise linear. It will exhibit low volatility in bear markets and high volatility in bull markets. Perverse market timing ability would also result in piecewise linearity with high volatility in bear markets and low volatility in bull markets. Third, if the alteration in volatility is correct 50% of the time, the scatter around the characteristic line will be large but the characteristic line will be linear.

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[8]The return on the DJIA was computed without regard to any transaction costs and is therefore overstated.

This led to the inclusion of a quadratic term in the market model to test for linearity. This equation is

$$r_{pt} = \alpha + B_1 r_{et} + B_2 r^2_{et} + \epsilon_{pt} \quad (2.2.4)$$

where r_{pt} is the excess return of the portfolio, α is the intercept, B_1 is the coefficient on the market risk premium, r_{et} is the market risk premium, B_2 is the coefficient on the market risk premium squared, r^2_{et} is the market risk premium squared, and ϵ_{pt} is the error term.

Empirical tests were conducted using annual data for 57 mutual funds during the 1953-62 period. They assume annual data is the most appropriate because even small funds would be unwilling to alter portfolio composition sufficiently to make a difference on a more frequent basis. The data set was divided into four categories by the dollar amount of assets under management to learn if small funds are more able to alter portfolio composition. The sample was further divided into growth and balanced funds since balanced funds may exhibit more market timing. This is due to the ability to alter portfolio composition through changing the ratio of debt to equity holdings or changing the volatility of equity holdings. Growth funds are limited to changing the riskiness of the equity holdings.

Results suggest that no fund exhibited superior timing ability (the characteristic line is linear and risk is constant). Further, they believe that these results are robust with respect to the evaluation period. This is due to the characteristic line being invariant with respect to time unless management policies or abilities change.

Jensen (1968) examined the evaluation of a portfolio manager's ability to generate abnormally high risk adjusted returns through security analysis. He criticized previous work on several grounds: for concentrating on measures of relative performance when an absolute

measure is required, for inappropriately defining risk, and for lack of statistical significance. He claims to provide a measure that overcomes these difficulties.

His model is derived from the CAPM and assumes[9]: investors are risk averse "expected utility of terminal wealth maximizers," investors have homogeneous expectations and "identical decision horizons," investors can select portfolios solely on expected returns and variance, there are no taxes or transaction costs, assets are infinitely divisible, and that "The capital market is in equilibrium." The basic model is expressed as

$$E(R_j) = R_F + \beta_j[E(R_M - R_F)] \quad (2.2.5)$$

where $E(R_j)$ is the expected return on portfolio j, R_F is the return to the risk free asset, β_j is the systematic risk defined as the covariance of the portfolio with the market divided by the variance of the market, and $E(R_M)$ is the expected return on the market portfolio. Subtracting R_F from both sides of the equation yields

$$E(R_j) - R_F = \beta_j[E(R_M - R_F)] \quad (2.2.6)$$

He notes that superior selection ability would result in systematically selecting securities "which realize $e_{jt} > 0$". Allowance for forecasting ability can be made by allowing "for a non-zero constant." This results in the estimating equation[10]

$$R_{jt} - R_{Ft} = \alpha_j + \beta_j[R_{Mt} - R_{Ft}] + \mu_{jt} \quad (2.2.7)$$

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[9]Although not stated, this also assumes a risk free asset exists and investors can borrow and lend at the risk free rate of interest.

[10]There is no time subscript on β_j which leads to the assumption that β_j is invariant with respect to time. He mentions that market timing activities can also be measured by α_j providing "β_j is the "target" risk level which the portfolio wishes to maintain on average through time."

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α_j "represents the average incremental rate of return on the portfolio per unit of time which is due solely to the manager's ability to forecast future security prices." A positive α_j shows excess risk adjusted returns.

Inferences of forecasting ability require a measure of the standard error of the estimate of α_j to determine the statistical significance of the measure. Ordinary Least Squares Regression (OLS) provides the standard error and α_j distributed as a student t with n_j - 2 degrees of freedom. This allows for direct comparison of portfolios of differing risk and is insensitive to general economic conditions.

If β_j is an unbiased estimate of risk, α_j will be unbiased. Timing ability would result in α_j being positively biased and β_j being negatively biased[11]. Empirical investigation of this model was undertaken using annually continuously compounded return data[12] on 115 open-end mutual funds during the 1955-64 period. Of these, only 56 had a full ten years data available. The risk free rate proxy was a one-year government bond and the market proxy was the S&P 500 Index.

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[11]As Jensen states, this is because "the regression line must pass through the point of sample means".

[12]Returns were computed as

$$R_{jt} = \log_e \left(\frac{NA_{jt} + ID_{jt} + CG_{jt}}{NA_{jt-1}} \right)$$

where NA_{jt} is the net asset value, ID_{jt} is the dividends received, and CG_{jt} is the capital gains received.

Results show that funds net of expenses earned 1.1% less than required to plot on the

security market line, suggesting that funds were unable to cover expenses through timing or

security selection. Results on gross return data are similar with $\alpha = -.004$. 48 funds had a

positive α whereas 67 funds had a negative α. Confining the sample to the 1955-64 period

provided $\alpha = -.001$. Sixty funds had a positive α whereas 55 funds had a negative α. This

result comes with an important caveat. Measurement errors of the independent variable will

cause "the estimated regression coefficient of that variable to be attenuated towards zero."

He concedes that "there are undoubtedly some errors in the measurement of both the riskless

rate and the estimated returns on the market portfolio," resulting in a downward bias of β_j

and an upward bias in α_j.

He claims that there is also a bias against the funds since it is assumed that they are

fully invested. However, cash balances are held since the funds receive investment and

redemption requests on a daily basis[13].

Examination of t-values on α_j shows that three of the funds are significantly positive.

However he warns that sampling theory could result in five funds in 100 having an α_j that

was positive and significant. He therefore concludes that there is no compelling evidence

that funds exhibit sufficient selection or timing ability to generate returns exceeding the cost

of doing so.

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[13]This does not appear to pose a problem since under a properly specified model this
would merely equate to dividing wealth between the market portfolio and the risk free
asset. This would serve to decrease β_j however, α_j should be unaffected if the theory
he is proposing holds.

2.3: The Issue of Investment Objectives on the Sharpe Measure

The importance of investment objectives was noticed promptly. Horowitz (1966) reexamined the Sharpe (1966) study after controlling for the stated objective of the fund. He showed that after controlling for objective, the reward-to-variability ratio (R/V) is less significant. Sharpe's sample consisted of 2 growth funds, 1 income fund, 14 growth-income funds, 13 balanced funds, and 4 income-growth funds. Horowitz used only 27 of the 34 funds, the 13 balanced funds and 14 growth-income funds.

Sharpe computed the product-moment correlation coefficient between the 1954-63 R/V ratio and found expenses and variability between the two periods was significant. The significance of the R/V ratio disappeared in the combined 27 fund subsample and in each subsample that comprised it. While the significance of the variability between the two periods remained for the combined sample of 27 funds, it lost significance in each of the smaller subsamples. Sharpe also reported a significant Spearman's rank correlation coefficient between the R/V ratio in the 1954-63 period and the R/V ratio for the 1944-52 period. That result also lost significance in the smaller sample used in this study. The significant relationship between the R/V ratio for the 1954-63 period and fund expenses remained significant for the 27 fund subsample. However, it was not significant in either of the smaller subsamples. The same relationship was found for the variability between the 1944-53 period and the 1954-63 period.

The product-moment correlation coefficient and the Spearman's rank correlation coefficient between the 1954-63 variability and the objective of the fund shows that variability is related to the objective of the fund. However, there is little relationship

between the variability in the two adjacent ten-year periods. This suggests within group variability changes over time. He concludes that R/V is transitory, unpredictable, and of little use once fund objectives are known.

Bogle (1970) examined whether the risk-return relationship of a mutual fund is consistent over time, and whether the performance of funds within investment objective groups has a systematic and predictable relationship with the market. Empirical tests were conducted on 26 mutual funds over the 1959-69 period on funds divided into the four Weisenberger Financial Services classifications of Balanced, Growth-Income, Growth, and Aggressive Growth.

Examination of returns and risk revealed that returns increase with the riskiness of the investment objective and with the standard deviation of returns. Also, the return per unit of standard deviation is equal for the S&P 500 Index and three of the four fund groups. Growth funds provided a higher return per unit of risk than the other categories. Performance in bull and bear markets was examined for upside and downside risk. Upside and downside risk, and the ratios of upside divided by downside risk, were found to increase with the aggressiveness of the funds objectives. Plotting funds on a grid based on either an upside-downside risk basis or a standard deviation-return basis showed that funds with similar objectives have similar risk-return relationships. The downside volatility of the June to January 1970 period was compared to the 1960-69 period. Results suggest that risk is relatively constant within groups.

Carlson (1970) used Lintner's (1965) reward-to-variability ratio to examine the performance of 57 mutual funds over the twenty-year period 1948-67. The sample of funds

was divided into three categories that include diversified common stock, balanced, and income funds.

He regressed returns against the standard deviation of returns and found risk and returns to be linearly related, supporting the CAPM. When the performance of funds was compared to the market, he found that results are dependent on the market used, the time period selected, and the category of mutual fund. He concludes that mutual funds "should be grouped by broad investment objectives before asking whether they . . . have outperformed 'the market'."

To evaluate the effect of the market, he examined the fit of a regression of market returns on common stock fund returns using both the S&P 500 Index and an index made from equally weighted common stock fund returns. He found that the manufactured index explained more variability than the S&P 500 Index, leading him to assert that managers should be "compared with an index reflecting actual results of managed portfolios."

He examined the relationship between the persistency of relative risk and relative return and found that the mean return and mean risk for one ten-year period were good predictors for the following decade. However, the reward-to-variability rankings were not significant although 35.7% of the funds with above average performance in the first decade remained there during the next decade. This is indicative that risk remains relatively constant. He also notes that there is a tendency for funds to remain in "in the top or bottom quartiles during both decades." For just the sample of common stock funds, only risk was significant from period to period. He repeated the analysis using five-year periods and found stronger persistency of performance. For 6 of the 11 five-year periods, performance

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persistency was significant. Investigation of determinants of performance suggested that performance was unrelated to fund size, expenses, or tenure of the fund.

2.4: Other Criticisms of the Sharpe and Treynor Measures

Arditti (1971) criticized the Sharpe (1966) measure for ignoring the skewness of the DJIA and the 34 mutual funds. The Sharpe measure assumes that the sample mean and sample standard deviation equal investors' expectations of the population parameters. However, the Sharpe measure ignores skewness by implicitly assuming it is equal. Arditti regressed the return on standard deviation and skewness and found that an investor is willing to accept an investment with a lower return for a given standard deviation if it has sufficient positive skewness. Examination of Sharpe's data revealed that the mutual funds had higher skewness than the DJIA. He concludes that mutual fund managers will sacrifice some return for a chance at even higher returns by taking on more variability. Therefore, mutual fund performance is not inferior to the DJIA.

French and Henderson (1985) investigated the Sharpe and Treynor measures by conducting an experiment to find out how well they rank the performance of portfolios under ideal conditions, and whether superior performance could be detected through statistical analysis. Criticisms of CAPM based measures are data problems that arise from "misspecified independent variables, omitted variables, errors in variables, and unstable parameters." To create an ideal condition, computer simulation was used to generate normally distributed monthly market returns for a five-year period. Security returns were generated using the market model and 51 portfolios were created. Portfolios were assigned

"extra return" in 0.001 increments from -0.025 to +0.025. The Sharpe, Treynor, and Modified Treynor measure were computed to rank the 51 portfolios. The Spearman rank correlation coefficient was used to compare each pair of rankings. Results suggest that there is little difference between rankings. They also found that it would require excess return nearly 12% per year for five years for a portfolio to provide statistically significant excess returns. They conclude that the current methods are satisfactory if random noise is the only factor that must be overcome. However, noise in portfolio returns will make it difficult to learn the skill of the portfolio manager.

2.5: Justifying Poor Performance

Levy and Sarnat (1972) investigated the rapid growth of the popularity of mutual funds despite evidence that they provide inferior risk adjusted returns to the security market line. They note that funds have varying objectives and therefore investment policies vary. However, two items are common to all funds. First, funds attempt to increase returns through professional management and economies of scale in portfolio management. Secondly, funds attempt to decrease risk through diversification. They evaluate eight funds on their risk-return characteristics compared to the S&P 500 Index over the 1958-68 period. They find that returns cluster along the security market line and claim that this may be an unrealistic test. If securities are not infinitely divisible, investors with limited financial resources may have to settle for a single share of several stocks and thus, not properly diversify. Then, investors would be better off with a mutual fund. Therefore, they conclude, it is rational for investors to select a "second best" alternative which is attainable, mutual

funds, to the best alternative that is not attainable.

2.6: Performance Revisited

Williamson (1972) examined the performance of 180 mutual funds over the 1961-70 period and found that only one fund outperformed the S&P 500 in eight of the ten years. He suggests that this may reflect the level of volatility of the funds rather than the quality of management. He examined volatility by plotting fund returns against market returns and found that the relationship was linear. This reflects a lack of market timing since superior timing ability would be evidenced by a curvilinear relationship (both ends curved upward to reflect higher returns). He examined whether performance persistency existed by examining rankings over two adjacent five-year periods and found no correlation for the complete group. However, he found that a few funds appear to consistently outperform most others. He says that there is "pretty good evidence that some funds consistently rank in the top 40 per cent, and fairly good evidence that some funds are in the top 20 per cent." However, he found no relationship between performance and net new money flowing into the fund.

Klemkosky (1973) examined the relationship among the Sharpe, Treynor, and Jensen measuers; two proposed composite performance measures, and risk. His data consisted of quarterly net returns for 40 mutual funds from 1966-71. His two proposed composite performance measures are the Reward-to-Semistandard Deviation (R-SD) and the Reward-to-Mean Absolute Deviation (R-MAD). R-SD is calculated as

$$R - SD_i = \frac{\overline{R}_i - R^\cdot}{\sqrt{\sum_{i-1}^{n}(R_{it} - \overline{R}_i)^2 / n}} \qquad (2.6.1)$$

R-SD is concerned with returns less than the mean return for the fund. R-MAD is calculated

as

$$R\text{-}MAD_i = \frac{\overline{R}_i - R^\cdot}{\sum_{i-1}^{n}|R_{it} - \overline{R}_i|n} \qquad (2.6.2)$$

R-MAD is concerned with the absolute deviation of returns from the mean.

Tests for bias consisted of computing the five composite performance measures and

regressing them against risk. Results suggest that all measures are biased, however, the R-

MAD and R-SD are less biased. He concludes that R-MAD and R-SD may be better

measures than the traditional measures. He suggests that further research is required over

a longer interval, using monthly data, and geometric means instead of arithmetic means.

Joy and Porter (1974) investigated whether the 34 funds used by Sharpe (1966) or

the DJIA exhibited first (FSD), second (SSD), or third (TSD) order stochastic dominance

during the 1954-63 period. This is important in light of Arditti's (1971) criticism that

Sharpe's reward-to-variability ratio ignores the third moment of returns. Stochastic

dominance uses the entire probability density function to measure the probabilities

associated with high or low payoffs. FSD only assumes that utility increases with wealth;

SSD adds the assumption that the marginal utility of wealth is nonincreasing; and TSD adds

the assumption that the utility function's third derivative is nonnegative.

FSD was not found in either direction, and none of the funds exhibited SSD or TSD over the DJIA. However, the DJIA exhibited SSD over six funds plus THD over those six and three others. They conclude that their results support Sharpe (1966) over Arditti (1971) and that the funds are inferior investments.

2.7: Investment Objectives Revisited

Reints and Vandenberg (1973) examined the risk of mutual funds, as measured by beta, and the Weisenberger risk classifications to learn if the subjective categories are mutually exclusive. The five categories examined were growth, growth-income, income-growth, income, and balanced.

To ascertain whether the Weisenberger classifications can discriminate between risk class, a one-way analysis of variance was performed to detect if the mean beta was different among the five classifications. The hypothesis of equal risk was rejected. He points out that this finding could be due to extreme values at either end and individual classifications may not be significantly different. This was tested using the Scheffe method to analyze thirteen linear contrasts. These included all ten pair-wise comparisons and three contrasts among groups. The three group contrasts consisted of: (1) the combined Growth and Growth-Income groups against Income-Growth; (2) the combined Income and Balanced groups against Income-Growth; and (3) the combined Growth, Growth-Income, and Income-Growth groups against the combined Income and Balanced groups. The final contrast was labeled the growth and no growth class. Results suggest that there are significant differences

between groups, but those differences do not exist between adjacent risk classes. Only extreme risk classes are different from one another. These are the contrasts among the three classifications of growth funds and the two classifications of no growth funds. He concludes that Weisenberger classifications do not provide independent risk classes and researchers should be cautious about grouping funds by risk class.

McDonald (1974) sought to "measure and evaluate the objectives, risk, and returns of 123 American mutual funds using monthly returns in the period 1960-1969." He examined five questions: (1) the relation between stated investment objectives, risk and return, (2) the relation between investment objectives and both returns and "return-to-risk measures," (3) if excess return increased with risk, (4) the relation of the risk-return tradeoff of mutual funds as a group compared to the market, and (5) whether funds "at one end of the risk spectrum" outperformed funds at the other end.

The CAPM was used to evaluate performance using "high grade 30-day commercial paper" as a proxy for the risk free asset and "an unweighted index of all New York Stock Exchange stocks" as the market portfolio. The investment objectives were obtained from Wiesenberger and consisted of six categories: maximum capital gain (MCG), growth (G), growth-income (GI), income-growth (IG), balanced (B), and income (I).

He found that: the stated objectives were positively related to variance and beta; average excess returns "increased with the aggressiveness of" the stated objective; the initial investment objective explains about as much variability as does systematic or total risk; return increased with both total variability and systematic risk; return to risk generally increased with the aggressiveness of the objectives; and the hypothesis that mutual funds

earn the market rate of return cannot be rejected.

Klemkosky (1976) extended the work of Rients and Vandenberg (1973) by using newer Weisenberger classifications and monthly data over a ten-year period (1964-73), and a five-year period (1969-73). The investment objectives were Maximum Capital Gain (MCG), Long-term Growth (L-TG), Growth and Current Income (G-CI), Income (I), and Balanced (B).

He notes that there is a consistent relationship between risk and investment objective classification, and that risk is relatively constant over time. One-way analysis of variance was used to test the hypothesis of equal risk among classifications. The null hypothesis of equality of average risk was rejected for both the five and ten year periods. The Scheffe test was conducted on 15 contrasts and significant differences were found for all but the Income and Balanced category using ten years of data. Results using only five years of data were similar however, there were no significant differences between the Long-term Growth (L-TG) and the Growth and Current Income (G-CI) categories.

He concluded that the "Weisenberger classifications are associated with market risk classes which are statistically independent" and that "there has been little change in the relative homogeneity of fund β coefficients within each objective classification and a wider disparity of β coefficients between objective classifications."

Starks (1987) provided theoretical justification for the empirical evidence by theoretically examining the impact that compensation contracts have on the investment decisions of portfolio managers. She assumes that investors are primarily concerned with the return and variance of return and frames her investigation in a principle-agent setting by

which both the principal and agent are utility maximizers.

The SEC has established specific compensation guidelines and one compensation option is a symmetrical bonus (SP) contract. This contract provides the portfolio manager with a fixed percentage of assets under management plus a bonus or penalty depending upon how the fund performed compared with some index. The major question investigated was whether these contracts will influence portfolio managers to act in the best interest of shareholders. She showed that SP contracts will cause portfolio managers to choose the investors optimal risk level and that risk can be proxied by the investment objective of the fund.

2.8: The Issue of Performance Persistency

Klemkosky (1977) investigated whether past performance predicts future performance using the Sharpe, Treynor, and Jensen measures. All three measures were computed using monthly data for 158 mutual funds during the 1968-75 period. Performance persistency was evaluated by subdividing the period into four two-year periods and two four-year periods.

The Spearman rank correlation coefficient was used to determine the significance of the relationship between the ranking during different periods. Results suggest a highly significant relationship between ranking over adjacent four-year periods but not over two-year periods.

Kendall's coefficient of concordance was used to test whether a comparison of all two-year rankings would show that some funds rank high while others rank low over all two-

year periods taken together. Results suggest that funds do retain relative ranking.

The Jensen measure was used to compare funds to the market, using the S&P 500 Index as the market proxy. A chi-square contingency test on alpha was used to test the relationship of performance between periods. Results indicate that the four-year periods provide a good indication of performance while the two-year periods do not.

2.9: Criticizing Jensen

Mains (1977) criticizes Jensen's (1969) results and conclusions due to "questionable methods of estimating" return and risk. He criticizes Jensen's computation of returns since funds pay dividends quarterly but Jensen's equation treated them as paid on the last day of the year. This leads to an inverse relationship between return and NAV. Jensen's computation of gross return is questioned because expenses were added back to net return on an annual basis. Since expenses are paid throughout the year, not on the last day of the year, returns are understated. Additionally, industry average brokerage fees and turnover were used since individual fund data were not available. The final criticism is that ten-year beta's were used and assumed to remain constant.

The impact of correcting those deficiencies was investigated by using monthly rates of return. Of the 115 funds in Jensen's sample, actual data was obtained for 70 funds and they were used as a comparison sample. Empirical results suggest that Jensen underestimated returns and overestimated risk. Net alpha increased from -0.62 to +0.09 and gross alpha increased from +0.009 to +1.07. However, alpha was not significantly different from zero. Reexamination of Jensen's conclusions revealed that 80% of the funds earned

positive gross risk adjusted returns and 60% earned positive net risk adjusted returns. These findings are inconsistent with the "strong" form of the efficient market theory. Mains also found that operating expenses and brokerage fees vary widely among funds, and concluded that they could lead to performance persistency.

Martin, Keown, and Farrell (1982) investigated whether the investment objectives of mutual funds cause them to possess extra-market covariation. Farrell[14], and Martin and Klemkosky[15] found that common stocks classified as growth, stable, cyclical, and oil related exhibited extra-market covariation that explained 35% of portfolio variance. If mutual fund objectives cause them to concentrate assets too heavily in equity groupings, they to could exhibit extra-market covariation. The significance of extra-market covariation is that it violates the CAPM assumption that all covariation among securities is explained by their common association with the market. This violation would cause the Jensen and Treynor measures to systematically understate beta and overstate alpha.

Seventy-two mutual funds, holding a minimum of 75% of assets in equities, were investigated over a five-year period ending in 1977. These funds were divided into five investment objective categories that included: Aggressive Growth, Growth, Growth and Income, Income, and other. Extra-market covariation was computed and a multivariate ANOVA was used to test if it was equal across categories. The factors used were investment objectives, extra-market variances, extra-market factors as a percent of portfolio variance,

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[14]Farrell, F.L., Jr. "Analyzing Covariations of returns to Determine Homogeneous Stock Groupings". Journal of Business 47, 1974.

[15]Klemkosky, R.C., and J.D. Martin. "The Effect of Market Risk on Portfolio Diversification". Journal of Finance, March, 1975.

and R^2. The hypotheses of equality of the extra-market variance, extra-market factor as a percent of portfolio variance, and R^2 between investment objective groups were rejected.

An alternate measure of portfolio performance was proposed that assumes real risk is the sum of the market risk plus the group component of extra-market covariation. This measure is

$$MKF = \frac{R_p - R_f}{\sigma_{mkf}} \qquad (29.1)$$

where R_p is the mean return for the portfolio, R_f is the risk free rate, and σ_{mkf} is the market and group variance. Tests of this measure against the Sharpe, Treynor, and Jensen measures were carried out on the 72 funds and it was found to possess less bias than the traditional measures.

2.10: The Stability of Risk and Preference

Fabozzi and Francis (1979) investigated the stability of beta by examining monthly return data for 85 mutual funds, and 85 random portfolios, over bull and bear markets during the 1965-71 period. This is important because a stochastic beta over varying market conditions would lead to incorrect inferences about managerial skill if an average beta were used in the Treynor or Jensen measures. Since there are multiple definitions for bull and bear market, three popular definitions were tested. Tests were carried out using both the market model and single-index model (SIMM). The SIMM is

$$r_{it} = \alpha_i + b_i r_{mt} + u_{it} \qquad (2.10.1)$$

where r_{it} is the return on fund i, α_i is the intercept, b_i is the beta coefficient r_{mt} is the return on the market, and u_{it} is the error term.

The equation used to test whether either beta or alpha differs in bull and bear markets was

$$r_{it} = A_{1i} + A_{2i}D_t + B_{1i}r_{mt} + B_{2i}D_t r_{mt} + e_{it} \qquad (2.10.2)$$

where r_{it} is the return on the mutual fund, D_t is a dummy variable that is a one in bull markets, A_{1i} and B_{1i} measure the impact of bull market conditions on alpha and beta respectively, r_{mt} is the return on the market, and e_{it} is an error term.

Results show that the number of funds with a significant differential alpha (A_{2i}) or beta (B_{2i}) was not different from the number that could be expected by chance, despite the definition used for bull and bear markets. This supports the Treynor and Mazuy (1966) finding using more powerful methodology. They conclude that there are three reasons that fund managers may not change beta: first, individual stocks have random beta coefficients; secondly, managers may not be able to forecast market movements; and finally, it may be costly to change the target beta compared with the expected gain from the change.

Ang and Chua (1982) assessed the ability of mutual funds to provide the multitude of risk classes that investors want by first deciding if a set of investors can be found who should prefer the fund to the market portfolio, and then finding out if that group of investors should prefer the fund consistently. Using the Pratt risk aversion function[16] investors were

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[16]Pratt, J. "Risk Aversion in the Large". Econometrica, January-April, 1964.

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divided into ten groups according to utility of wealth for various payoff scenarios[17]. The range of these ten risk aversion classes was 0.0-0.01 for group one to 0.09-0.10 for group ten. First and second order stochastic dominance were used to determine the basis of preference.

Empirical results are based on 25 years of quarterly return data from 1955-79 for 62 mutual funds and the S&P 500. Findings show that 60 funds dominated the index over at least one period for at least one risk class and the other two were comparable to the market. In addition, the more risk averse classes of investors preferred a larger number of mutual funds to the market. However, tests of consistency revealed that only 30 of the 62 funds exhibit consistent preference as measured by being preferred in three out of five five-year subperiods.

Veit and Cheney (1982) investigated the ability of mutual fund managers to adjust the risk level of funds to leverage the ability to time the market. They test the null hypothesis that alphas and betas are the same in bull and bear market using annual data for 74 funds over the 1944-78 period. The sample was subdivided into balanced funds, income, and growth to examine differential effects by investment objective.

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[17]Risk aversion was calculated as the second derivative of the utility of wealth divided by the first derivative of the utility of wealth for the utility function
$$U = -e^{-Ry}$$
where e is the constant 2.7, y is rate of return, and R is the risk aversion function value. Investors were assumed to have a choice between a risky investment with a .5 probability of a 25% return and a .5 probability of a -5% return or a riskless asset.

Market timing can arise from the manager changing the risk level through a change in the mix of security types such as, from cash, bonds, or preferred stock to common stock; or from increasing the riskiness of securities within a specific group as securities.

To mitigate the imprecise definition of bull and bear markets, the results of four different definitions were examined. These include: (1) a bull market is when the S&P 500 return is positive and a bear market is when it is negative; (2) a bull market is when the S&P 500 return is greater than +3%, a bear market when it is less than -3%, and unchanged if it is between +3% and -3%; (3) a bull market is when the return is greater than the median return and a bear market is when it is less than the median return; (4) a bull market is when there is a capital gain on the S&P 500 and a bull market is when there is a capital loss.

Empirical tests are conducted using the market model and the S&P 500 as the market proxy. This generated estimates of alpha and beta for bull market periods, bear market periods, and the complete period. Results suggest funds in general do not change their risk level to time the market. There was no evidence that risk changes occurred within any of the three investment objective classes, using any of the four definitions of bull and bear market. They conclude that inability to forecast market returns, high transactions' costs to change portfolio composition, or unwillingness to change the risk class of the fund, are possible explanations for the lack of timing.

2.11: The Importance of the Selected Index

Brown and Brown (1987) assessed the usefulness of CAPM from a practical standpoint given Roll's criticism that ambiguity exists when performance is measured using

the security market line. Since the true market portfolio cannot be observed "(beta) will depend as much on the proxy we select to represent the universe of assets as well as on security-unique attributes."

The performance of 32 mutual funds during the 1947-78 period was studied using the Jensen measure. Six different value weighted indices were used as proxies for the market portfolio to find out the sensitivity of results to the selected index. The indices used were: (1) U.S. common stock, (2) index one plus fixed-income securities, (3) index two plus real estate, (4) index three plus U.S. Government Bonds, (5) index four plus municipal bonds, and (6) index five minus common stock.

Cross-sectional regression shows four things: (1) only indices' one through five explain returns, (2) the three indices that include real estate provide different inferences than the others, (3) only the indices with real estate have significant alphas and betas, and (4) beta increases drastically for indices that contain real estate and alpha becomes significantly negative.

They next examined the effect of index selection on the performance ranking of individual mutual funds. They separated funds into three groups (significantly positive alpha, insignificant alpha, significant negative alpha) then sorted each of the three groups by alpha. Funds were then ranked by the size of alpha. The largest alpha in the significant positive category was ranked number one and the smallest alpha in the significant negative category was ranked last. This was performed for indices one through five and a sixth ranking on raw returns was also provided. Despite many rank changes, they conclude that these rankings are similar for the five indices.

They compared the association of these rankings using the Spearman rank correlation coefficient and the Kendall Partial Tau coefficient and found that while these statistics provide a relatively high degree of association, they show that many funds experienced changes in the significance of alpha for changes in the index. This led them to conclude that the choice of index is important.

Lehmann and Modest (1987) also investigated whether conventional measures of mutual fund performance are sensitive to the reference benchmark. Many studies have used the CAPM, however, many anomalies have been documented. This causes the selection of the benchmark and CAPM to be questioned. An alternate pricing theory, APT, was developed by Ross (1976). This theory allows K common factors to be priced in the market rather than the single factor CAPM.

The interest was whether empirical results produced by these two measures will be similar or different. To examine the performance implications of these two return generation processes, they compare the performance results generated from a CAPM, using CRSP value-weighted and equally-weighted indices as a market proxies, and several arbitrage pricing theory (APT) models using 5, 10, and 15 factors. The APT factor loadings were estimated using four methods that include "two maximum-likelihood factor-analysis procedures, a principal-components procedure, and an instrumental-variable estimator."

The sample of mutual funds consisted of monthly return data on 130 funds during the 1968-82 period. To reduce errors due to changing risk levels over an extended period, three five-year intervals were examined. Results suggest that absolute and relative rankings are sensitive to both the asset pricing model used and the selected benchmark.

They also show that even if CAPM was the appropriate model, a performance evaluation problem arises if portfolio managers possess superior information and use it to time the market. While the Jensen measure is good for showing stock selection ability, "it cannot be used to evaluate managers since α_p could be positive even if the manager were an unsuccessful stock picker and a perverse market timer." They conclude that: alpha is "sensitive to the method used to construct the APT benchmark," and that CAPM and APT provide conflicting results. This suggests the importance of knowing the appropriate risk-return generating process.

2.12: Toward a New Paradigm

Grinblatt and Titman (1989) revisited mutual fund performance due to the lack of consensus about the ability of professional portfolio managers to generate risk adjusted abnormal returns. Previous studies have generally found that mutual funds fail to exhibit positive risk adjusted returns. They claim that this is reasonable because "if mutual fund managers have superior investment talent, they may be able to capture rents from their talent in the form of higher fees or perquisites obtained through higher expenses."

They use both gross and net returns[18] during the 1975-84 period to mitigate this problem. Performance is evaluated using the Jensen Measure[19]. The proxy used for the risk

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[18]Net returns are net of fund expenses other than load fees. Load fees are not considered for either set of returns.

[19]They note that the Jensen Measure was criticized by "Roll (78), Jensen (72), and Dybvig and Ross (85)" for two reasons. First, it is sensitive to the chosen market portfolio. Second, it is sensitive to timing ability. They also acknowledge the benchmark issue is relevant in this study.

free rate is the return on 30 day T-Bills, and four proxies are used for the market portfolio. The four market proxies include the Center for Research in Security Prices (CRSP) value-weighted index (VW), the CRSP equally-weighted index (EW), a ten-factor portfolio (F10) developed using the factor-analytic approach of Lehmann and Modest (1988), and an "eight-portfolio benchmark" (P8) developed by Grinblatt and Titman (1988).

Of the chosen benchmarks, they consider the P8 benchmark the best because the α's estimated on "109 passive portfolios" were "closest to zero" using the P8 as a benchmark. Additionally, they found the EW and F10 indices to have "size, dividend yield, and beta related pricing errors." Additionally, the VW index performed poorly during this period causing positive α's when it was chosen as the benchmark.

Monthly mutual fund data was obtained from CDA Investment Technologies, Inc. A second data set containing the equity composition of the mutual funds, as reported to the Securities Exchange Commission (SEC) in the quarterly holding report, was used to generate hypothetical returns based on those holdings[20]. These hypothetical returns are used for comparison to the actively managed returns.

Empirical results are presented on six topics:

1.   Transaction costs were estimated by comparing the α's from returns of 157 actual

mutual funds and 157 hypothetical portfolios. They find that transaction costs

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[20]These portfolios ignored Over the Counter (OTC) stock, cash, and the fixed income portion of the mutual fund portfolio. However, they claim that this is a small portion of holdings and would not significantly alter results.

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range from 1% to 2.5%[21] depending upon the selected benchmark.

2. Survivorship bias was computed from the difference in α's between 274 mutual funds not subject to survivorship bias and 157 that were. They conclude that differences in performance were not significant.

3. Average performance was examined for both hypothetical returns and actual returns. They found that "returns differ substantially across different benchmarks." They found negative α's for the EW and F10 benchmarks and concluded that it is due to inefficient benchmarks and "due to size, beta, and dividend-related biases induced by these benchmarks." Using the P8 and VW indices as market proxies yielded positive α's. They claim that this is "not necessarily indicative of benchmark inefficiency since it can be generated with superior information." The P8 benchmark indicates that the funds generate 1.5% per year positive performance however, the gain is less than the 2.5% in expenses required to generate it.

4. Performance by investment objective was studied by dividing the 157 surviving funds divided into aggressive growth, balanced, growth, growth and income, income, special purpose, and venture capital/special situation funds. Results suggest that no group has a significantly positive α with any of the four

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[21]They note that some difference in benchmarks can be caused by sampling error. Also, two other biases can be present. One bias can result from hypothetical portfolios being formed on quarterly data. This can result in lower gross returns and a consequent overestimation of transaction costs. Opposing bias can result from "window dressing" if managers sell poorly performing funds prior to listing them in the SEC quarterly holdings report.

benchmarks and that the EW and VW indices yield no significantly negative α's.

However, the P8 index shows balanced and income funds are significantly

negative. The F10 benchmark shows negative performance for balanced,

aggressive growth, growth, growth and income, and venture capital/special

situation funds. However, contrary to the P8, it does not show income funds to be

significantly negative. Repeating the experiment with 274 hypothetical returns

using the P8 benchmark shows that growth and aggressive growth funds have a

3% per year positive abnormal performance. This suggests investment talent but

the talent is eaten up by fees, leaving no excess returns for investors.

Two additional hypotheses were tested. First, the P8 benchmark was used

to test the hypothesis that all the α's of individual funds within a given category were

zero. This hypothesis was rejected for aggressive growth and growth funds.

Second, the P8 benchmark was used to test the hypothesis that all the α's of

individual funds within a given category were equal to each other. This hypothesis

was rejected as well for aggressive growth and growth funds.

5.   Two theories about NAV and performance were also examined. The first is that

small funds perform better since they can rebalance their portfolios without altering

prices significantly. The opposing theory is that large funds perform better due to

economies of scale[22] and lower transaction costs. To examine the theories, five

size-based portfolios were formed. Results suggest that small NAV outperform

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[22]These could arise from marketing, administrative, legal, or custodial economies of
scale.

large NAV by 2.5% per year before expenses but net returns are equal after costs. Equivalent results were obtained in the growth and aggressive growth subgroups.

6. Benchmark inefficiency was examined to find out if performance was at least partly due to superior management. They compared the original portfolio composition returns (a passive portfolio) to portfolios updated annually and quarterly. They found that the risk, as measured by β, was the same; however, the portfolios updated quarterly had the highest returns, the portfolios' updated annually had the next highest returns, and the passive portfolio had the lowest returns. They conclude that "Superior performance may in fact exist, particularly between aggressive-growth and growth funds and those funds with the smallest net asset values." However, their net returns do not exhibit abnormal performance. Therefore, investors cannot capitalize on the abilities of portfolio managers by purchasing the mutual funds they manage.

In summary, they find that survivorship bias is small, transactions' costs are large and are "inversely related to fund size," net returns are unrelated to fund size, and gross returns for aggressive growth and growth funds are significantly positive but net returns are not.

Grinblatt and Titman (1989) examined criticisms of the Jensen measure and developed the positive period weighting measure (PPW). The PPW requires a mean-variance efficient benchmark, however, it is not distorted by market timing. They show that if a portfolio manager possesses timing information a biased estimate of beta will be generated. This can lead to a negative alpha for correct market timing and a positive alpha

for perverse market timing.

Ippolito (1989) investigated the efficiency of the mutual fund industry in a world with costly information to decide if costs of information gathering result in abnormal returns. To find out if a random selection of mutual funds outperformed an index fund, Jensen's α was estimated from the standard CAPM for the group as a whole. The performance of the group of 146 mutual funds was compared over the 1965-84 period using annual data. Both the S&P 500 and NYSE indices were used as market proxies. To ensure betas were stable, he divided the sample into two periods and tested for changing betas. He concluded betas were stable except 15 funds that he excluded from further testing.

He found that α's for the funds were significantly positive, suggesting that fund managers add value however, load fees that are not reflected in the data consumed the excess return. After dividing funds into groups according to the Wiesenberger investment objective classification, he repeated the test and found no evidence that excess returns were related to betas or investment objectives.

To test factors more precisely, he ran the following regression

$$R_{it} - R_{ft} = b\beta_i[R_{mt} - R_{ft}] + cE_{it} + dMF_i + eY_t + error \quad (2.12.1)$$

where β_i was estimated from the market model (b should equal 1), Mf_i and Y_t are mutual fund and year dummies, and E_{it} is mutual fund expense. His major results were: mutual funds earn sufficient return on information to cover costs; load funds earn sufficient return over no-load funds to cover the load fee; turnover is unrelated to return, and net returns on actively managed funds outperformed index funds on a risk adjusted basis.

Lee and Rahman (1990, 1991) examined both market timing and selectivity for a

sample of 93 mutual funds during the 1977-84 period. Using generalized least squares (GLS) regression and the following model, measures of timing and selectivity were measured.

$$R_{pt} = \alpha_p + TE(R_{Mt})(1-D)R_{Mt} + DT(R_{MT})^2 + TDE_pR_{Mt} + u_{pt} \quad (2.12.2)$$

Where R_{pt} is the return on the portfolio, α_p is the intercept and will measure selection ability, T is the managers' response to information, E is the error of the manager's forecast, R_m is the return on the market, and D is the coefficient of determination between the manager's forecast and excess returns on the market.

Results show both selectivity and timing ability for some funds. In total, 14 funds exhibit selection ability and 16 funds exhibit timing ability. Ten funds exhibit both selection and timing ability.

Bogle (1991) examined performance in terms of the risk and return characteristics by investment objective and compared the performance of equity funds to the unmanaged S&P 500 Index. The investment objectives examined were aggressive growth, growth, growth-income, equity-income, and small company funds. He believes this is of practical importance and "can provide a rational basis" for intelligent investing. Three measures of risk were used: beta; a risk measure based on the monthly returns below T-Bills, and standard deviation. After using three measures of risk, he commented the measure of risk is unimportant because "they all pretty much track one another."

Additionally, he found higher risk did not result in higher returns. Contrary to theory, aggressive growth funds had the largest degree of risk and the lowest returns. Less

risky equity income and growth-and-income funds had the lowest risk and the highest returns. This is opposite the result predicted by capital asset pricing theory and is unexplained.

He also provided evidence that it is difficult to outperform the S&P 500 Index. During the 1969-89 period, the average annual return on the Lipper General Equity Fund Average was +9.4% compared to +11.5% for the S&P 500 Index. Three costs are believed to cause this performance differential: fund operating costs of 1.1%, portfolio transaction costs of .7%, and approximately .5% due to the inability to remain fully invested because of nearly continuous receipts and disbursements of cash. The lowest number of funds outperformed by the index was 15% in 1977 and the high was 89% in 1970. The limited number of funds beating the index in any given year shows the difficulty of doing so, particularly when costs must be recouped.

Bogle (1992) assessed the difficulty in selecting a mutual fund that will be a top performer in the future using information available to informed investors such as past returns, the *Forbes Honor Roll*[23], and *Morningstar Mutual Funds*. He first selected the top 20 mutual funds in one period, in terms of raw returns, and examined how they perform in a future period. Results reveal that funds ranked high one year perform less impressively the following year. Similar results appear when ten year performance intervals are utilized. This led him to conclude that raw returns cannot be used to predict future superior performance of mutual funds.

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[23]He mentions that this has been reported annually since 1973 and that it considers the total return, relative performance over varying market conditions, and tenure of the portfolio manager.

He then examined the results of a strategy of dividing wealth equally over the funds

comprising the *Forbes Honor Roll*, and rebalancing the portfolio annually. The average

return over the 1974-90 period was +12.2% compared to +11.8% for the Lipper General

Equity Fund, gross of load fees. Net of load fees, the return is +10.4% compared to +12.4%

for the Wilshire 5000 Index. This led him to conclude that the *Forbes Honor Roll* cannot be

used to select future "winners."

The star ranking system of *Morningstar Mutual Funds* was then examined to find

out if it could resolve the apparent difficulty[24]. He again found some regression toward the

mean but concludes that the preliminary indication is that it "provides some basis for

selecting the better performing funds, and for avoiding the worse-performing."

2.13: Recent Developments in Measuring Performance and Detecting Performance Persistency

Grinblatt and Titman (1992) investigated the persistency of mutual fund performance

since few previous studies have examined that critical issue and those that have are subject

to a benchmark bias[25] or provide no test statistics[26]. They claim that this is due to CAPM and

APT based benchmarks favoring "small capitalization and high dividend-yield stocks." They

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[24]He notes that the top 10% of funds are ranked five stars, the next highest 22.5% four stars, the next 35% are ranked three stars, the next 22.5% are ranked two stars, and the bottom 10% are ranked one star.

[25]They cite Jensen (1969) and Beebower and Bergstrom (1977).

[26]They cite Lehmann and Modest (1987).

extend the results presented in Grinblatt and Titman (1989), which found significant differences in performance of growth and aggressive growth funds using the P8 benchmark they developed, to detect if this performance is persistent over time.

Sample data was obtained from CDA Investment Technology Inc., and consisted of monthly return data for 279 mutual funds over the 1974-84 period. Performance determination was made using the market model and the P8 benchmark as the market proxy. Persistency tests involve three steps: splitting the sample into two five-year periods, computing α for each fund in each period, and regressing the α's from the most recent period on the latter period.

If the β coefficient is insignificantly different from zero, there is no evidence of a relation between past and future performance. A significantly positive β, on the other hand, would suggest a positive relation between past and future performance.

Empirical evidence suggests that performance is persistent. Since Jegadeesh and Titman (1991) found that individual stocks exhibit long run abnormal returns, the ten years of return data was randomly sorted into two 60 month samples[27]. Tests were repeated and persistency results were even stronger, leading them to conclude that the result is not due to the performance of individual securities. To eliminate net performance persistency from being created by differences in costs and fees, the α's of the top and bottom 10% of funds were examined for 60 months outside the ranking period. Results show both positive and negative persistency exists. They conclude that past performance is indicative of future

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[27]Januaries were sorted separately to ensure the same number of Januaries were included in each period to mitigate the creation of a January effect.

performance and that those results are consistent with persistent differences in costs and fees.

Grinblatt and Titman (1993) investigated the monthly performance of 155 mutual funds over the 1974-84 period using a "portfolio change measure" (PCM) developed in this paper. The sample data from CDA Investment Technologies, Inc., is subdidived into seven investment objectives that includes aggressive growth, balanced, growth, growth and income, income, special purpose, and venture capital. They believe that this is the first study unaffected by benchmark problems.

The PCM assumes that uninformed investors believe expected asset returns are constant over time. Therefore, they will not alter portfolio weights. However, informed investors will alter their portfolio weights to exploit time varying expected excess returns. Therefore, the actual expected return, less the expected return if weights are uncorrelated, is zero for uninformed investors since covariance is zero. Informed investors will have correlated weights and returns, resulting in a positive covariance term[28]. This follows from

$$COV = \sum_{J=1}^{N}(E[w_j R_j] - E[w_j]E[r_j]) \qquad (2.13.1)$$

where w_j is the portfolio weight for security j, and R_j is the return on security j.

This also holds for sample covariance, scov, since

$$scov(w_j, R_j) = \sum_{t=1}^{T} w_{jt}(R_{jt} - \overline{R_j})/T = \sum_{t=1}^{T}(w_{jt} - \overline{w_j})R_{jt}/T \qquad (2.13.2)$$

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[28]They state that Grinblatt and Titman (1989) show "that non-increasing Rubenstein absolute risk aversion is a sufficient condition for the sum of the N terms . . . to be positive."

To compute the covariance between the portfolio weights and security returns they use the PCM defined as

$$PCM = \Sigma\Sigma[R_{jt}(w_{jt} - w_{j,t-k})]/T \qquad (2.13.3)$$

where w_{jt} is the portfolio weight of security j at time t and $w_{j,t-k}$ is the portfolio weight of security j during a previous period. If superior information is nonexistent, portfolio weights and returns will be uncorrelated and the PCM will be approximately zero for large samples. Superior information will cause the PCM to provide the average covariance if past weights are uncorrelated with returns.

By examining the quarterly holdings of these funds, two portfolios were formed for comparison. The first uses a one quarter lag by looking at portfolio weight changes on a quarterly basis whereas the second uses a one year lag by examining portfolio weight changes on an annual basis. Returns on these portfolios were generated simply by multiplying the return on each security in the portfolio by its weight. This creates a no-cost arbitrage portfolio for comparison. If the systematic risk of the portfolios is the same as that of the fund being evaluated, the PCM will be zero if superior information is nonexistent.

Empirical results are presented on the performance of actual funds and the one quarter and one-year lag portfolios for the complete sample and the sample divided by investment objective. Results for the one-quarter lag sample show only growth funds exhibit significant performance but it is only .66% per year gross of expenses. The overall one-year lag sample exhibits statistically significant performance of 2.04%.

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The following subsamples also exhibit performance: aggressive growth 3.40%, growth 2.41%, and income 1.33%. The hypotheses of equal performance within and across investment objective categories were rejected.

To decide if the results were beta driven, they examined risk and found the average beta for the no-cost portfolios to be significant and positive, however, betas are small and do not affect the results. They conclude that positive and differential performance exists in "aggressive growth, growth, growth-income, and venture capital/special situation categories."

Performance persistency was examined by splitting the sample into a 56-month period and a 55-month period. Fund performance within each investment objective was ranked by deciles in each period. They find persistency in the combined sample and in aggressive growth, growth, and growth and income categories[29]. They conclude that "past performance per se is a valid indicator of future performance and is not a variable that is confounded with investment objective." However, abnormal performance here is the gross return and does not imply investors can take advantage of this due to high and variable fees charged by the mutual funds.

They tested within group betas to detect if results were beta driven and found that beta differences were small, and the hypothesis of equal betas could not be rejected, leading them to conclude that performance differences were not beta driven.

They note three limitations of this measure: it is data intensive and costly to

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[29]They mention that the other four investment objectives suffer from small sample sizes which makes tests meaningless.

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implement, quarterly data only proxies a fund since true performance is not measured, and

managers may "game the measure by selecting securities when they are riskier than usual."

Ippolito (1993) reviewed mutual fund performance studies and documented the shift

in paradigm from the original efficient market theory (EMT) to a modified EMT. The

original EMT claimed expenditure on research and trading would result in substandard

performance. Empirical support for this was provided by Sharpe (1966), Treynor and Mazuy

(1966), and Jensen (1968). Sharpe found that his sample had a return 40 basis points less

than the DJIA and that funds with lower expenses performed better. Treynor and Mazuy

found no evidence of superior market timing ability for individual mutual funds, suggesting

expenses incurred attempting to time the market were unprofitable. Jensen found the

average alpha was -110 basis points.

Grossman and Stiglitz (1980) explain how information is incorporated into prices if

information is costly. Uninformed investors would be on the unprofitable side of trades, and

in equilibrium, informed investors would earn sufficiently higher gross returns to cover

information costs. This would leave the two groups with equal net returns. This is the

modified EMT. Support for this is wide spread. Carlson (1970) found an alpha of +60 basis

points using the Market Model and the S&P 500 as a market proxy. McDonald (1974) found

an alpha of +62 basis points using the Market Model and the NYSE as a market proxy.

Mains (1977) replicated Jensen's study using both annual and monthly data. He found an

alpha of -62 basis points with annual data and an alpha of +9 basis points with monthly data.

Shawky (1982) found alpha to be insignificantly different from zero. Tests of market timing

studies generally conclude that funds individually do not exhibit evidence of successful

market timing ability.

Lehmann and Modest (1987) show that various benchmarks can cause the estimated net alpha to range from -385 basis points to -545 basis points. Grinblatt and Titman (1989) developed the P8 benchmark and concluded it is a better market proxy not subject to benchmark bias. The P8 benchmark yielded an alpha of +180 basis points for gross return data and +60 basis points for net return data. They conclude that superior performance may exist gross of expenses. Ippolito (1989) and Grinblatt and Titman (1989) separately estimated the expenses of mutual funds and provided a range from 1.50% to 2.77% (150-277 basis points). Ippolito (1989) considered the market to be efficient and in equilibrium when returns net of expenses are equal. This is consistent with the Grossman and Stiglitz (1980) model. Using Jensen's sample, Ippolito found alpha to be +81 basis points and concluded that mutual funds can earn returns to offset expenses. This supports Modified EMT over EMT.

He suggests that not all funds recover expenses, but some generate sufficient gains to cause the average to be zero. Some funds may be competent and others incompetent but noise may make it difficult to ascertain which is which. Therefore, it is important to investigate the quality issue and find out how quality problems are handled by the market.

Grinblatt and Titman (1994) investigated three controversies arising from traditional CAPM performance measures. These include timing ability, statistical power, and benchmark efficiency. The results of three performance measures were compared using four indices to learn the sensitivity of results to various performance measures and proxies for the

market portfolio. The three measures compared are the Jensen[30], Positive Period Weighting (PPW), and Treynor-Mazuy measures (TM). The PPW and TM measures were used to address the concern about the timing issue levied at the Jensen measure. The four indices used are the CRSP (EW) equally-weighted, CRSP (VW) value-weighted, the P8 developed by Grinblatt and Titman (1988), and the F10 developed from a 10-factor maximum likelihood factor analysis by Lehmann and Modest (1988)[31].

Mutual fund data[32] consisted of the monthly net returns for 279 funds over the 1974-84 period and CRSP data was used to create the benchmarks and the 109 passive portfolios. Of the 109 passive portfolios, 37 were formed by industry and 72 were formed by sorting data by firm size, dividend yield, past returns, interest rate sensitivity, beta, and co-skewness (the beta of the squared term in the TM model).

Empirical results are presented for the sensitivity of performance to the benchmark choice, selected performance measure, and fund characteristics. They find both performance measures and benchmarks affect ranking, however, benchmark choice has a greater effect. This suggests that inferences about both the mutual fund industry as a whole, and individual funds in particular, are sensitive to the chosen benchmark.

An examination of performance differences of the three measures indicates that performance results are highly correlated. They believe that the similarity between the

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[30]They note that the issues discussed for the Jensen measure apply to Treynor's measure as well.

[31]They note that past research has shown all but the P8 benchmark to be mean-variance inefficient.

[32]The source of data was CDA Investment Technologies.

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Jensen and PPW measure arises from the inability of mutual fund managers to time the market.

Performance was examined relative to Net Asset Value (size of fund), load fee, expense ratio, turnover, and management fee. Using a multivariate regression, with the Jensen measure as the dependent variable, they find that performance is related to turnover but unrelated to size or expenses.

Goetzmann and Ibbotson (1994) examined the net returns on mutual funds to find out whether past relative performance of funds suggests future relative performance by examining 258 mutual funds over the 1976-88 period.

First, raw returns were examined to determine the relation between relative performance in two successive time intervals. The time intervals selected were one-year, two-years, and three-years. The two-year sample results show that in four of five two-year periods winners tended to repeat. Overall, 60% of the winners from one period could be expected to be winners in the next. However, the one period that showed opposite results could suggest a risk-return relationship in a declining market.

The second method involved using the market model to generate alphas for each fund, then using alphas to rank the funds. Results indicate stronger persistency of performance since winners repeated in all five two-year periods. Also, the total repeat rate increased to 62%.

Three-year returns were examined after dividing funds into performance quartiles. Both raw return, and risk adjusted return data, suggest that persistency is even stronger for funds in the top or bottom quartile. They conclude that historical ranking can be used to

enhance the chance of "superior relative performance."

2.14: International Equity Fund Studies

This section restricts its attention to evaluation of U.S. based international mutual funds. The basis for evaluation extends directly from portfolio theory, and empirical results from major studies are presented.

Cumby and Glen (1990) examined monthly return data for 15 open-end diversified international mutual funds during the 1982-88 period using the Jensen measure and Positive Period Weighting (PPW) measures. Three indices were tested for mean-variance efficiency and then used as proxies for the market portfolio in regressions to evaluate mutual fund performance. The three market proxies used were the Morgan Stanley Capital International Perspective World Index[33], the U.S. Market Index, and an index created from the Morgan Stanley Capital International Perspective World Index and an equally weighted eurocurrency deposit portfolio[34].

To test mean-variance efficiency of the benchmarks, thirteen national market indexes were individually used in a regression to detect if any provided statistically significant superior returns[35]. None of the 13 national market indexes was statistically superior to the

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[33]The Morgan Stanley Capital International Perspective World Index was selected due to its large representation of stock traded in 20 countries.

[34]The Eurocurrency deposit portfolio contained the Canadian dollar, Deutsche mark, Dutch guilder, French franc, Japanese yen, Pound sterling, and Swiss franc.

[35]The 13 national indexes were: Australia, Belgium, Canada, France, Germany, Hong Kong, Italy, Japan, Netherlands, Singapore-Malaysia, Switzerland, U.K., and the United

MSCI index, or the index created from the Morgan Stanley Capital International Perspective World Index and an equally weighted eurocurrency deposit portfolio. Therefore, mean-variance efficiency could not be rejected. Indexes were sorted by country size (GNP), market capitalization, market turnover, liquidity (turnover / capitalization), concentration (percent of market capitalization accounted for by the largest 10 firms), and dividend yields in an attempt to examine anomalous behavior. None of these factors is significant in explaining returns of country indexes.

They examined the performance of mutual funds against the indices and found that none of the funds exhibits statistically significant performance against either the Morgan Stanley Capital International Perspective World Index, or the index created from the Morgan Stanley Capital International Perspective World Index and an equally weighted eurocurrency deposit portfolio. Further, the results are similar for both the Jensen and the positive period weighting measures. However, the funds are jointly significant. They believe this is caused by many negative alphas. They confirmed that this was not a market timing problem by using the Treynor and Mazuy (1966) model.

$$r_{pt} = \alpha + B_1 r_{ct} + B_2 r_{ct}^2 + \epsilon_{pt} \qquad (2.14.1)$$

A positive B_2 is consistent with successful timing ability. All 15 funds have a significant negative B_2, suggesting no timing ability. Examination of fund performance using a dummy variable for the October 1987 crash yields a similar result for market timing.

Eun, Kolodny, and Resnick (1991) investigated the performance of international mutual funds to examine the benefits of international portfolio diversification. Monthly

States.

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return data for 13 U.S. based international mutual funds during the 1977-86 were examined as were 19 funds during the 1982-86 period. The sample included seven Global funds, five Foreign funds, two Regional Funds, three Country Funds, and two Gold-related Funds. Seventeen of the funds were open-end and two were closed end funds. Mean variance efficiency was examined using three benchmarks: (1) the S&P 500 Index, (2) the Morgan Stanley Capital International World Index (MSCI), and (3) an index constructed from the 60 largest U.S. MNCs in terms of foreign revenue. They found that the mean returns of the international funds were higher than the mean returns of the S&P 500 Index and that the standard deviations were only slightly higher for the international funds (excluding the gold funds).

The market model suggests that the international funds are low risk when held as part of a well-diversified domestic portfolio. Results also suggest that the MNC Index provides little diversification for U.S. investors, which is consistent with Fatemi (1984). They conclude that international funds provide a good means of further diversifying well-diversified domestic portfolios. The average Treynor and Jensen measure for the funds exceeded those for all three indices, however, the Sharpe measure for the funds was less than that for the MSCI Index.

The ability of each fund to increase the mean variance efficiency of a well-diversified portfolio was examined during the 1977-86 period using the S&P 500 Index as a portfolio proxy. The methodology of Elton, Gruber, and Rentzler (1987) was used to decide if an international fund should be added to the investor's portfolio. Their model is

$$\frac{[\overline{R}_i - R_f]}{\sigma i} > \frac{[\overline{R}_d - R_f]}{\sigma d}\rho_{id} \qquad (2.14.2)$$

where R_i and σ_i are mean returns and standard deviations of the funds, R_d and σ_d are the mean return and standard deviation of the S&P 500 Index, and ρ_{id} is the correlation coefficient between the S&P 500 Index and the fund. Results show that 18 of the 19 funds observed would have benefited U.S. investors holding well-diversified portfolios.

Selectivity and market-timing analysis was investigated, using the methodology of Henriksson and Merton (1981), to detect the degree to which international funds guard against downside U.S. market risk. The model is

$$R_{it} - R_{ft} = \alpha_i \beta_{i1} X_{1t} \cdot \beta_{i2} X_{2t} \cdot \epsilon_{it} \qquad (2.14.3)$$

where $X_{1t} = \max [0, R_{mt} - R_{ft}]$, $X_{2t} = \min [0, R_{mt} - R_{ft}]$, $X1_t$ is the bull market risk premium, and X_{2t} is the bear market risk premium. If β_1 is greater than β_2, market timing is good. The measure of selectivity is α_i. During the period 1982-86 period, 12 of the 19 funds exhibited results consistent with good market timing ability. Adding of any of these funds to a domestic portfolio would decrease susceptibility to a U.S. bear market.

The ability of international funds to hedge against domestic inflation was also investigated since diversification benefits can arise from both increased mean-variance efficiency and increased hedging efficiency. The model is

$$R_{it} = \gamma_{oi} \cdot \gamma_{1i}\beta_i \cdot \gamma_{2i}(\pi_i - \beta) \cdot \epsilon_{it} \qquad (2.14.4)$$

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where β_t is the T-bill rate and proxies expected inflation, π_t is the consumer price index inflation rate, and π_t-β_t is used as a proxy for unexpected inflation. During the 1977-82 period, all 13 international funds were poor hedges against expected inflation (γ_1 negative), however, four were good hedges against unexpected inflation. Of these, two were gold funds and one was a country-specific fund. They conclude that international mutual funds do not act as a good hedge against expected inflation.

Droms and Walker (1994) criticized previous work for not covering a period of over ten years or more than 18 international funds. They attempted to correct that deficiency by using a pooled cross-sectional/time series regression methodology to examine 30 funds over six years (1985-90), 15 funds over ten years (1981-90), and four funds over 20 years (1971-90). Annual data on total returns, asset size, load fees, expense ratios and turnover obtained from Wiesenberger Investment Companies Service.

By using the standard market model, returns were examined against the S&P 500 Index, the EAFE Index, and the Morgan Stanley World Index (MSCI)[36]. Results show only two funds had a significant alpha during the 1981-90 period when measured against the S&P 500 Index and both were negative, however, the EAFE and MSCI indices produced insignificant alphas for all funds.

To examine whether performance is related to "key operating characteristics of mutual funds" they examined the following relation

$$R = f(A, E, T, L) \quad (2.14.5)$$

where R is either the unadjusted or adjusted rate of return (adjusted rates of return are

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[36]Returns on the EAFE and MSCI are U.S. dollar returns.

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computed from the Sharpe, or Treynor measure), A is total asset size of the fund, E represents total expenses as a percentage of net asset value, T is the turnover rate, and L is a dummy variable that takes on a value of one for load funds. The model used for the empirical work was

$$R = \alpha + b_1A + b_2E + b_3T + b_4L + b_5A*L + b_6E*L + U \quad (2.14.6)$$

This model was estimated using both unadjusted and risk adjusted return data for four funds during the period from 1971-90, 15 funds from 1981-90, and 30 funds from 1985-90. None of the betas were statistically different from zero except during the 1985-90 period, suggesting that none of the independent variables has much explanatory power before 1985. During the 1985-90 period, they found both the load and expense variables to be negative and the load expense interaction term to be positive. This result held for both unadjusted returns, and returns adjusted by the Sharpe measure. Returns adjusted by the Treynor measure are confirmatory for load and interaction, however, expense is no longer significant. They conclude that "Load funds generally underperform no-loads on a risk adjusted basis."

Results of pooled cross-sectional/time-series analysis of all funds in operation during any given year during 1981-90 indicate that returns are not related to turnover rates, load, size, or expenses.

2.15: Summary of Performance and Performance Persistency Studies

Previous studies suggest that performance ranking is sensitive to the assumed return generation process (CAPM or APT), the choice of benchmark, and timing ability by portfolio managers. This leads to performance ambiguity. Recent studies also suggest that performance may persist and that the result is not beta driven. Additionally, the paradigm of EMT appears to be shifting to a modified EMT of efficiency with costly information. Clearly a method of performance evaluation not subject to either the assumed return generation process, or the choice of benchmark, is required. Additionally, a method that can rank portfolios in homogeneous risk-return classes based on statistical significance could help us decide if persistency really exists, or if it is manufactured by a method that consistently biases results.

2.16: Relationship of This Study to Previous Studies

Klemkosky (1976) and Starks (1987) provide empirical and theoretical support, respectively, for an *a priori* belief that risk is homogeneous within investment objective groups. If this remains true, it may be possible to use the ANOVA statistical technique to examine performance within investment objective groups. Inability to reject the null hypothesis of equal returns among funds would support EMT, whereas rejection would support the modified EMT of Grossman and Stiglitz (1980). Rejection of the null would also enable the Tukey HSD test to be used to compartment funds into categories of statistical

significance. This may be a crucial step toward investigating the markets' handling of quality problems recommended by Ippolito (1993). This methodology also circumvents the benchmark problems presented in Lehmann and Modest (1987), Grinblatt and Titman (1994), and Droms and Walker (1994), by eliminating benchmark based methodology. Finally, we believe that this methodology will result in stronger performance persistency tests than those of Grinblatt and Titman (1992) or Goetzmann and Ibbotson (1994).

Chapter Three

Data Sources, Methodology, and Hypothesis Testing

3.1: Data Sources

To select the sample for analysis, a list of open-end mutual funds that were in operation during the period September 1981 through September 1991 was obtained from CDA Investment Technology, Incorporated[37, 38]. The initial list consists of 1,751 mutual funds in operation during at least part of that period. The sample will be sorted by the eight CDA investment objectives for evaluation. Each of those eight investment objectives is assumed to translate into a unique risk category. This is consistent with the methodology employed by other researchers[39]. Klemkosky (1976) studies the discriminatory power of Weisenberger classifications and finds equal risk within groups and different risk between groups. This effectively divides the security market line into multiple segments of risky

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[37]The *CDA Mutual Fund Hypo* program will be used to obtain data and perform hypothetical investments. We wish to thank Waddell & Reed Financial Services for allowing us access to the data for this study.

[38]Data from CDA is also used by Grinblatt and Titman (1989, 1992, 1993, and 1994) to study mutual fund performance and performance persistency. Grinblatt and Titman spot-checked CDA data on several occasions and found it to be accurate.

[39]This is consistent with the works of Horowitz (1966), Treynor and Mazuy (1966), Bogle (1970, 1991), Carlson (1970), Reints and Vandenberg (1973), McDonald (1974), Klemkosky (1976), Martin, Keown, and Farrell (1982), Ippolito (1989), and Grinblatt and Titman (1989, 1993).

assets. The lowest risk category of mutual funds, money market funds, will not be evaluated. Table 3.1 contains information concerning the investment objective, size of the sample, and reference to the appropriate appendix for further information.

In Table 3.1, column one provides the CDA Investment Technologies investment objective classification; column two provides the reference for the appendix that contains the list of the funds to be examined; and column three provides the size of the sample.

Classification of Fund	Appendix	Number of Funds
Overall	A	1,751
Aggressive Growth	B	178
Growth	C	346
Growth & Income	D	180
Balanced	E	108
International	F	123
Precious Metal	G	32
Bond & Preferred Stock	H	416
Municipal Bond	I	368

In summary, the initial 1,751 fund sample is comprised of 178 aggressive growth (AG), 346 growth (G), 180 growth and income (GI), 108 balanced (B), 123 international (IN), 32 precious metal (ME), 416 bond and preferred stock (BP), and 368 municipal bond (MB) funds.

Each list of funds will be screened and those funds that were not in operation for the

entire period will be eliminated[40]. This is consistent with the selection process used by Grinblatt and Titman (1989, 1992, 1993, 1994). Table 3.2 contains information concerning the refined sample.

In Table 3.2, column one provides the CDA Investment Technologies investment objective classification; column two provides the reference for the appendix that contains the list of funds to be examined; and column three provides the size of the sample.

Classification of Fund	Appendix	Number of Funds
Overall	J	474
Aggressive Growth	K	60
Growth	L	146
Growth & Income	M	72
Balanced	N	47
International	O	20
Precious Metal	P	8
Bond & Preferred Stock	Q	82
Municipal Bond	R	39

This screening will result in a total sample of 474 funds; consisting of 60 aggressive growth (AG), 146 growth (G), 72 growth and income (GI), 47 balanced (B), 20 international

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[40]Survivorship bias is not believed to be a problem. Grinblatt and Titman (1989, 1992, 1993, 1994) use a similar screening process and conclude that survivorship bias was negligible. Additionally, survivorship bias would act to bias the result *against* finding performance differentials if mutual funds that performed in a substandard fashion went out of business. Under the "strong" form of EMT, only good performing funds would survive.

(IN), 8 precious metal (ME), 82 bond and preferred stock (BP), and 39 municipal bond (MB) funds. This is the largest sample of funds over a period in excess of ten years of which we are aware. A similar screening will be conducted to eliminate funds that ceased operation between September 1991, and September 1994. This is anticipated to have minimal impact on the sample size. Finally, international funds will be screened to eliminate country and regional specific funds to ensure homogeneity.

Results of the final screening are reported in Table 3.3.

In Table 3.3, column one provides the CDA Investment Technologies investment objective classification; column two provides the reference for the appendix that contains the list of funds to be examined; and column three provides the size of the sample.

Classification of Fund	Appendix	Number of Funds
Overall	S	377
Aggressive Growth	T	43
Growth	U	115
Growth & Income	V	61
Balanced	W	39
International	X	15
Precious Metal	Y	8
Bond & Preferred Stock	Z	66
Municipal Bond	AA	30

This screening will result in a total sample of 377 funds; consisting of 43 aggressive growth (AG), 115 growth (G), 61 growth and income (GI), 39 balanced (B), 15 international

(IN), 8 precious metal (ME), 66 bond and preferred stock (BP), and 30 municipal bond (MB)

funds.

CDA's return data will also be used for the S&P 500 Index, Dow Jones Industrial

Average (DJIA), and the risk-free proxy (T-bill return). The Center of Research in Security

Prices (CRSP) return data will be used for the CRSP equally weighted (EW) and value

weighted (VW) indices. Selection of these indices is consistent with previous studies[41],

however, domestic indices fail to appropriately measure the risk to an investor who holds

an internationally diversified portfolio.

Solnik (1974) shows that portfolios diversified by industry, country, and hedged

against exchange rate risk provide investors with the best risk-return characteristics.

Therefore, with at least partially integrated capital markets, an index of global equity returns

is more appropriate. Return data for the Morgan Stanley Capital International Perspective

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[41]The DJIA is used in early studies by Treynor (1965) and Sharpe (1966). It has also
been used in subsequent studies. Dorfman (1982) claims that many consider the
DJIA to be the market. As stated by O'Higgins and Downes (1991), this may be due to
the DJIA being comprised of blue chip stocks that are " . . . the most widely held and
popularly followed stocks in the world". Additionally, it comprises about 25% of the
market value of the NYSE. However, despite its wide following, it contains only
30 stocks.
    The S&P 500 provides the needed diversification and is used by Jensen
(1968), Bogle (1970, 1991), Carlson (1970), Levy and Sarnat (1972), Williamson (1972),
Klemkosky (1977), Ang and Chua (1982), Ippolito (1989), Eun, Klodny, and Resnick
(1991), and Droms and Walker (1994). The S&P 500 can be considered the most
publicly followed of the U. S. well diversified indices.
    The CRSP (EW) and (VW) are used by Lehmann and Modest (1987) and
Grinblatt and Titman (1989, 1994). These indices provide many more securities and
should be more representative of "the domestic securities market". However, they are not
publicly followed.

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Index (MSCI)[42] will be obtained and used to provide the risk measure for globally diversified investors. The MSCI is a U. S. dollar denominated, value weighted index covering 20 national markets, and over 1400 companies are used in this index. Each national index represents approximately 60% of the market value of equity in the 20 countries and 99% of the non-U. S. stocks included are readily purchasable by non-nationals.

3.2: Computation of Returns

Continuously compounded monthly net returns will be computed by taking the natural log of the change in wealth over the holding period[43]. Computationally, this is

$$R_{it} = \ln[\frac{NAV_{it} + DV_i + CG_i}{NAV_{it-1}}] \qquad (3.2.1)$$

where: R_{it} is the return on fund i during the period t, NAV_{it} is the net asset value of fund i at time t, DV_i is the dividend and interest paid on fund i during the period, and CG_i is the capital gain distribution paid on fund i during the period. Index returns will be computed similarly.

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[42]Cumby and Glen (1990), Eun, Klodny, and Resnick (1991), and Droms and Walker (1994) use the MSCI as a market proxy to study the performance of international mutual funds due to its truer representation of the portfolio held by investors.

[43]This is consistent with Klemkosky (1973).

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3.3: Measures of Performance

3.3.1: Introduction

To detect and examine performance differentials and performance persistency, four measures will be compared. Three measures are the traditional Sharpe, Treynor, and Jensen measures. The forth measure is our measure. It is developed by using one-way analysis of variance and the Tukey's honestly significant difference (HSD) test to make all pairwise comparisons among factor level means. The rationale for the fourth method is that it is believed to overcome criticisms levied at the other measures.

3.3.2: The Sharpe Measure

The Sharpe (1966) measure is used by Horowitz (1966), Klemkosky (1973, 1977), and French and Henderson (1985) to examine the return per unit of risk investors receive. Utility maximizing investors will select the portfolio that provides the highest return per unit of risk borne. Risk in this measure is defined as the standard deviation of the portfolio. The Sharpe measure is computed as

$$S_p = \frac{R_{it} - R_f}{\sigma_p} \qquad (3.3.2.1)$$

where S_p is the Sharpe measure, R_f is the risk free rate, R_{it} is the return on fund i in period t, and σ_p is the standard deviation of the fund.

This measure is criticized by Jensen (1968) for concentrating on ranking and not on absolute performance. Arditti (1971) shows that it is also sensitive to the normality of returns. Positive skewness could cause rational utility maximizing investors to prefer a lower Sharpe measure over a higher, normally distributed measure. Another limitation of the Sharpe measure is that while historical portfolio returns and standard deviation can be observed, the true risk free rate cannot. Some short term debt instrument, such as the T-bill rate, is commonly used as a proxy. This introduces bias if the precise investment horizon is indeterminate unless the yield curve is flat and invariant with respect to time. Additionally, the point estimate provided cannot be reasonably expected to be non-stochastic. It appears to be more reasonable to expect that the Sharpe measure is a sample statistic drawn from a population. This measure will rank performance, however, it does not provide any evidence on whether the differences in rankings are merely due to chance or if they are statistically different from one another. This can result in ambiguous rankings of a set of securities with only minor changes in the evaluation period.

3.3.3: The Treynor Measure

The Treynor (1965) measure is used by Sharpe (1966) Klemkosky (1973, 1977), French and Henderson (1985), Eun, Klodny, and Resnick (1991), and Droms and Walker (1994). It also seeks to evaluate the return per unit of risk investors receive, but uses the beta of the portfolio as a risk surrogate. The Treynor measure is computed as

$$T_p = \frac{R_{it} - R_f}{\beta_p} \qquad (3.3.3.1)$$

where T_p is the Treynor measure, R_f is the risk free rate, R_{it} is the return on fund i in period t, and β_p is the beta of the fund.

This measure is also criticized by Jensen (1968) for concentrating on ranking and not on absolute performance. Another limitation of the Treynor measure is selection of the proxy for the risk free rate, as discussed above for the Sharpe measure. A potentially more serious limitation is its sensitivity to the proxy used for the market portfolio[44]. Additionally, the point estimate provided cannot be reasonably expected to be non-stochastic. It is more reasonable to believe that the Treynor measure is a sample statistic drawn from a population. Like the Sharpe measure, this measure will rank performance, however, it does not provide any evidence on whether the differences in ranking are merely due to chance or if they are statistically different from one another.

3.3.4: The Jensen Measure

The Jensen (1968) measure is computed by using ordinary least squares (OLS) regression to regress fund risk premiums on market risk premiums. This is the most popular

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[44]Lehmann and Modest (1987) and Grinblatt and Titman (1994) show that performance rankings are sensitive to the selected market proxy. These empirical works support Roll's (1978) criticism of using the SML to evaluate performance.

measure of performance and is used extensively[45]. This procedure enables returns to be adjusted for risk by fitting the market model. Beta removes the risk of the portfolio and alpha will equal zero if the portfolio return lies on the security market line (SML). If the portfolio outperforms the SML, alpha will be positive; if the portfolio underperforms the SML, alpha will be negative. If risk and return are positively related, beta will be positive and significant. The fit of the model can be examined by the R^2, which should be high. The F-statistic should be sufficiently high to reject the null hypothesis that alpha and beta together fail to explain returns. The equation is the standard market model.

$$R_{it} - R_f = \alpha_i + \beta_i(R_{mt} - R_f) + \epsilon_i \qquad (3.3.4.1)$$

where R_{it} is the return on fund i in period t, R_f is the risk free rate, R_{mt} is the return on the market proxy in period t, and β_i is the beta of the portfolio.

The OLS method requires the following assumptions:[46]

1. The relation between risk and return is linear and constant.

2. The market risk premium is a non-stochastic variable (X is fixed).

3. The error term is normally distributed, has a mean value of zero, and constant variance for all observations. Further, the error terms are independent. The expected covariance between the errors of fund i and fund j is zero.

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[45]Some of the studies that use the Jensen measure include Williamson (1972), Reints and Vandenberg (1973), McDonald (1974), Klemkosky (1977), Brown and Brown (1987), Lehmann and Modest (1987), Ippolito (1989, 1993), Grinblatt and Titman (1989, 1992, 1993, 1994), Cumby and Glen (1990), Eun, Klodny, and Resnick (1991), Droms and Walker (1994), and Goetzmann and Ibbotson (1994).

[46]See Pindyck & Rubinfeld (1991).

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In addition, the CAPM assumptions[47] are:

1. Investors are risk averse and can choose portfolios based on expected return and variance. This requires either normally distributed returns or that investors have quadratic utility functions.

2. Investors have homogeneous expectations and have insufficient wealth to influence price.

3. There are no taxes, transaction costs, regulations, or restrictions on shortselling.

4. Information is costless and instantaneously available to all investors.

5. A risk free asset exists and unlimited borrowing and lending at the risk free rate of interest is possible.

6. All assets are marketable, perfectly divisible, and quantities are fixed.

The Jensen Measure can be criticized on numerous counts. First, it is subject to the inability to observe the market portfolio. Roll (1978) shows this can cause ambiguity in ranking performance. Lehmann and Modest (1987) and Grinblatt and Titman (1994) show both relative and absolute performance appraisals are sensitive to the selected market proxy. Second, numerous anomalies to CAPM have been discovered. Fama (1970, 1991) provides an excellent discussion of early tests and recent empirical tests of CAPM and market efficiency. Fama (1991) concludes that the "strong positive relations between β and the average return on U. S. stocks observed in the early tests . . . does not seem to extend to later

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[47]See Copeland and Weston, Financial Theory and Corporate Policy (3rd. Ed.)., New York, Addison-Wesley, 1988.

periods." Fama and French (1992) declare beta to be dead. They find that book-to-market equity and size are the best explanatory variables for returns, and that beta is insignificant when used in a regression with size and book-to-market equity. Third, is the problem with identifying the appropriate risk free asset. Fourth, if mutual fund managers time the market by increasing risk in bull markets, and decreasing risk in bear markets perverse market timing can result in positive performance[48]. Finally, the computed alpha can be used to rank portfolios but it cannot provide evidence that differences are due to more than random chance.

3.3.5: The Proposed Measure

3.3.5.1: Introduction

The final measure of performance is obtained by using analysis of variance (ANOVA) to determine if a statistically significant difference in performance exists. This is a central issue in this manuscript. ANOVA is used by Reints and Vandenberg (1973) and Klemkosky (1976) to test the equality of mean betas within and among funds grouped by investment objective. Klemkosky shows that risk, as measured by beta, is homogeneous within investment objective groups and heterogeneous among groups. That work provides the impetus for this study since theory tells us that equal risk should result in equal return.

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[48]This is discussed in Jensen (1972), Admati and Ross (1985), and Grinblatt and Titman (1989).

3.3.5.2: Advantages of the Proposed Method

The advantages of the ANOVA model are many. First, it does not require measurement of returns on either the market portfolio or the risk free asset. Second, it can determine if differences in performance are statistically significant or due to chance. This may eliminate continuous performance ranking changes. Third, it is free of CAPM anomalies and does not require a single factor return generation process. Thus, it is robust to the number of priced factors and can accommodate either a mulitfactor CAPM or an APT return generation process. Fourth, it can be used in conjunction with statistical tests of contrasts, enabling funds to be grouped by statistical performance categories if significant differences exist.

3.3.5.3: Assumptions of the Method

The ANOVA model assumes[49]:

1. The probability distribution of the return of each mutual fund is approximately normally distributed[50].

2. The return distribution of each mutual fund has the same variance or standard deviation. This implicitly assumes that the mutual funds being compared are equally risky in the Markowitz sense.

3. The observations for each fund are random observations and are independent of

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[49]See Netter, Kutner, and Wasserman (1990).

[50]OLS regression and the CAPM also require normally distributed returns.

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the observations for any other mutual fund.

3.3.5.4: Testing Assumptions of the Method

Before testing our central hypothesis, the assumption of equal within group variance will be tested. This is similar to the work of Reints and Vandenberg (1973) and Klemkosky (1976). However, we use the variance of end of period wealth as a measure of risk, whereas previous works used beta. The advantage of our method is that observation of the market portfolio alleviated. Formally, the hypothesis is

$$H1: \sigma_1^2 = \sigma_2^2 = \ldots = \sigma_n^2$$

$$HA: \text{not all } \sigma_i^2 \text{ are equal}$$

This will be tested using the Hartley test, which is simply a ratio of the highest and lowest sample variances. Formally, it is

$$H = \frac{\max \ (S_i^2)}{\min \ (S_i^2)} \qquad (3.3.5.4.1)$$

Like ANOVA, the Hartley test requires approximate normality. The assumption of normality will be tested using the Kolmogorov-Smirnov goodness of fit test. Failure to reject H1, and approximate normality are sufficient to permit the central hypothesis to be tested using ANOVA.

3.3.5.5: The Formal Model and Hypothesis Testing

The single factor ANOVA model used will be[51]:

$$Y_{ij} = \mu_i + \epsilon_{ij} \qquad (3.3.5.5.1)$$

where Y_{ij} is the end of period value for the ith fund in the jth period, μ_i is a parameter, and ϵ_{ij} is a normally distributed mean zero error term.

ANOVA will be utilized to test our central null hypothesis:

$$H2: \mu_1 = \mu_2 = \mu_3 = \ldots = \mu_n$$

HB: not all μ_i are equal.

Simply stated, the null hypothesis is that the average end of period value of an equal initial investment in each of the funds within the investment objective group is equal. It is tested against the alternate hypothesis that at least one fund is not equal to the others. This is the central hypothesis tested in this manuscript. If Klemkosky's equal risk findings are valid, this method provides investors with a benchmark free measure of relative performance over an indeterminate investment horizon if past performance can reasonably be expected to repeat. This follows from EMT that if risk is equal returns must be equal. If returns are equal, end of period value of an initial investment would be equal. If risk within investment objective groups is homogeneous, failure to reject the null hypothesis would support the strong form of EMT. Rejection of the null hypothesis would support the "modified" EMT with costly information of Grossman and Stiglitz (1980).

Rejection of the null hypothesis requires that the calculated F-statistic exceed the

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[51]See Neter, Wasserman, & Kutner (1990).

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critical F-statistic.

The F-statistic will be calculated by:

$$F^* = \frac{\dfrac{\sum_i n(\overline{Y}_{i.} - \overline{Y}_{..})^2}{r - 1}}{\dfrac{\sum_i \sum_j (Y_{ij} - \overline{Y}_{i.})^2}{n_T - r}} \qquad (3.3.5.5.2)$$

where n_T is the total number of observations (cases), n_i is the number of observations for fund i, r is the number of funds (factor levels), and Y_{ij} is the jth observation for the ith fund. The other values will be computed as follows:

$$\overline{Y}_{i.} = \frac{\sum\limits_{j=1}^{n_i} Y_{ij}}{n_i} \qquad (3.3.5.5.3)$$

$$\overline{Y}_{..} = \frac{\sum\limits_i \sum\limits_j Y_{ij}}{n_T} \qquad (3.3.5.5.4)$$

To alleviate any problems associated with possible undetected severe departures from normality, the Wilcoxon, non-parametric, sum of ranks test will be used to confirm results obtained through ANOVA. The Wilcoxon test is used by Grinblatt and Titman (1993) as a supplemental measure to test alphas for the same reason.

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3.3.5.6: Relative Performance Ranking

The Tukey HSD test will be used to make all pairwise comparisons of factor level (mutual fund average end of period wealth) means at a $(1-\alpha)$ family confidence coefficient within those objective categories where differences in average end of period wealth are found. The formula is:

$$D = \mu_i - \mu_i' \qquad (3.3.5.6.1)$$

where the μ_i are the means under comparison. The comparison of estimated means is

$$D +/- Ts\{D\} \qquad (3.3.5.6.2)$$

where:

$$D = \overline{Y_{i.}} - \overline{Y_{i.'}} \qquad (3.3.5.6.3)$$

$$s = \sqrt{\frac{\Sigma\Sigma(Y_{ij} - \overline{Y_{i.}})^2}{n_T - r}} \times [\frac{1}{n_1} + \frac{1}{n_2}] \qquad (3.3.5.6.4)$$

$$T = \frac{1}{\sqrt{2}} q (1 - \alpha; r, n_T - r) \qquad (3.3.5.6.5)$$

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The Tukey test will enable funds within homogeneous risk classes to be grouped into statistically significant performance categories within the risk class. This contrasts to previous work where funds are grouped only by quartiles, quintiles, or other groups by percentage rank[52]. Ranking in this manner may facilitate stronger inference about performance persistency since ranking should be less subject to noise.

3.4: Performance Persistency Testing

3.4.1: Introduction

The third hypothesis to be tested is whether performance persistency exists. Performance persistency tests will be carried out for each of the four performance measures. The entire sample period of 156 months is split into two 78 month periods. This is in accord with previous studies[53].

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[52]Sharpe (1966), Carlson (1970), Klemkosky (1977), Bogle (1992), Grinblatt and Titman (1992, 1993), and Goetzmann and Ibbotson (1994) group funds by performance but not by statistical significant performance.

[53]Sharpe (1966), Carlson (1970), Williamson (1972), Klemkosky (1977), Bogle (1992), Grinblatt and Titman (1992, and Goetzmann and Ibbotson (1994) also utilize adjacent time periods ranging from one to ten years to examine performance persistency.

3.4.2: Methodologies for Testing Performance Persistency

3.4.2.1: Testing Performance Persistency for the Sharpe and Treynor Measures

Persistency tests for the Sharpe and Treynor Measures will be undertaken using Spearman's rank correlation coefficient. This is consistent with the work of Sharpe (1966) and Klemkosky (1977).

3.4.2.2: Testing Performance Persistency for the Jensen Measure

To test the persistency of the Jensen measure, OLS regression will be used to regress the alpha from the most recent period on the alpha from the latter period. This parallels the method used by Grinblatt and Titman (1992) and Goetzmann and Ibbotson (1994).

3.4.2.3: Testing Performance Persistency for the Proposed Measure

Performance persistency of funds grouped by Turkey's HSD will be tested using Kendall's tau coefficient of concordance. This commonly used test of association of ordinal data is used by Klemkosky (1977).

3.4.3: Contrasting Performance Persistency Results

Finally, results of persistency tests for the four methods will be qualitatively compared and contrasted to determine if the new measure provides superior inferences about future performance.

3.5: Summary

In Summary, traditional performance measures provide ambiguous rankings of mutual fund performance. This causes noise in the price system, making it difficult to ascertain if some funds are truly better performers. The inability to determine true performance exacerbates the problem of determining performance persistency.

The liabilities of previous studies (e.g., Droms and Walker (1994), Goetzmann and Ibbotson (1994), and Grinblatt and Titman (1994)), are thought to be at least partially overcome through the use of ANOVA to determine if average end of period wealth differs significantly among funds of equal risk. This avoids the market proxy issue and aligns with Markowitz (1952, 1991) which says that investors can nearly maximize utility acting on the basis of mean and variance. Additionally, it provides a stronger basis for learning the manner in which quality problems are handled by the market than Ippolito (1993) since benchmark bias is eliminated.

Chapter Four

Empirical Results

4.1: Introduction

This chapter presents the empirical results of the CAPM, Sharpe measure, Treynor measure, Jensen measure, and ANOVA tests. Performance differences are examined along with performance persistency. Finally, results of the various ranking systems are compared.

4.2: Empirical Results of CAPM

The empirical results of the CAPM for each group of funds are provided in tables 4.2.1 through 4.2.8. Summary results are presented for the continuously compounded returns achieved from a strategy of investing and equal dollar amount in each of the funds contained within the CDA classification and rebalancing monthly. Results were obtained using the Jensen (1968) model. If the CAPM holds and markets are efficient, R^2 should be high, α insignificantly different from zero, and β significantly different from zero (no riskless asset classes are investigated). A positive significant α indicates superior performance while a negative significant α indicates substandard performance. Common significance levels are .01, .05, or .10. This manuscript uses .10 for α's as it is somewhat

easier to visualize[54]. Based on Roll's (1977,78) criticism, results are presented for five

indices; the S&P 500 Index, Dow Jones Industrial Average, CRSP Equally Weighted (EW)

Index, CRSP Value Weighted (VW) Index, and the Morgan Stanley Capital World

International Perspective (MSCI) Index. Panel A of each table covers the entire observation

period of September 1981 to September 1994 , while panels B and C cover the first and

second subperiods respectively. The first and second subperiods are from September 1981

to March 1988 and March 1988 to September 1994 respectively. These simply divide the

total period into two halves for comparison and for persistency tests which follow.

Table 4.2.1.A presents the results for balanced funds. Results indicate that over 75

percent of the variation in the returns of balanced funds can be explained using any of the

domestic indices. Interestingly, the intercept is positive in each period despite the surrogate

market proxy. However, it is only significant against the S&P 500 index in the total and first

period and the MSCI index in the second period. Therefore, we must conclude that, on

average, balanced funds perform as well as the market on a risk adjusted basis. Additionally,

investing in balanced funds is an attractive alternative to investing in an index fund which

tracks the S&P 500.

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[54]The conclusions are unaltered at other significance levels.

Table 4.2.1.A   Balanced Funds

The results of the market model regressions for the 39 balanced funds are presented below. Column one is the index used as the market proxy, column two presents the adjusted R^2, columns three and four present the estimated α and β respectively, column five provides the Durbin-Watson statistic, and column six provides the number of monthly observations used to compute the estimates. Beneath the estimates of α and β in columns three and four are the standard error of the estimate in brackets [ ], the T-statistic in parentheses ( ), and the P-value in braces { }.

Panel A (Total Period 9/81 - 9/94)

Index	$\overline{R^2}$	$\hat{\alpha}$	$\hat{\beta}$	DW	N
S&P 500	.94012	.001070 [.00056205] (1.905) {.0587}	.624335 [.012654] (49.339) {.0000}	1.58505	156
DJIA	.87009	.000700897 [.00083042] (.844) {.400}	.593543 [.018412] (32.236) {.0000}	1.46022	156
CRSP EW	.85941	.001123 [.00090039] (1.247) {.2145}	.561145 [.018773] (29.891) {.0000}	1.89473	147
CRSP VW	.95639	.000692008 [.00050205] (1.378) {.1702}	.643879 [.011378] (56.590) {.0000}	1.63235	147
MSCI	.57887	.003075 [.001534] (2.005) {.0468}	.495785 [.034910] (14.202) {.0000}	1.91753	147

Panel B (First Period 9/81 - 3/88)

Index	$\overline{R^2}$	$\hat{\alpha}$	$\hat{\beta}$	DW	N
S&P 500	.94120	.001771 [.00094533] (1.8373) {.0649}	.638341 [.018175] (35.121) {.0000}	1.64732	78

DJIA	.88159	.001453 [.001344] (1.081) {.2831}	.612157 [.025545] (23.964) {.0000}	1.41539	78
CRSP EW	.90683	.000444735 [.001198] (.371) {.7116}	.600202 [.021909] (27.395) {.0000}	1.84393	78
CRSP VW	.95709	.000874468 [.0008107] (1.079) {.2841}	.659438 [.015907] (41.457) {.0000}	1.74205	78
MSCI	.70011	.00050011 [.002187] (.229) {.8198}	.641910 [.048697] (13.182) {.0000}	1.53058	75

Panel C (Second Period 3/88 - 9/94)

Index	$\overline{R^2}$	$\hat{\alpha}$	$\hat{\beta}$	DW	N
S&P 500	.94235	.000454577 [.00058804] (.773) {.4419}	.592556 [.016695] (35.492) {.0000}	1.37447	78
DJIA	.87432	.000084064 [.0009618] (.087) {.9306}	.552404 [.026692] (20.696) {.0000}	1.48699	78
CRSP EW	.75280	.001986 [.001285] (1.545) {.127}	.475692 [.032977] (14.425) {.0000}	2.26210	69
CRSP VW	.95916	.00061641 [.00052698] (1.17) {.2463}	.605179 [.015139] (39.975) {.0000}	1.29621	69
MSCI	.45524	.004373 [.001888] (2.316) {.0235}	.341869 [.044013] (7.767) {.0000}	2.21074	72

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Further examination of balanced funds is provided in table 4.2.1.B. Results indicate

that the model fit is generally reasonable. However, at least one fund has a poor fit for each

index in the second period. The distribution of intercepts indicates that roughly twice as

many intercepts are positive versus negative. One would expect a fairly even distribution

if CAPM and efficient markets obtain. Also of concern is the number of intercepts

significant at the .10 level.

Table 4.2.1.B   Balanced Funds

The results of the market model regressions for the 39 balanced funds are presented below. Column one is the index used as the market proxy, column two provides the maximum and minimum R^2, column three provides the number of α's which are positive and negative, column four provides the number of funds with significant, positive or negative, α's, and column five provides the maximum and minimum β for the funds.

Panel A (Total Period 9/81 - 9/94)

Index	R^2 (max/min)	Number of α's (pos/neg)	Significant α's (pos/neg)[55]	β (max/min)
S&P 500	.92 / .36	29 / 10	17 / 2	.95 / .31
DJIA	.88 / .33	27 / 12	10 / 2	.92 / .29
CRSP EW	.86 / .40	30 / 9	10 / 2	.88 / .30
CRSP VW	.93 / .38	27 / 12	13 / 2	.99 / .32
MSCI	.59 / .26	37 / 2	18 / 0	.73 / .25

Panel B (First Period 9/81 - 3/88)

Index	R^2 (max/min)	Number of α's (pos/neg)	Significant α's (pos/neg)	β (max/min)
S&P 500	.93 / .36	31 / 8	17 / 1	1.06 / .29
DJIA	.88 / .33	27 / 12	11 / 1	1.05 / .27
CRSP EW	.92 / .36	24 / 15	9 / 3	1.03 / .28
CRSP VW	.94 / .39	26 / 13	12 / 3	1.09 / .31
MSCI	.73 / .28	22 / 17	3 / 1	1.04 / .29

[55]Significance is determined at the .10 level.

Panel C (Second Period 3/88 - 9/94)

Index	R² (max/min)	Number of α's (pos/neg)	Significant α's (pos/neg)	β (max/min)
S&P 500	.96 / .05	28 / 11	4 / 3	.87 / .12
DJIA	.89 / .06	30 / 9	1 / 1	.83 / .13
CRSP EW	.82 / .06	36 / 3	10 / 0	.79 / .12
CRSP VW	.96 / .04	30 / 9	3 / 1	.92 / .12
MSCI	.50 / .00	39 / 0	28 / 0	.48 / .05

Table 4.2.2.A presents the results for municipal bond funds. Results indicate that less than 35 percent of the variation in fund returns is explained by the market. The intercept is positive in each period of estimation against all indices. However, the intercept is only significantly positive against the two CRSP indices and the MSCI Index for the total and second periods. Thus, one can conclude that municipal bond funds perform at least as well as the market on a risk adjusted basis.

Table 4.2.2.A   Municipal Bond Funds

The results of the market model regressions for the 30 municipal bond funds are presented below. Column one is the index used as the market proxy, column two presents the adjusted R^2, columns three and four present the estimated α and β respectively, column five provides the Durbin-Watson statistic, and column six provides the number of monthly observations used to compute the estimates. Beneath the estimates of α and β in columns three and four are the standard error of the estimate in brackets [ ], the T-statistic in parentheses ( ), and the P-value in braces { }.

Panel A (Total Period 9/81 - 9/94)

Index	$\overline{R^2}$	$\hat{\alpha}$	$\hat{\beta}$	DW	N
S&P 500	.19075	.002074 [.001377] (1.5070 {.1339}	.189886 [.030994] (6.127) {.0000}	1.89670	156
DJIA	.16474	.002005 [.001403] (1.429) {.1549}	.174789 [.031107] (5.619) {.0000}	1.86989	156
CRSP EW	.13371	.002747 [.001468] (1.872) {.0633}	.148449 [.030600] (4.851) {.0000}	1.98355	147
CRSP VW	.18716	.002479 [.001423] (1.742) {.0836}	.189767 [.032254] (5.884) {.0000}	1.95461	147
MSCI	.10938	.003073 [.001412] (2.176) {.0311}	.139853 [.032144] (4.351) {.0000}	1.71339	147

Panel B (First Period 9/81 - 3/88)

Index	$\overline{R^2}$	$\hat{\alpha}$	$\hat{\beta}$	DW	N
S&P 500	.14064	.003286 [.002506] (1.311) {.1937}	.177693 [.048180] (3.688) {.0004}	1.92116	78

DJIA	.11293	.003288 [.002552] (1.289) {.2014}	.159350 [.048482] (3.287) {.0015}	1.90709	78
CRSP EW	.11586	.003030 [.002560] (1.184) {.2403}	.155854 [.046801] (3.33) {.0013}	1.96221	78
CRSP VW	.15569	.002975 [.002494] (1.193) {.2365}	.190751 [.048929] (3.898) {.0002}	1.93670	78
MSCI	.07468	.003672 [.002494] (1.472) {.1452}	.146620 [.055529] (2.640) {.0101}	1.64729	75

Panel C (Second Period 3/88 -9/94)

Index	$\overline{R^2}$	$\hat{\alpha}$	$\hat{\beta}$	DW	N
S&P 500	.35173	.000802065 [.001160] (.692) {.4912}	.215319 [.032921] (6.541) {.0000}	1.79254	78
DJIA	.33650	.000623027 [.001179] (.528) {.5987}	.207062 [.032718] (6.329) {.0000}	1.69686	78
CRSP EW	.18972	.002453 [.001242] (1.975) {.0524}	.131066 [.031862] (4.114) {.0001}	2.08020	69
CRSP VW	.31067	.001931 [.001155] (1.671) {.0994}	.186720 [.033192] (5.626) {.0000}	2.03435	69
MSCI	.18095	.002384 [.001355] (1.760) {.0828}	.129027 [.031587] (4.085) {.0001}	1.86401	72

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Further examination of municipal bond funds is provided in table 4.2.2.B. Results

indicate that in some cases, little of the variation in fund returns is explained by the market.

Also, the number of positive intercepts are roughly nine times the number of negative

intercepts and the number of significant intercepts varies widely by index and period of

estimation.

Table 4.2.2.B   Municipal Bond Funds

The results of the market model regressions for the 30 municipal bond funds are presented below.
Column one is the index used as the market proxy, column two provides the maximum and minimum R^2,
column three provides the number of α's which are positive and negative, column four provides the number
of funds with significant, positive or negative, α's, and column five provides the maximum and minimum β
for the funds.

Panel A (Total Period 9/81 - 9/94)

Index	R^2 (max/min)	Number of α's (pos/neg)	Significant α's (pos/neg)	β (max/min)
S&P 500	.22 / .12	27 / 3	8 / 2	.25 / .04
DJIA	.18 / .09	27 / 3	5 / 2	.23 / .03
CRSP EW	.19 / .06	27 / 3	20 / 2	.21 / .03
CRSP VW	.22 / .11	27 / 3	13 / 2	.26 / .04
MSCI	.14 / .06	27 / 3	26 / 2	.18 / .03

Panel B (First Period 9/81 - 3/88)

Index	R^2 (max/min)	Number of α's (pos/neg)	Significant α's (pos/neg)	β (max/min)
S&P 500	.21 / .08	27 / 3	4 / 2	.32 / .03
DJIA	.17 / .05	27 / 3	3 / 2	.22 / .03
CRSP EW	.23 / .04	27 / 3	2 / 2	.24 / .03
CRSP VW	.23 / .08	27 / 3	2 / 2	.29 / .04
MSCI	.11 / .03	27 / 3	7 / 2	.21 / .03

Panel C (Second Period 3/88 - 9/94)

Index	R² (max/min)	Number of α's (pos/neg)	Significant α's (pos/neg)	β (max/min)
S&P 500	.41 / .20	28 / 2	0 / 0	.53 / .03
DJIA	.40 / .18	27 / 3	0 / 0	.29 / .02
CRSP EW	.22 / .12	30 / 0	24 / 0	.18 / .02
CRSP VW	.37 / .15	29 / 1	13 / 0	.27 / .03
MSCI	.21 / .07	30 / 0	16 / 0	.18 / .02

Table 4.2.3.A presents the results for precious metal funds. Results indicate that the

CAPM is a poor fit. Only the MSCI index has a consistently significant β and a consistently

positive R^2. However, it only explains 18 percent of the variation in metal fund returns at

best. The intercept is never significant but is negative for each index and each time period

of estimation. Interestingly, only the MSCI provides an F-statistic for the entire regression

during the second period which is significant at the .05 level.

Table 4.2.3.A   Precious Metal Funds

The results of the market model regressions for the 8 precious metal funds are presented below. Column one is the index used as the market proxy, column two presents the adjusted R^2, columns three and four present the estimated α and β respectively, column five provides the Durbin-Watson statistic, and column six provides the number of monthly observations used to compute the estimates. Beneath the estimates of α and β in columns three and four are the standard error of the estimate in brackets [ ], the T-statistic in parentheses ( ), and the P-value in braces { }.

Panel A (Total Period 9/81 - 9/94)

Index	$\overline{R^2}$	$\hat{\alpha}$	$\hat{\beta}$	DW	N
S&P 500	.02890	-.003459 [.00732] (-.473) {.6371}	.390425 [.164793] (2.369) {.0191}	1.97437	156
DJIA	.04824	-.004517 [.007269] (-.621) {.5353}	.47968 [.161174] (2.976) {.0034}	1.98559	156
CRSP EW	.04653	-.005149 [.007666] (-.672) {.5028}	.455577 [.159829] (2.850) {.0050}	1.93570	147
CRSP VW	.03029	-.004635 [.007739] (-.599) {.5502}	.413578 [.175390] (2.358) {.0197}	1.97077	147
MSCI	.12338	-.004736 [.007280] (-.651) {.5164}	.769207 [.165703] (4.4642) {.0000}	2.04282	147

Panel B (First Period 9/81 - 3/88)

Index	$\overline{R^2}$	$\hat{\alpha}$	$\hat{\beta}$	DW	N
S&P 500	.07485	-.005963 [.011943] (-.499) {.6190}	.617418 [.229618] (2.689) {.0088}	2.11745	78

DJIA	.09323	-.006930 [.011849] (-.585) {.5604}	.672314 [.225146] (2.986) {.0038}	2.10567	78
CRSP EW	.09956	-.008137 [.011865] (-.686) {.4949}	.669120 [.216939] (3.084) {.0028}	2.08123	78
CRSP VW	.07535	-.006801 [.011987] (-.567) {.5721}	.634354 [.235192] (2.697) {.0086}	2.11806	78
MSCI	.18458	-.009672 [.011744] (-.824) {.4129}	1.101789 [.261510] (4.213) {.0001}	2.12643	75

Panel C (Second Period 3/88 - 9/94)

Index	$\bar{R}^2$	$\hat{\alpha}$	$\hat{\beta}$	DW	N
S&P 500	-.01038	.000312079 [.008288] (.038) {.9701}	-.107622 [.235318] (-.457) {.6487}	1.66320	78
DJIA	-.01215	-.000770742 [.008337] (-.092) {.9266}	.063710 [.231372] (.275) {.7838}	1.66007	78
CRSP EW	-.01487	-.001227 [.009136] (-.134) {.8936}	-.013841 [.234415] (-.059) {.9531}	1.64528	69
CRSP VW	-.01129	-.000374874 [.009200] (-.041) {.9676}	-.129705 [.264290] (-.491) {.6252}	1.65437	69
MSCI	.04611	-.002747 [.008437] (-.326) {.7457}	.414133 [.196718] (2.105) {.0389}	1.75987	7

Further examination of precious metal funds is provided in table 4.2.3.B. The distribution of intercepts indicates that no meatal fund significantly outperforms or underperforms any of the selected market proxies during any of the estimation periods. However, only the MSCI provides a regression F-statistic and β which are significant at the .05 level for each fund during the total and first period. During the second period, only the MSCI yields any significant regressions and β's. However, the MSCI is only significant for four of the eight funds during the second period.

Table 4.2.3.B   Precious Metal Funds

The results of the market model regressions for the 8 precious metal funds are presented below. Column one is the index used as the market proxy, column two provides the maximum and minimum R^2, column three provides the number of α's which are positive and negative, column four provides the number of funds with significant, positive or negative, α's, and column five provides the maximum and minimum β for the funds.

Panel A (Total Period 9/81 - 9/94)

Index	R^2 (max/min)	Number of α's (pos/neg)	Significant α's (pos/neg)	β (max/min)
S&P 500	.06 / -.00	0 / 8	0 / 0	.51 / .23
DJIA	.08 / .01	0 / 8	0 / 0	.60 / .34
CRSP EW	.08 /.00	0 / 8	0 / 0	.56 / .30
CRSP VW	.06 / .00	0 / 8	0 / 0	.52 / .26
MSCI	.15 / .06	0 / 8	0 / 0	.82 / .68

Panel B (First Period 9/81 - 3/88)

Index	R^2 (max/min)	Number of α's (pos/neg)	Significant α's (pos/neg)	β (max/min)
S&P 500	.11 / .02	0 / 8	0 / 0	.71 / .51
DJIA	.12 / .03	0 / 8	0 / 0	.77 / .58
CRSP EW	.14 / .03	0 / 8	0 / 0	.76 / .57
CRSP VW	.10 / .02	0 / 8	0 / 0	.72 / .53
MSCI	.25 / .09	0 / 8	0 / 0	1.20 / 1.00

Panel C (Second Period 3/88 - 9/94)

Index	R^2 (max/min)	Number of α's (pos/neg)	Significant α's (pos/neg)	β (max/min)
S&P 500	.01 / -.01	5 / 3	0 / 0	.07 / -.39
DJIA	.01 / -.01	4 / 4	0 / 0	.26 / -.19
CRSP EW	-.01 / -.01	4 / 4	0 / 0	.14 / -.29
CRSP VW	.01 / -.01	4 / 4	0 / 0	.02 / -.41
MSCI	.07 / .02	3 / 5	0 / 0	.33 / .53

Table 4.2.4.A presents the results for international funds. Results indicate that the MSCI provides the highest R^2 in each estimation period. During the total period, international funds, on average, had positive risk adjusted returns against all indices. However, positive performance was only significant against the MSCI Index. First period performance was positive for all indices except the MSCI, however, none was significant. Second period performance was negative, but not significant, against domestic indices. However, it was positive and highly significant against the MSCI Index.

4.2.4.A   International Funds

The results of the market model regressions for the 15 international funds are presented below. Column one is the index used as the market proxy, column two presents the adjusted R^2, columns three and four present the estimated α and β respectively, column five provides the Durbin-Watson statistic, and column six provides the number of monthly observations used to compute the estimates. Beneath the estimates of α and β in columns three and four are the standard error of the estimate in brackets [ ], the T-statistic in parentheses ( ), and the P-value in braces { }.

Panel A (Full Period 9/81 - 9/94)

Index	$\overline{R^2}$	$\hat{\alpha}$	$\hat{\beta}$	DW	N
S&P 500	.63489	.001615 [.002021] (.799) {.4255}	.748528 [.045509] (16.448) {.0000}	2.12698	156
DJIA	.65665	.000864904 [.001966] (.440) {.6607}	.751930 [.043599] (17.246) {.0000}	2.16072	156
CRSP EW	.62454	.001149 [.002145] (.536) {.5931}	.698388 [.044723] (15.616) {.0000}	1.94404	147
CRSP VW	.61275	.000996803 [.002181] (.457) {.6483}	.752814 [.049422] (.457) {.0000}	2.09927	147
MSCI	.83238	.002715 [.001426] (1.904) {.0589}	.874536 [.032457] (26.945) {.0000}	1.85803	147

Panel B (First Period 9/81 - 3/88)

Index	$\overline{R^2}$	$\hat{\alpha}$	$\hat{\beta}$	DW	N
S&P 500	.68895	.003281 [.002963] (1.108) {.2716}	.746099 [.056965] (13.098) {.0000}	2.14561	78

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DJIA	.68438	.002737 [.002991] (.915) {.3630}	.736538 [.056831] (12.960) {.0000}	2.01909	78
CRSP EW	.71541	.001466 [.002854] (.514) {.6089}	.727847 [.052180] (13.949) {.0000}	1.88049	78
CRSP VW	.66849	.002383 [.003071] (.776) {.4401}	.753197 [.060252] (12.501) {.0000}	2.14420	78
MSCI	.85096	-.000017011 [.002131] (-.008) {.9937}	.976415 [.047447] (20.579) {.0000}	2.21879	75

Panel C (Second Period 3/88 - 9/94)

Index	$\overline{R^2}$	$\hat{\alpha}$	$\hat{\beta}$	DW	N
S&P 500	.53807	-.00005299 [.002781] (-.019) {.9848}	.751755 [.078950] (9.523) {.0000}	2.07333	78
DJIA	.60717	-.001102 [.002577] (-.428) {.670}	.783533 [.071522] (10.955) {.0000}	2.28309	78
CRSP EW	.45203	.000877688 [.003257] (.269) {.7884}	.631547 [.083582] (7.556) {.0000}	2.05962	69
CRSP VW	.50153	-.00055470 [.003134] (-.177) {.8601}	.750156 [.090035] (8.332) {.0000}	2.01899	69
MSCI	.83279	.004598 [.001758] (2.615) {.0109}	.772047 [.040998] (18.831) {.0000}	1.38659	72

Further examination of international funds is provided in table 4.2.4.B. While, on average, international funds performed well on a collective basis, few did so significantly. However, the existence of significantly positive and negative intercepts indicates some funds may better choices than others.

Table 4.2.4.B   International Funds

The results of the market model regressions for the 15 international funds are presented below. Column one is the index used as the market proxy, column two provides the maximum and minimum R^2, column three provides the number of α's which are positive and negative, column four provides the number of funds with significant, positive or negative, α's, and column five provides the maximum and minimum β for the funds.

Panel A (Total Period 9/81 - 9/94)

Index	R^2 (max/min)	Number of α's (pos/neg)	Significant α's (pos/neg)	β (max/min)
S&P 500	.83 / .29	13 / 2	1 / 0	1.05 / .54
DJIA	.83 / .31	13 / 2	1 / 0	1.02 / .55
CRSP EW	.86 / .27	13 / 2	1 / 1	1.00 / .54
CRSP VW	.84 / .27	12 / 2	1 / 1	1.07 / .56
MSCI	.83 / .51	13 / 2	5 / 0	1.02 / .53

Panel B (First Period 9/81 - 3/88)

Index	R^2 (max/min)	Number of α's (pos/neg)	Significant α's (pos/neg)	β (max/min)
S&P 500	.88 / .33	14 / 1	3 / 1	1.08 / .58
DJIA	.86 / .32	13 / 2	2 / 1	1.03 / .58
CRSP EW	.93 / .34	10 / 5	1 / 1	1.05 / .57
CRSP VW	.89 / 32	12 / 3	1 / 1	.89 / .32
MSCI	.81 / .64	9 / 6	0 / 1	1.21 / .74

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Panel C (Second Period 3/88 - 9/94)

Index	R² (max/min)	Number of α's (pos/neg)	Significant α's (pos/neg)	β (max/min)
S&P 500	.76 / .23	9 / 6	1 / 0	1.00 / .35
DJIA	.80 / .29	4 / 11	1 / 0	1.02 / .37
CRSP EW	.83 / 14	10 / 5	1 / 0	.88 / .32
CRSP VW	.76 / .19	6 / 9	1 / 0	.98 / .36
MSCI	.98 / .36	14 / 1	8 / 0	.98 / .31

Table 4.2.5.A presents the results for growth funds. Results indicate that despite negative intercepts for all indices except the MSCI during the total period, only the CRSP VW Index provided a significant value. The first period yielded negative intercepts against all indices and the CRSP EW and CRSP VW were both significant at the .05 level. The second period yielded only one significant intercept, which was positive for the MSCI. Thus, it is difficult to conclude that performance exists on average.

Table 4.2.5.A   Growth Funds

The results of the market model regressions for the 115 growth funds are presented below. Column one is the index used as the market proxy, column two presents the adjusted R^2, columns three and four present the estimated α and β respectively, column five provides the Durbin-Watson statistic, and column six provides the number of monthly observations used to compute the estimates. Beneath the estimates of α and β in columns three and four are the standard error of the estimate in brackets [ ], the T-statistic in parentheses ( ), and the P-value in braces { }.

Panel A (Full Period 9/81 - 9/94)

Index	$\overline{R^2}$	$\hat{\alpha}$	$\hat{\beta}$	DW	N
S&P 500	.95498	-.00087398 [.00075095] (-1.164) {.2463}	.969531 [.016907] (57.346) {.0000}	2.26210	156
DJIA	.89291	-.001484 [.001162] (-1.277) {.2035}	.926394 [.025759] (35.964) {.0000}	1.82027	156
CRSP EW	.89941	-.001282 [.001179] (-1.087) {.2787}	.888526 [.024583] (36.144) {.0000}	2.02984	147
CRSP VW	.96447	-.001817 [.00070145] (-2.590) {.0106}	1.000937 [.015897] (62.965) {.0000}	2.37728	147
MSCI	.55869	.002281 [.002444] (.933) {.3523}	.758488 [.055640] (13.632) {.0000}	1.95084	147

Panel B (First Period 9/81 - 3/88)

Index	$\overline{R^2}$	$\hat{\alpha}$	$\hat{\beta}$	DW	N
S&P 500	.95794	-.001026 [.001202] (-.854) {.3957}	.967795 [.023104] (41.888) {.0000}	2.32591	78

DJIA	.91324	-.001575 [.001730] (-.910) {.3655}	.936194 [.032865] (28.486) {.0000}	1.70639	78
CRSP EW	.95916	-.003212 [.001192] (-2.694) {.0087}	.927395 [.021802] (42.537) {.0000}	2.02969	78
CRSP VW	.96391	-.002341 [.001117] (-2.095) {.0395}	.994602 [.021926] (45.362) {.0000}	2.52798	78
MSCI	.70355	-.002787 [.003315] (-.841) {.4032}	.980855 [.073804] (13.290) {.0000}	1.64073	75

Panel C (Second Period 3/88 - 9/94)

Index	$\overline{R^2}$	$\hat{\alpha}$	$\hat{\beta}$	DW	N
S&P 500	.94771	-.00073241 [.00091752] (-.798) {.4272}	.973548 [.026050] (37.372) {.0000}	2.06593	78
DJIA	.84763	-.001325 [.001574] (-.841) {.4027}	.905207 [.043686] (20.721) {.0000}	1.86588	78
CRSP EW	.77264	.000974140 [.002065] (.472) {.6386}	.807034 [.052974] (15.235) {.0000}	2.26414	69
CRSP VW	.96600	-.001281 [.00080544] (-1.590) {.1164}	1.017249 [.023139] (43.963) {.0000}	1.97131	69
MSCI	.40574	.005455 [.003233] (1.687) {.0960}	.530179 [.075375] (7.034) {.0000}	2.20235	72

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Further examination of growth funds is provided in table 4.2.5.B. Results indicate that the number of negative and significant negative intercepts exceeds expectations for domestic indices and the MSCI Index during the first period. The opposite is true for the MSCI Index during the total and second periods.

Table 4.2.5.B   Growth Funds

The results of the market model regressions for the 115 growth Funds are presented below. Column one is the index used as the market proxy, column two provides the maximum and minimum R^2, column three provides the number of α's which are positive and negative, column four provides the number of funds with significant, positive or negative, α's, and column five provides the maximum and minimum β for the funds.

Panel A (Total Period 9/81 - 9/94)

Index	R^2 (max/min)	Number of α's (pos/neg)	Significant α's (pos/neg)	β (max/min)
S&P 500	1.00 / .43	36 / 79	5 / 19	1.24 / .45
DJIA	.93 / .35	26 / 89	1 / 26	1.17 / .40
CRSP EW	.91 / .33	31 / 84	1 / 18	1.18 / .36
CRSP VW	.99 / .42	22 / 93	1 / 45	1.29 / .47
MSCI	.62 / .42	105 / 10	16 / 0	.94 / .38

Panel B (First Period 9/81 - 3/88)

Index	R^2 (max/min)	Number of α's (pos/neg)	Significant α's (pos/neg)	β (max/min)
S&P 500	1.00 / .54	41 / 74	8 / 14	1.27 / .48
DJIA	.95 / .44	33 / 82	2 / 15	1.22 / .43
CRSP EW	.95 / .43	13 / 102	0 / 52	1.28 / .41
CRSP VW	.99 / .54	25 / 90	2 / 38	1.33 / .50
MSCI	.77 / .33	21 / 94	0 / 9	1.26 / .45

Panel C (Second Period 3/88 - 9/94)

Index	R² (max/min)	Number of α's (pos/neg)	Significant α's (pos/neg)	β (max/min)
S&P 500	1.00 / .19	39 / 76	0 / 11	1.16 / .39
DJIA	.90 / .18	21 / 94	0 / 8	1.08 / .33
CRSP EW	.90 / .08	84 / 31	5 / 0	1.03 / .26
CRSP VW	.99 / .18	22 / 93	0/ 18	1.23 / .40
MSCI	.47 / .10	114 / 1	45 / 0	.68 / .31

Table 4.2.6.A presents the results for aggressive growth funds. Results indicate that the model is a good fit however, the funds significantly underperformed the domestic indices for the total and first period. Intercepts were negative except for the total and second periods against the MSCI Index.

Table 4.2.6.A   Aggressive Growth Funds

The results of the market model regressions for the 43 aggressive growth funds are presented below. Column one is the index used as the market proxy, column two presents the adjusted R^2, columns three and four present the estimated α and β respectively, column five provides the Durbin-Watson statistic, and column six provides the number of monthly observations used to compute the estimates. Beneath the estimates of α and β in columns three and four are the standard error of the estimate in brackets [ ], the T-statistic in parentheses ( ), and the P-value in braces { }.

Panel A (Total Period 9/81 - 9/94)

Index	$\overline{R^2}$	$\hat{\alpha}$	$\hat{\beta}$	DW	N
S&P 500	.84221	-.003508 [.001802] (-1.9646) {.0534}	1.167892 [.040579] (28.781) {.0000}	1.97033	156
DJIA	.79056	-.004259 [.002083] (-2.045) {.0426}	1.118130 [.046186] (24.209) {.0000}	1.75867	156
CRSP EW	.89457	-.004466 [.001548] (-2.885) {.0045}	1.136424 [.0032275] (35.210) {.0000}	1.91262	147
CRSP VW	.85873	-.004608 [.001794] (-2.569) {.0112}	1.211747 [.040653] (29.807) {.0000}	2.03244	147
MSCI	.47634	.000417703 [.003412] (.122) {.9027}	.898254 [.077653] (11.567) {.0000}	1.82211	147

Panel B (First Period 9/81 - 3/88)

Index	$\overline{R^2}$	$\hat{\alpha}$	$\hat{\beta}$	DW	N
S&P 500	.87447	-.005170 [.002592] (-1.994) {.0497}	1.155426 [.049842] (23.182) {.0000}	2.21155	78

DJIA	.83754	-.005846 [.002955] (-1.978) {.0516}	1.120289 [.056157] (19.949) {.0000}	1.85138	78
CRSP EW	.93510	-.008147 [.001877] (-4.340) {.0000}	1.143660 [.034321] (33.322) {.0000}	2.35492	78
CRSP VW	.88133	-.006748 [.002531] (-2.667) {.0094}	1.188357 [.049651] (23.934) {.0000}	2.31370	78
MSCI	.64842	-.007479 [.004501] (-1.662) {.1009}	1.175250 [.100233] (11.725) {.0000}	1.66828	75

Panel C (Second Period 3/88 - 9/94)

Index	$\overline{R^2}$	$\hat{\alpha}$	$\hat{\beta}$	DW	N
S&P 500	.78339	-.001929 [.002523] (-.765) {.4469}	1.197444 [.071628] (16.717) {.0000}	1.71793	78
DJIA	.70246	-.002669 [.002972] (-.898) {.3720}	1.114975 [.082469] (13.520) {.0000}	1.60160	78
CRSP EW	.82500	-.00035091 [.002457] (-.143) {.8869}	1.130720 [.063055] (17.932) {.0000}	1.73687	69
CRSP VW	.81863	-.002402 [.002524] (-.952) {.3446}	1.272227 [.072501] (17.548) {.0000}	1.74493	69
MSCI	.30199	.006025 [.004737] (1.272) {.2076}	.622017 [.110446] (5.632) {.0000}	1.86224	72

Further examination of aggressive growth funds is provided in table 4.2.6.B. Again,

the number of negative and significantly negative intercepts greatly exceeds the number that

would be expected. This is indicative of underperformance.

Table 4.2.6.B   Aggressive Growth Funds

The results of the market model regressions for the 43 aggressive growth funds are presented below. Column one is the index used as the market proxy, column two provides the maximum and minimum R^2, column three provides the number of α's which are positive and negative, column four provides the number of funds with significant, positive or negative, α's, and column five provides the maximum and minimum β for the funds.

Panel A (Total Period 9/81 - 9/94)

Index	R^2 (max/min)	Number of α's (pos/neg)	Significant α's (pos/neg)	β (max/min)
S&P 500	.89 / .46	5 / 38	0 / 13	1.50 / .85
DJIA	.85 / .43	2 / 41	0 / 17	1.42 / .82
CRSP EW	.90 / .61	2 / 41	0 / 22	1.46 / .85
CRSP VW	.90 / .48	2 / 41	0 / 24	1.57 / .88
MSCI	.53 / .28	28 / 15	1 / 3	1.14 / .65

Panel B (First Period 9/81 - 3/88)

Index	R^2 (max/min)	Number of α's (pos/neg)	Significant α's (pos/neg)	β (max/min)
S&P 500	.93 / .59	4 / 39	0 / 18	1.54 / .81
DJIA	.90 / .53	4 / 39	0 / 18	1.48 / .80
CRSP EW	.94 / .61	0 / 43	0 / 34	1.54 / .83
CRSP VW	.93 / .61	2 / 41	0 / 27	1.60 / .83
MSCI	.72 / .39	1 / 42	0 / 12	1.61 / .81

Panel C (Second Period 3/88 - 9/94)

Index	R^2 (max/min)	Number of α's (pos/neg)	Significant α's (pos/neg)	β (max/min)
S&P 500	.85 / .31	15 / 28	1 / 4	1.48 / .89
DJIA	.77 / .30	12 / 31	1 / 4	1.37 / .82
CRSP EW	.88 / .38	23 / 20	2 / 5	1.51 / .83
CRSP VW	.88 / .33	12 / 31	1 / 6	1.53 / .96
MSCI	.43 / .15	2 / 41	10 / 1	.78 / .84

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Table 4.2.7.A presents the results for growth and income funds. Results indicate that

the model is a good fit. The intercepts oscillate between positive and negative and the only

significant intercept is for the second period against the MSCI Index (positive).

Table 4.2.7.A   Growth and Income Funds

The results of the market model regressions for the 61 growth and income funds are presented below. Column one is the index used as the market proxy, column two presents the adjusted R^2, columns three and four present the estimated α and β respectively, column five provides the Durbin-Watson statistic, and column six provides the number of monthly observations used to compute the estimates. Beneath the estimates of α and β in columns three and four are the standard error of the estimate in brackets [ ], the T-statistic in parentheses ( ), and the P-value in braces { }.

Panel A (Total Period 9/81 - 9/94)

Index	$\overline{R^2}$	$\hat{\alpha}$	$\hat{\beta}$	DW	N
S&P 500	.97304	.000420710 [.00045309] (.929) {.3546}	.763077 [.010201] (74.806) {.0000}	1.84353	156
DJIA	.91402	-.0000718012 [.00081173] (-.088) {.9296}	.730795 [.017998] (40.604) {.0000}	1.66845	156
CRSP EW	.89615	.000232192 [.00093197] (.249) {.8036}	.689979 [.019432] (35.508) {.0000}	2.08080	147
CRSP VW	.98059	-.000245116 [.00040335] (-.608) {.5443}	.785106 [.009141] (85.888) {.0000}	1.85903	147
MSCI	.57882	.002838 [.001860] (1.526) {.1292}	.601226 [.042339] (14.200) {.0000}	1.97207	147

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Panel B (First Period 9/81 - 3/88)

Index	$\overline{R^2}$	$\hat{\alpha}$	$\hat{\beta}$	DW	N
S&P 500	.97712	.000851489 [.00069462] (1.226) {.2240}	.765941 [.013355] (57.352) {.0000}	1.92833	78
DJIA	.92414	.000441602 [.001268] (.348) {.7285}	.738025 [.024084] (30.644) {.0000}	1.58316	78
CRSP EW	.94102	-.000737965 [.001123] (-.657) {.5131}	.720012 [.020534] (35.065) {.0000}	1.82680	78
CRSP VW	.98222	-.000185810 [.00061469] (-.302) {.7633}	.786766 [.012061] (65.233) {.0000}	2.05546	78
MSCI	.70469	-.000501930 [.002587] (-.194) {.8467}	.767762 [.057613] (13.326) {.0000}	1.59410	75

Panel C (Second Period 3/88 - 9/94)

Index	$\overline{R^2}$	$\hat{\alpha}$	$\hat{\beta}$	DW	N
S&P 500	.96401	.00000926686 [.00058637] (.016) {.9874}	.756227 [.016648] (45.424) {.0000}	1.67209	78
DJIA	.89100	-.000531100 [.001026] (-.518) {.6061}	.714603 [.028462] (25.108) {.0000}	1.71260	78
CRSP EW	.79619	.001396 [.001493] (.935) {.3533}	.625524 [.038307] (16.329) {.0000}	2.45116	69

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CRSP VW	.97611	-.000297862 [.00051563] (-.578) {.5654}	.780928 [.014813] (52.720) {.0000}	1.47225	69
MSCI	.44575	.004741 [.002408] (1.969) {.0529}	.427898 [.056137] (7.622) {.0000}	2.24489	72

Further examination of growth and income funds is provided in table 4.2.7.B. The distribution of intercepts and significant intercepts is generally in line with expectations for these funds.

Table 4.2.7.B   Growth and Income Funds

The results of the market model regressions for the 61 growth and income funds are presented below. Column one is the index used as the market proxy, column two provides the maximum and minimum R^2, column three provides the number of α's which are positive and negative, column four provides the number of funds with significant, positive or negative, α's, and column five provides the maximum and minimum β for the funds.

Panel A (Total Period 9/81 - 9/94)

Index	R^2 (max/min)	Number of α's (pos/neg)	Significant α's (pos/neg)	β (max/min)
S&P 500	.98 / .29	39 / 22	11 / 5	1.05 / .24
DJIA	.93 / .21	31 / 30	5 / 5	1.00 / .23
CRSP EW	.89 / .16	35 / 26	7 / 3	.98 / .25
CRSP VW	.98 / .30	27 / 34	7 / 10	1.09 / .25
MSCI	.58 / .19	59 / 2	24 / 0	.78 / .19

Panel B (First Period 9/81 - 3/88)

Index	R² (max/min)	Number of α's (pos/neg)	Significant α's (pos/neg)	β (max/min)
S&P 500	.98 / .25	37 / 24	15 / 7	1.02 / .25
DJIA	.95 / .19	35 / 26	6 / 7	1.00 / .23
CRSP EW	.92 / .18	28 / 33	5 / 11	.99 / .26
CRSP VW	.97 / .27	33 / 28	8 / 11	1.05 / .26
MSCI	.72 / .11	30 / 31	1 / 4	1.03 / .25

Panel C (Second Period 3/88 - 9/94)

Index	R² (max/min)	Number of α's (pos/neg)	Significant α's (pos/neg)	β (max/min)
S&P 500	.98 / .30	27 / 34	3 / 2	1.10 / .22
DJIA	.90 / .24	18 / 43	3 / 2	1.02 / .23
CRSP EW	.88 / .12	52 / 9	5 / 0	1.00 / .22
CRSP VW	.99 / .30	26 / 35	2 / 7	1.17 / .22
MSCI	.54 / .18	61 / 0	35 / 0	.60 / .14

Table 4.2.8.A presents the results for bond and preferred stock funds. Results indicate that the intercepts are positive against all indices for all estimation periods. Additionally, the intercepts are significant for all but the S&P 500 and DJIA Indexes during the second period. Therefore, bond and preferred stock funds outperform the market on a risk adjusted basis and would be preferred to an index fund.

Table 4.2.8.A Bond and Preferred Stock Funds

The results of the market model regressions for the 66 bond and preferred stock funds are presented below. Column one is the index used as the market proxy, column two presents the adjusted R^2, columns three and four present the estimated α and β respectively, column five provides the Durbin-Watson statistic, and column six provides the number of monthly observations used to compute the estimates. Beneath the estimates of α and β in columns three and four are the standard error of the estimate in brackets [ ], the T-statistic in parentheses ( ), and the P-value in braces { }.

Panel A (Total Period 9/81 - 9/94)

Index	$\overline{R^2}$	$\hat{\alpha}$	$\hat{\beta}$	DW	N
S&P 500	.27583	.002941 [.001145] (2.570) {.0111}	.199667 [.025769] (7.748) {.0000}	1.53935	156
DJIA	.24148	.002861 [.001175] (2.434) (.0161)	.184866 [.026054] (7.095) {.0000}	1.46916	156
CRSP EW	.28639	.003376 [.001172] (2.880) {.0046)	.188673 [.024440] (7.720) {.0000}	1.68513	147
CRSP VW	.29615	.003293 [.001165] (2.825) {.0054}	.208690 [.026412] (7.901) {.0000}	1.61177	147
MSCI	.22610	.003562 [.001098] (3.246) {.0015}	.165059 [.024982] (6.607) {.0000}	1.30779	147

Panel B (First Period 9/81 - 3/88)

Index	$\overline{R^2}$	$\hat{\alpha}$	$\hat{\beta}$	DW	N
S&P 500	.23928	.004510 [.001963] (2.297) {.0244}	.189558 [.037746] (5.022) {.0000}	1.76277	78

Index	$\bar{R}^2$	$\hat{\alpha}$	$\hat{\beta}$	DW	N
DJIA	.20460	.004476 [.002012] (2.225) {.0290}	.174368 [.038227] (4.561) {.0000}	1.69072	78
CRSP EW	.23892	.004084 [.001978] (2.065) {.0423}	.181400 [.036156] (5.017) {.0000}	1.82765	78
CRSP VW	.27207	.004153 [.001928] (2.154) {.0344}	.206441 [.037830] (5.457) {.0000}	1.79377	78
MSCI	.20506	.003699 [.001770] (2.090) {.0401}	.176656 [.039415] (4.482) {.0000}	1.34323	75

Panel C (Second Period 3/88 - 9/94)

Index	$\bar{R}^2$	$\hat{\alpha}$	$\hat{\beta}$	DW	N
S&P 500	.35520	.001326 [.001176] (1.128) {.2630}	.220064 [.033398] (6.589) {.0000}	.99686	78
DJIA	.32161	.001182 [.001213] (.975) {.3327}	.206092 [.033653] (6.124) {.0000}	.92559	78
CRSP EW	.40681	.002568 [.001146] (2.241) {.0284}	.202931 [.029403] (6.902) {.0000}	1.14354	69
CRSP VW	.34994	.002309 [.001210] (1.908) {.0606}	.213185 [.034764] (6.132) {.0000}	1.04003	69
MSCI	.24354	.003308 [.001327] (2.494) {.0150}	.151083 [.030931 (4.884) {.0000}	1.19442	72

Further examination of bond and preferred stock funds is provided in table 4.2.8.B.

Results indicate a poor model fit in some instances and that intercepts are highly skewed

toward the positive.

Table 4.2.8.B   Bond and Preferred Stock Funds

The results of the market model regressions for the 66 bond and preferred stock Funds are presented below. Column one is the index used as the market proxy, column two provides the maximum and minimum R^2, column three provides the number of α's which are positive and negative, column four provides the number of funds with significant, positive or negative, α's, and column five provides the maximum and minimum β for the funds.

Panel A (Total Period 9/81 - 9/94)

Index	R^2 (max/min)	Number of α's (pos/neg)	Significant α's (pos/neg)	β (max/min)
S&P 500	.65 / .00	65 / 1	54 / 0	.66 / .00
DJIA	.64 / .00	65 / 1	50 / 0	.65 / .00
CRSP EW	.73 / -.01	65 / 1	57 / 0	.67 / .00
CRSP VW	.65 / .00	65 / 1	58 / 0	.68 / .00
MSCI	.37 / -.01	66 / 0	61 / 0	.51 / .00

Panel B (First Period 9/81 - 3/88)

Index	R^2 (max/min)	Number of α's (pos/neg)	Significant α's (pos/neg)	β (max/min)
S&P 500	.88 / -.01	65 / 1	55 / 1	.76 / .00
DJIA	.83 / -.01	65 / 1	54 / 1	.73 / .00
CRSP EW	.85 / -.01	65 / 1	47 / 1	.71 / .00
CRSP VW	.86 / -.01	65 / 1	49 / 1	.77 / .00
MSCI	.59 / -.01	65 / 1	47 / 1	.74 / .00

Panel C (Second Period 3/88 - 9/94)

Index	R² (max/min)	Number of α's (pos/neg)	Significant α's (pos/neg)	β (max/min)
S&P 500	.41 / .01	60 / 6	5 / 1	.45 / .00
DJIA	.39 / .00	59 / 7	4 / 1	.47 / .00
CRSP EW	.63 / -.01	63 / 3	37 / 0	.58 / -.04
CRSP VW	.42 / .00	63 / 3	31 / 1	.48 / .00
MSCI	.26 / .00	65 / 1	50 / 0	.29 / .00

4.2.1: Summary of CAPM Empirical Results

In summary, the CAPM appears to fit most individual funds and groups of funds well. There are some notable exceptions however. First, the entire group of metal funds exhibits a poor fit. Second, municipal bond funds as a whole have less than 50 percent of the fund return variations explained by the market and some individual funds have less than 10 percent of return variation explained by the market. Third, some growth and growth and income funds have less than 30 percent of fund return variation explained by the market. Finally, some balanced and bond and preferred stock funds have less than 10 percent of fund return variation explained by the market.

The CAPM does show that some funds exhibit performance significantly different from zero for most indices and time periods. However, the distribution of intercepts and significant intercepts is unexplained by the CAPM, efficient market theory, and sampling theory.

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4.3: Empirical Results of the Sharpe Measure

The summary results of the Sharpe measure by investment objective group are reported in table 4.3.1 below. The Sharpe measure represents the additional return investors receive for taking on an additional unit of variance risk. As long as the Sharpe measure is positive, investors are rewarded for bearing risk. An investment with a negative Sharpe measure would not be desired. Under the efficient market hypothesis, the Sharpe measure should be the same for each fund, or group of funds; otherwise, the capital market line would not be linear. In the event that Sharpe measures are unequal, an investor would prefer the higher measure since it represents a higher return for bearing an additional unit of risk. Results suggest that investors would be better off investing in bond and preferred stock funds for the total and first periods since the return per unit of risk is higher for that group. However, during the second period, municipal bonds did slightly better. Large differences also exist within each group. Individual results are not reported due to length but are used in persistency tests.

Table 4.3.1   Summary of Sharpe Measures by Fund Group

Column one is the fund group by investment objective; column's two, three, and four are the average Sharpe measures for the total, first, and second periods of estimation respectively.

Investment Objective	Total Period 9/81 - 9/94	First Period 9/81 - 3/88	Second Period 3/88 - 9/94
Aggressive Growth	1.169365	.705780	2.061614
Growth	2.666948	2.240010	3.567658
Growth and Income	4.266689	5.126009	5.749852
Balanced	6.009912	5.383475	7.544370
International	3.534619	3.746608	3.991034
Precious Metal	-.038133	-.081991	.095231
Bond and Preferred	12.204206	13.560177	12.588811
Municipal Bond	5.461054	2.798015	13.230752

4.4: Empirical Results of the Treynor Measure

The summary results of the Treynor measure by investment objective group for five indices are reported in tables 4.4.1 through 4.4.5 below. Table 4.4.1 indicates that investors holding the S&P 500 would prefer bond and preferred stock funds. Those funds outperformed all other groups during all three observation periods by providing a higher return per unit of risk. This is consistent with the Sharpe measure in the total and first periods however, the two measures disagree in the second period. The Sharpe measure selected municipal bond funds in the second period and bond and preferred stock were in second place. The Treynor measure did not find it to be a close contest as municipal bond funds were in a distant third place.

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Table 4.4.1 Summary Treynor Measures for the S&P 500 Index

Column one provides the investment objective of the fund group; columns two through four provide the average Treynor measure for the total period, first period, and second period respectively.

Investment Objective	Total Period 9/81 - 9/94	First Period 9/81 - 3/88	Second Period 3/88 - 9/94
Aggressive Growth	.003530	.002764	.004275
Growth	.005860	.006552	.005172
Growth and Income	.007469	.011151	.006304
Balanced	.009071	.011345	.007272
International	.009213	.012726	.006090
Precious Metal	-.004676	-.002784	.011484
Bond and Preferred	.031403	.064056	.014878
Municipal Bond	.015883	.022604	.009080

Table 4.4.2 shows that investors holding the DJIA would be confused by the data. Fund choice now depends upon the period of estimation. Bond and preferred stock funds are preferred for the total period however, municipal bond funds were best during the first period while metal funds win the nod in the second period. This choice agrees with the Sharpe measure for the total period however, the first and second subperiods are in dire conflict. The Sharpe measure ranked the top choices for the Treynor measure in the first and second period fifth and eighth respectively.

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Table 4.4.2   Summary Treynor Measures for the Dow Jones Industrial Average Index
Column one provides the investment objective of the fund group; columns two through four provide
the average Treynor measure for the total period, first period, and second period respectively.

Investment Objective	Total Period 9/81 - 9/94	First Period 9/81 - 3/88	Second Period 3/88 - 9/94
Aggressive Growth	.003693	.002851	.004604
Growth	.006139	.006774	.005574
Growth and Income	.007824	.011650	.006620
Balanced	.009566	.011904	.007551
International	.009139	.012857	.005844
Precious Metal	-.003000	-.002426	.016486
Bond and Preferred	.040638	-.046733	.016321
Municipal Bond	.017248	.025624	.009617

Table 4.4.3 eases the dilemma somewhat for investors holding the CRSP EW Index.

Those investors would prefer bond and preferred stock funds for the total and first periods.

However, they would prefer metal funds in the second period. The selection agrees with the

Sharpe measure for the total and first period however, the second period selection was

ranked eighth by the Sharpe measure.

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Table 4.4.3   Summary Treynor Measures for the CRSP EW Index

Column one provides the investment objective of the fund group; columns two through four provide the average Treynor measure for the total period, first period, and second period respectively.

Investment Objective	Total Period 9/81 - 9/94	First Period 9/81 - 3/88	Second Period 3/88 - 9/94
Aggressive Growth	.003658	.002825	.004591
Growth	.006400	.006843	.006286
Growth and Income	.008310	.011925	.007668
Balanced	.010003	.012057	.008608
International	.009916	.013094	.007170
Precious Metal	-.003300	-.002481	.037581
Bond and Preferred	.093186	.060746	.026600
Municipal Bond	.020539	.026568	.015061

Table 4.4.4 shows that fund selection for investors holding the CRSP VW Index is simplified. Bond and preferred stock funds would be preferred in all three periods. This result is consistent with the Sharpe measure selections for the total and first period however, the second period selection was ranked second by the Sharpe measure.

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Table 4.4.4   Summary Treynor Measures for the CRSP VW Index

Column one provides the investment objective of the fund group; columns two through four provide the average Treynor measure for the total period, first period, and second period respectively.

Investment Objective	Total Period 9/81 - 9/94	First Period 9/81 - 3/88	Second Period 3/88 - 9/94
Aggressive Growth	.003395	.002691	.004012
Growth	.005675	.006370	.004952
Growth and Income	.007252	.010869	.006127
Balanced	.008807	.010941	.006957
International	.009187	.012669	.006090
Precious Metal	-.004008	-.002656	.014217
Bond and Preferred	.030188	.047589	.016201
Municipal Bond	.015962	.021339	.010686

Table 4.4.5 shows that investors holding the MSCI World Index would prefer bond and preferred stock funds for the total and second periods however, municipal bond funds win out in the first period. This is consistent with the Sharpe measure in only the total period. The Sharpe measure ranked the first and second subperiod selections forth and second respectively.

Table 4.4.5   Summary Treynor Measures for the MCSI World Index

Column one provides the investment objective of the fund group; columns two through four provide the average Treynor measure for the total period, first period, and second period respectively.

Investment Objective	Total Period 9/81 - 9/94	First Period 9/81 - 3/88	Second Period 3/88 - 9/94
Aggressive Growth	.004624	.002740	.008277
Growth	.007508	.006504	.009461
Growth and Income	.009483	.011180	.010995
Balanced	.011368	.011356	.012133
International	.007898	.009334	.006697
Precious Metal	-.001154	-.001355	-.000402
Bond and Preferred	.042695	.019698	.021807
Municipal Bond	.021622	.028006	.015576

4.4.1: Summary of Results of the Treynor Measure

The Treynor measure indicates that all investors would prefer bond and preferred stock funds over the entire period which is consistent with the Sharpe measure. However, investors using the DJIA as a reference portfolio would select different categories funds for each period. Globally diversified investors would only deviate in the first period, by choosing municipal bond funds. Investors holding the CRSP EW Index would also only deviate in one period. However, they would deviate in the second period by selecting metal funds. In no instance did the Sharpe and Treynor measures agree for all three observation periods.

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4.5: Results of ANOVA Tests

Results of one-way ANOVA tests are provided in tables 4.5.1 through 4.5.7. Tests were conducted using the fund as a factor level and three levels of means which include monthly returns, annual returns, and monthly end of period value for an equal assumed investment in each fund over the observation period. Three periods were examined. The total period is from September 1981 through September 1994. The total period was subdivided into the first half, September 1981 through March 1988, and the second half, March 1988 through September 1994. The subdivision was chosen to divide the sample into two equal parts for persistency testing which is consistent with previous works in this area. ANOVA tests were conducted on each of the three periods for each of the eight CDA investment objectives. Where applicable, investment objective groups were refined and ANOVA tests were repeated on the refined sample. This was attempted when differences in end of period value were found but the hypothesis of equal variance was rejected by either the Hartley or Levene tests.

The use of the Hartley or Levene test is critical in ANOVA testing. If risk is homogeneous within each investment objective group and heterogeneous between groups, as found by Klemkosky (1976), ANOVA can be appropriately used to detect differences in the means of either returns or wealth. However, if risk is heterogeneous within investment objective groups, ANOVA is inappropriate and would result in detecting differences in means caused by differences in risk. The Hartley and Levene tests are used to test the equality of risk to ensure ANOVA is appropriate. The Hartley test is simply the ratio of the highest to lowest sample variance. A Hartley statistic near one would suggest that risk is

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equal and ANOVA testing is appropriate. This test was conducted in every instance. For groups of 50 or fewer funds, the Levene test was also conducted[56]. The Levene test is more robust with respect to testing non-normally distributed data and provides a p-value for the test of the hypothesis that variance is equal among all funds within the group.

If the equal risk hypothesis is rejected, fund groups were refined to attempt to correct the problem. The refinement is an inexact, and somewhat arbitrary, process. The general approach was to eliminate funds which were not considered to be in the same investment class by the other two major providers of investment information, *Morningstar* and the *Wall Street Journal*. However, a complete analysis of each competing classification is beyond the scope of this manuscript. The focus of this manuscript is on the CDA classification system since it is the system widely used in past academic works and is also widely used by practitioners to provide clients with past performance of mutual funds for comparative purposes.

If refinement of the data set did not correct the equality of variance problem, data were transformed using commonly accepted transformations suggested by the data. ANOVA tests were repeated on those refined and transformed samples to determine if ANOVA could untangle the performance persistency dilemma. Since return data consists of both positive and negative returns over the holding periods, statistical transformation of return data is often difficult. For example, a square root transformation can not be used on non-positive returns data. Therefore, end of period value data is reported since it is better

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[56]SPSSX software limitations prevent the calculation of the Levene statistic for groups containing more than 50 units to be compared.

suited to transformation.

Worthy of note is that monthly return data indicates that there is no difference in average monthly returns. However, variance is large making small differences impossible to detect. This problem is eliminated when average annual return data is used. These rolling one-year periods provide results similar to those of end of period value reported below. Differences between the results of the two methods are addressed by fund group.

The results of the ANOVA tests on municipal bond funds (MB) over the total period are summarized in table 4.5.1 and indicate that the null hypothesis that the average end of period value for these funds is equal can be rejected at the .01 level. The Tukey test reveals that eight categories of performance exist within the municipal bond classification over the total period[57]. Therefore, investors believing that risk is homogeneous within this risk group would be able to select funds from among the top performing group. However, 19 of the 30 funds are included in that group. To ensure that this performance differential is not due to the critical assumption of equal variance, the Hartley and Levene tests were conducted. Those tests reject the hypothesis of equal variance at better than the .01 level. Clearly, the risk is not equal within the CDA municipal bond classification.

An examination of the data indicates that three or four funds are very different from the others. A cross check of the investment objective shows that *Morningstar* classifies one fund as short term and the *Wall Street Journal* concurs and adds two more to the short term list. The shorter duration would explain the extremely low variance since they are far less subject to interest rate risk. Neither source eliminated the fourth fund, however, investors

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[57]Annual return data resulted in only three groups.

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observing lower risk would exclude it in making a choice. Therefore, all four funds were eliminated and ANOVA tests were conducted on data for the first and second subperiods for both the original and refined subsamples.

Tables 4.5.2 and 4.5.4 confirm the above results for each of the subperiods for the full sample. There is a significant difference in average end of period value however, the risk is far from equal. Tables 4.5.3 and 4.5.5 present results for the refined sample of 26 funds. Results indicate that performance differences are less significant but variance remains unequal[58]. Data were transformed to correct the inequality of variance for both periods and results of ANOVA tests are presented in tables 4.5.6 and 4.7.7. First period results indicate transformed returns are not equal and that risk is now equal. However, the Tukey groups provide a top group of 23 "good" funds and a group of 25 "bad" funds out of 26 total funds.

Results for the second period indicate that with equal variance, differences in value disappear. Therefore, even the slight difference in performance noted for the first period disappears.

Results of ANOVA tests for precious metal funds (ME) for the total period are provided in table 4.5.1. The null hypothesis of equality of the average value of an equal investment in each fund can be rejected at the .01 level[59]. However, so can the hypothesis of equal risk as measured by variance. Screening of the investment objective by *Morningstar* and by the *Wall Street Journal* categories is of no assistance in eliminating

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[58]Annual return data for the refined sample indicates that there is no difference in returns and funds comprise only one performance group.

[59]Annual return data indicates that there is no difference between funds for any period and that the funds comprise only one performance group.

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funds. Therefore, a refined sample is not tested. Tables 4.5.2 and 4.5.4 indicate that previous results are robust with respect to the period of estimation as they are exhibited in both the first and second periods. Attempts to transform the data to correct the inequality of variance were unsuccessful. In the first period, only mild improvements were achieved. Both value and risk are significantly different. In the second period, attempts to transform the data were unsuccessful as no improvement in equality of variance was attainable. Therefore, one must conclude that while differences in wealth occurring from investing in the funds are statistical significant, increased risk must be borne to achieve greater wealth. This supports the traditional view of efficient markets theory.

International fund (IN) results also indicate that both the hypothesis of equal value and equal risk can be rejected at the .01 level for all three periods, as indicated in tables 4.5.1, 4.5.2, and 4.5.4 respectively[60]. Refinement was difficult due to multiple classification schemes and no clear visual pattern as to a fit for any particular scheme. However, three funds were eliminated and ANOVA repeated. Refinement provided little improvement as indicated in tables 4.5.3 and 4.5.5. However, both the significance in differences in value and risk are decreased. Tables 4.5.6 and 4.5.7 show that data transformations were ineffective in correcting the inequality of variance problem and fail to provide useable results. While the Levene statistic was able to be reduced from 6.825 to 2.6847 in the first period, the hypothesis of equal variance was still rejected at the .0021 level. Additionally, ANOVA produced a table of all zeros. The second period was similar in that the Levene statistic was

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[60]Annual return data show that only one group exists for the total period for the full sample. However, two groups emerge in the first and second period. Once the sample is refined however, only one performance group exists in each period.

able to be reduced from 9.9844 to 4.1338, however, the hypothesis of equal risk is rejected at the .0000 level and the ANOVA table is all zeros.

Balanced (B) fund results support the previous trend of rejecting the hypothesis of equal value and equal risk for all three periods and the two subperiods for the refined sample[61]. The refined sample eliminated funds classified as growth and income, growth, sector, and equity income by the other two classification schemes. However, refinement was not able to correct the equality of variance problem as indicated in tables 4.5.3 and 4.5.5. Transformation of the refined sample was only mildly successful in the first period as indicated by table 4.5.6. However, once equality of variance failed to be rejected at standard significance levels, so did the hypothesis of equality of end of period value. Interestingly, the significance level of both hypothesis tests is roughly equivalent. This supports the traditional view that risk and return are positively related. As indicated in table 4.5.7, even transformation of the data was unable to equate variances to make ANOVA results meaningful.

Results for aggressive growth funds (AG) are presented in tables 4.5.1 through 4.5.7 and follow the previous trend of rejecting both hypotheses and achieving only mild improvements with the refined sample[62]. Attempts to transform data were completely unsuccessful. Transformations of first period data resulted in decreasing the Levene statistic from 27.7987 to 5.2586, however, equality of variance was rejected at the .0000 level and

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[61]Annual return data resulted in only one performance group for the first period for the refined sample and two large overlapping performance groups for the second period refined sample.

[62]Annual return results are similar to those for end of period wealth.

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the transformation resulted in an ANOVA table with all zeros. Second period transformations yielded similar results with the only exception being the untransformed and transformed Levene statistics are 46.3101 and 12.3516 respectively.

Results for growth and income funds (GI) follow suit with both the hypothesis of equal value and equal variance[63] being rejected for both the total and refined samples, as indicated in tables 4.5.1 through 4.5.5. The refinement in this sample came form eliminating funds with classifications as growth, sector, balanced, and equity income by the other sources. Attempts to correct the severe inequality of variance were unsuccessful as indicated in tables 4.5.6 and 4.5.7. First period data transformation resulted in reducing the Levene statistic from 14.9672 to 1.8877, however, equality of variance was rejected at the .0007 level and the ANOVA table became all zeros. Second period results were similar with the Levene statistic being reduced from 9.5975 to 3.3664, however no reduction in the level of significance for rejecting equality of variance was achieved and the ANOVA table was all zeros.

Results for bond and preferred stock funds (BP) are similar with strong rejection of both equal value and equal variance for the total and refined samples[64]. Refinement consisted of eliminating funds classified as either world bond or bond high income. Again, transformation was unsuccessful and resulted in ANOVA tables, for both the first and

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[63]Due to software limitations of the SPSSX program, Levene tests for homogeneity of variance were only conducted for investment objective groups containing less than 50 funds. Therefore Levene statistics are only provided for the refined sample of 41 funds. The Hartley test was used for groups of greater than 50 funds.

[64]Annual return data provides similar results.

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second period, of all zeros. Transformation for the first period were able to correct the equality of variance as evidenced by the Levene statistic decreasing from 5.9690 to .7364 with a significance of .8855. However, without a valid ANOVA, it was of little use. Transformations in the second period were not successful in correcting the equality of variance problem. The Levene statistic could be reduced from 9.9472 to 6.0043 however, rejection of the hypothesis of equal variance occurred at the .0000 level.

Results for growth funds (G) also followed the same pattern as both the hypothesis of equal value and equal risk were rejected for both the total and refined samples[65]. Refinement consisted of eliminating funds classified as growth and income, aggressive growth, small stock, capital appreciation, and sector. One interesting detail is apparent from the data in tables 4.5.4 and 4.5.5. The Hartley statistic is the same for the total and refined sample for the second period. While refinement reduced the difference in risk spread in the first period, it did not reduce it in the second as neither the highest or lowest risk fund was eliminated. Transformation results in tables 4.5.6 and 4.5.7 show that the Hartley statistic could be reduced from 26.6696 to 2.8203 for the first period and from 17.5046 to 2.9835 in the second period. With a difference in risk of nearly a factor of three, this does not support the hypothesis of equal risk and it is unsurprising that the hypothesis of equal value can be rejected in both periods at the .0001 level.

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[65]Annual return data provides similar results.

Table 4.5.1 ANOVA Results for the Total Period (9/81 - 9/94)

Column one is the investment objective. Columns two through four provide the degrees of freedom between groups, within groups, and the total degrees of freedom, respectively. Column five provides the F-statistic, column six provides the number of Tukey groups at the .05 significance level, column seven provides the Hartley statistic, and column eight provides the Levene statistic. The P-value is provided in brackets [ ].

IO	DFBG	DFWG	DFT	F	TUKEY	H	LEVENE[6]
AG	42	6708	6750	61.0114 [.0000]	21	974.7233	92.1209 [.000]
G	114	17940	18054	25.7249 [.0000]	36	54.3452	N/A
GI	60	9516	9576	23.7548 [.0000]	21	15.4130	N/A
B	38	6084	6122	18.9345 [.0000]	15	13.0565	22.1573 [.000]
BP	65	10296	10361	10.7775 [.0000]	13	12.2507	N/A
MB	29	4680	4709	23.1891 [.0000]	8	10.8157	20.1183 [.000]
IN	14	2340	2354	14.3902 [.0000]	4	6.1492	20.5176 [.000]
ME	7	1248	1255	94.5279 [.0000]	4	4.9850	16.9962 [.000]

[66]The Levene statistic is only provided for investment objective groups with less than 50 funds due to software limitations.

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Table 4.5.2   ANOVA Results for the First Period (9/81 - 3/88)

Column one is the investment objective. Columns two through four provide the degrees of freedom between groups, within groups, and the total degrees of freedom, respectively. Column five provides the F-statistic, column six provides the number of Tukey groups at the .05 significance level, column seven provides the Hartley statistic, and column eight provides the Levene statistic. The P-value is provided in brackets [ ].

IO	DFBG	DFWG	DFT	F	TUKEY[67]	H	LEVENE
AG	42	3354	3396	31.9873 [.0000]	15	87.1584	32.8505 [.000]
G	114	8970	9054	14.4801 [.0000]	26+	34.6343	N/A
GI	60	4758	4818	11.4316 [.0000]	19	11.9020	N/A
B	38	3042	3080	9.2595 [.0000]	10	9.4882	12.7188 [.000]
BP	65	5148	5213	5.7581 [.0000]	8	11.0396	N/A
MB	29	2340	2369	12.9390 [.0000]	6	13.2528	14.5098 [.000]
IN	14	1170	1184	4.9884 [.0000]	3	10.4420	14.9328 [.000]
ME	7	624	631	11.8545 [.0000]	5	3.1997	3.5233 [.001]

[67]Due to software limitations of the SAS program, a maximum of 26 overlapping groups can be generated. Growth funds had over 26 overlapping groups therefore, the exact number and groupings is not available.

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Table 4.5.3   ANOVA Results for the First Period (9/81 - 3/88) for a Refined Sample

Column one is the investment objective. Columns two through four provide the degrees of freedom between groups, within groups, and the total degrees of freedom, respectively. Column five provides the F-statistic, column six provides the number of Tukey groups at the .05 significance level, column seven provides the Hartley statistic, and column eight provides the Levene statistic. The P-value is provided in brackets [ ].

IO	DFBG	DFWG	DFT	F	TUKEY	H	LEVENE
AG	31	2496	2527	33.4074 [.0000]	11	51.8561	27.7987 [.000]
G	82	6474	6556	13.8100 [.0001]	24	26.6696	N/A
GI	40	3198	3238	10.1006 [.0000]	11	9.2687	14.9672 [.000]
B	22	1794	1816	2.2045 [.0010]	2	2.8872	4.7560 [.000]
BP	39	3120	3159	4.8120 [.0000]	5	9.2012	5.9690 [.000]
MB	25	2028	2053	3.1617 [.0000]	3	2.4266	3.2043 [.0000]
IN	11	936	947	2.2079 [.0124]	1	2.9998	6.8250 [.000]
ME	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 4.5.4   ANOVA Results for the Second Period (3/88 - 9/94)

Column one is the investment objective. Columns two through four provide the degrees of freedom between groups, within groups, and the total degrees of freedom, respectively. Column five provides the F-statistic, column six provides the number of Tukey groups at the .05 significance level, column seven provides the Hartley statistic, and column eight provides the Levene statistic. The P-value is provided in brackets [ ].

IO	DFBG	DFWG	DFT	F	TUKEY	H	LEVENE
AG	42	3354	3396	30.8226 [.0000]	17	129.2623	56.6422 [.000]
G	114	8970	9084	10.5900 [.0001]	26	17.5046	N/A
GI	60	4758	4818	7.2200 [.0001]	13	77.8464	N/A
B	38	3042	3080	5.0254 [.0000]	6	7.8251	10.0344 [.000]
BP	65	5148	5213	5.8800 [.0001]	11	27.1787	N/A
MB	29	2340	2369	4.5464 [.0000]	3	4.2840	6.5417 [.0000]
IN	14	1170	1184	22.3911 [.0000]	7	10.4663	11.5715 [.000]
ME	7	624	631	54.4261 [.0000]	5	2.4560	2.7517 [.008]

Table 4.5.5   ANOVA Results for the Second Period (3/88 - 9/94) for a Refined Sample

Column one is the investment objective. Columns two through four provide the degrees of freedom between groups, within groups, and the total degrees of freedom, respectively. Column five provides the F-statistic, column six provides the number of Tukey groups at the .05 significance level, column seven provides the Hartley statistic, and column eight provides the Levene statistic. The P-value is provided in brackets [ ].

IO	DFBG	DFWG	DFT	F	TUKEY	H	LEVENE
AG	31	2496	2527	32.8516 [.0000]	13	81.8128	46.3101 [.000]
G	82	6474	6556	11.7200 [.0001]	20	17.5046	N/A
GI	40	3198	3238	6.3877 [.0000]	9	5.4369	9.5975 [.000]
B	22	1973	1815	5.0732 [.0000]	5	4.4697	8.4535 [.000]
BP	39	3120	3159	4.3687 [.0000]	3	20.9879	9.9472 [.000]
MB	25	2028	2053	1.4391 [.0737]	1	1.8765	1.6573 [.022]
IN	11	936	947	15.0947 [.0000]	5	4.5646	9.9844 [.000]
ME	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 4.5.6   ANOVA Results for the First Period (9/81 - 3/88) for a Transformed and Refined Sample

Column one is the investment objective. Columns two through four provide the degrees of freedom between groups, within groups, and the total degrees of freedom, respectively. Column five provides the F-statistic, column six provides the number of Tukey groups at the .05 significance level, column seven provides the Hartley statistic, and column eight provides the Levene statistic. The P-value is provided in brackets [ ].

IO	DFBG	DFWG	DFT	F	TUKEY	H	LEVENE
AG	N/A	N/A	N/A	N/A	N/A	N/A	N/A
G[68]	82	6474	6556	9.61 [.0001]	18	2.8203	N/A
GI	N/A	N/A	N/A	N/A	N/A	N/A	N/A
B[69]	22	1794	1816	1.3178 [.1471]	1	1.5000	1.3572 [.124]
BP	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MB[70]	25	2028	2053	2.1510 [.0008]	2	1.5405	.4713 [.988]
IN	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ME[71]	7	624	631	12.3571 [.0000]	4	1.8232	1.8253 [.080]

[68]Data were transformed using the reciprocal of the square.

[69]Data were transformed using the square of the reciprocal of the natural log.

[70]Data were transformed using the reciprocal of the square root of value.

[71]Data were transformed using the natural logarithm of the value.

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Table 4.5.7　ANOVA Results for the Second Period (3/88 - 9/94) for a Transformed and Refined Sample

Column one is the investment objective. Columns two through four provide the degrees of freedom between groups, within groups, and the total degrees of freedom, respectively. Column five provides the F-statistic, column six provides the number of Tukey groups at the .05 significance level, column seven provides the Hartley statistic, and column eight provides the Levene statistic. The P-value is provided in brackets [ ].

IO	DFBG	DFWG	DFT	F	TUKEY	H	LEVENE
AG	N/A	N/A	N/A	N/A	N/A	N/A	N/A
G^{72}	82	6474	6556	7.3700 [.0001]	12	2.9835	N/A
GI	N/A	N/A	N/A	N/A	N/A	N/A	N/A
B^{73}	22	1793	1815	4.0494 [.0000]	4	2.8000	4.3450 [.000]
BP	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MB^{74}	25	2028	2053	1.1804 [.2450]	1	1.4874	.6067 [.937]
IN	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ME	N/A	N/A	N/A	N/A	N/A	N/A	N/A

4.5.1: ANOVA Rankings

As indicated above, ANOVA results in being able to both determine performance and rank funds into categories of statistical significance using the Tukey method. However, the vital assumption of equal variance is strongly rejected. Therefore, this method is not a viable alternative using CDA risk classes. For ANOVA to be viable, a different fund classification system is needed to classify funds into homogeneous variance risk classes. If accomplished, ANOVA has the potential to untangle the performance and performance persistency issue.

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[72]Data were transformed using the reciprocal of the square.

[73]Data were transformed using the square of the reciprocal of the natural log.

[74]Data were transformed using the reciprocal of the square root of value.

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4.5.2: Summary of Results for ANOVA Tests

In summary, if true differences in performance exist, and risk is homogeneous within CDA risk classes, ANOVA tests should result in rejecting the hypothesis of equal value and the Hartley or Levene test should be unable to reject the hypothesis of equal risk. If that result is obtained, the Tukey test should be able to segment funds into statistically significant performance subgroups and if performance persists, those subgroup memberships should remain relatively constant. Results of the tests support rejecting both the hypothesis of equal value and equal risk with three exceptions. Table 4.5.6 indicates municipal bond fund values are not equal after correcting for risk and that two performance groups can be generated by the Tukey test. This supports recent empirical work that there are performance differences, at least within this group. The results for balanced funds, in the same table, show that once risk is equal, so is value. This supports economic theory's law of one price and efficient capital markets. With one exception to the equal risk and equal return in the first period, one would be interested in whether or not this phenomenon reappeared in the latter period. It does not. Table 4.5.7 indicates that once risk is set equal, values are not significantly different. Again, the law of one price and efficient capital markets are supported.

4.5.3: Summary of Variance Risk by Investment Objective

Table 4.5.8 summarizes the variance risk for each of the eight CDA investment objective groups for the three periods of investigation. Summary results are consistent with the popular view that the risk of funds is related to investment objective. However, as shown above, there is no support for the hypothesis that risk is homogeneous within the CDA

investment objective groups. The risk is heterogeneous between groups and decreases as one moves from aggressive growth, growth, growth and income, and balanced. Both municipal bond and bond and preferred stock funds have lower risk than the above but the next lower level of risk is dependent upon the observation period.

Precious metal funds and international funds can be extremely risky when held by themselves and unlike the other groups of funds, the variance between observation periods is large.

Table 4.5.8   Summary Return Variance for Fund Groups

Column one provides the investment objective of the fund group; columns two through four provide the average return variance for the total period, first period, and second period respectively.

Investment Objective	Total Period 9/81 - 9/94	First Period 9/81 - 3/88	Second Period 3/88 - 9/94
Aggressive Growth	.003638	.004630	.002685
Growth	.002214	.003001	.001553
Growth and Income	.001402	.001910	.000901
Balanced	.001005	.001700	.000569
International	.002098	.002604	.015900
Precious Metal	.009294	.012740	.005967
Bond and Preferred	.000423	.000533	.000301
Municipal Bond	.000440	.000690	.000264

4.6: Results of Persistency Tests

Sections 4.6.1 through 4.6.4 present the results of performance persistency tests of the Sharpe, Treynor, Jensen, and the proposed measure respectively. Persistency tests are carried out for the Sharpe and Treynor measures using the Spearman Rank Correlation

Coefficient which is consistent with the works of Sharpe (1966) and Klemkosky (1977).

Persistence of the Jensen measure is tested by regressing the intercept of the most recent observation period on the latter observation period which is consistent with the works of Grinblatt and Titman (1992) and Goetzmann and Ibbotson (1994). Persistency tests of the new measure are conducted using Kendall's tau coefficient of concordance which is consistent with the work of Klemkosky (1977). Finally, section 4.6.5 compares and contrasts persistency results of the various measures.

4.6.1: Results of Persistency Tests for the Sharpe Measure

Table 4.6.1 presents the results of the Spearman Rank Correlation test. A two tailed test is used to test the null hypothesis that the rankings in the two subperiods are independent (no persistency of performance) against the alternate hypothesis that rankings are dependent (relative performance persists). Results indicate that the null hypothesis can be rejected for all investment objective groups except international, municipal bond, and precious metals funds. Aggressive growth and balanced fund investors can increase the probability of choosing a top performing fund by considering past performance. Growth, growth and income, and bond and preferred stock fund investors may still use past performance as a guide, however, the correlation is lower.

Table 4.6.1 Persistency tests of the Sharpe Measure

Row one provides the investment objective of the fund where AG is aggressive growth, B is balanced, BP is bond and preferred stock, Gl is growth and income, G is growth, IN is international, MB is municipal bond, and ME is precious metal. Row two provides the correlation coefficient, row three provides the level of significance, and row four the number of observations.

I/O	AG	B	BP	GI	G	IN	MB	ME
Corr	.4171	.4383	.2880	.2510	.2687	.0214	.0723	.5476
Sig	.005	.005	.019	.051	.004	.940	.704	.160
N	43	39	66	61	115	15	30	8

4.6.2: Results of Persistency Tests for the Treynor Measure

Tables 4.6.2.1 through 4.6.2.5 present the results of performance persistency test using the Treynor measure for the S&P 500 Index, DJIA Index, CRSP EW Index, CRSP VW Index, and the MSCI Index respectively. Again, the two-tailed Spearman Rank Correlation Coefficient is used to test the null hypothesis that ranking in adjacent subperiods are unrelated.

Results for the S&P 500 Index presented in table 4.6.2.1. indicate that the rankings of aggressive growth, balanced, and growth funds are persistent and that investors can increase their probability of selecting a top fund in a future period by using past relative performance as a guide.

Table 4.6.2.1 Persistency tests of the Treynor Measure using the S&P 500 Index

Row one provides the investment objective of the fund where AG is aggressive growth, B is balanced, BP is bond and preferred stock, GI is growth and income, G is growth, IN is international, MB is municipal bond, and ME is precious metal. Row two provides the correlation coefficient, row three provides the level of significance, and row four the number of observations.

I/O	AG	B	BP	GI	G	IN	MB	ME
Corr	.3944	.4777	.1656	.1876	.1596	-.3571	.3023	-.3333
Sig	.009	.002	.184	.148	.088	.191	.104	.420
N	43	39	66	61	115	15	30	8

Persistency results for the DJIA are presented in table 4.6.2.2. Results indicate that only aggressive growth and balanced fund investors could benefit from using past performance rankings.

Table 4.6.2.2 Persistency tests of the Treynor Measure using the DJIA Index

Row one provides the investment objective of the fund where AG is aggressive growth, B is balanced, BP is bond and preferred stock, GI is growth and income, G is growth, IN is international, MB is municipal bond, and ME is precious metal. Row two provides the correlation coefficient, row three provides the level of significance, and row four the number of observations.

I/O	AG	B	BP	GI	G	IN	MB	ME
Corr	.3905	.4362	.1949	.1596	.1529	-.4107	.2271	-.3095
Sig	.010	.005	.117	.219	.103	.128	.227	.456
N	43	39	66	61	115	15	30	8

Persistency tests for the CRSP EW Index are presented in table 4.6.2.3. Results indicate that aggressive growth, balanced, and bond and preferred stock fund investors can increase the probability of selecting a top performing fund by using past performance.

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Table 4.6.2.3 Persistency tests of the Treynor Measure using the CRSP EW Index

Row one provides the investment objective of the fund where AG is aggressive growth, B is balanced, BP is bond and preferred stock, GI is growth and income, G is growth, IN is international, MB is municipal bond, and ME is precious metal. Row two provides the correlation coefficient, row three provides the level of significance, and row four the number of observations.

I/O	AG	B	BP	GI	G	IN	MB	ME
Corr	.4509	.4057	.6851	.1691	.1050	-.2857	.2752	.5714
Sig	.002	.010	.000	.193	.264	.302	.141	.139
N	43	39	66	61	115	15	30	8

Persistency tests for the CRSP VW Index are presented in table 4.6.4. Results indicate that aggressive growth, balanced, bond and preferred stock, and growth fund investors can benefit by using past performance to guide fund selection.

Table 4.6.2.4 Persistency tests of the Treynor Measure using the CRSP VW Index

Row one provides the investment objective of the fund where AG is aggressive growth, B is balanced, BP is bond and preferred stock, GI is growth and income, G is growth, IN is international, MB is municipal bond, and ME is precious metal. Row two provides the correlation coefficient, row three provides the level of significance, and row four the number of observations.

I/O	AG	B	BP	GI	G	IN	MB	ME
Corr	.3830	.4415	.2637	.1768	.1547	-.3250	.2672	-.1429
Sig	.011	.005	.032	.173	.099	.237	.153	.736
N	43	39	66	61	115	15	30	8

Persistency tests for the MSCI Index are presented in table 4.6.2.5. Results indicate that aggressive growth, balanced, and growth fund investors can use past performance as a guide in fund selection to increase the probability of selecting a top fund.

Table 4.6.2.5 Persistency tests of the Treynor Measure using the MSCI Index

Row one provides the investment objective of the fund where AG is aggressive growth, B is balanced, BP is bond and preferred stock, GI is growth and income, G is growth, IN is international, MB is municipal bond, and ME is precious metal. Row two provides the correlation coefficient, row three provides the level of significance, and row four the number of observations.

I/O	AG	B	BP	GI	G	IN	MB	ME
Corr	.4071	.4565	.0593	.1501	.1841	-.1964	.2458	.5952
Sig	.007	.003	.636	.248	.049	.483	.190	.120
N	43	39	66	61	115	15	30	8

In summary, the null hypothesis that the performance rankings are independent can be rejected for four of the eight investment objective groupings for at least one of the five indices. Aggressive growth, balanced, bond and preferred stock, and growth fund investors can increase their probability of selecting a top performing fund by knowing the past performance ranking. Aggressive growth and bond and preferred stock fund investors can benefit most by using the CRSP EW Index. However, balanced fund investors can benefit most from using the S&P 500 Index, while growth fund investors should consider the MSCI Index. The Treynor measure is a better predictor of future of performance than the Sharpe measure for most of those funds. That finding is consistent with the findings of Sharpe (1966).

However, the Sharpe measure can add one more group of funds to the group that exhibit persistency and improve the probability of selecting a top performing fund in one other. First, growth and income fund investors can use the Sharpe measure to assist in selecting a top performing fund. Also, growth fund investors can increase the chance of selecting a top performing fund by using the Sharpe measure.

4.6.3: Results of Persistency Tests for the Jensen Measure

Results of persistency tests for the Jensen measure for each group of funds by investment objective are presented in tables 4.6.3.1 through 4.6.3.8. Persistency tests are carried out by regressing the estimated α from the most recent period on the α from the more distant period. Positive persistency would be indicated by a positive and significant β. This test was conducted for all five indices.

Results of persistency tests of aggressive growth funds are presented in table 4.6.3.1. β is positive and significant for all indices except the DJIA. This indicates that superior performance persists for all indices except the DJIA. Of those indices, the MSCI Index provides the highest correlation coefficient (.505). This indicates that using past performance can increase the probability of picking a top fund.

Table 4.6.3.1   Performance Persistency for Aggressive Growth Funds

Column one presents the index used, column two presents the adjusted R^2 of the OLS regression, column three presents the intercept, column four presents the slope, and column five presents the F-statistic of the regression. The P-value for the intercept, slope, and overall regression are in brackets [ ].

Index	R^2	α	β	F
S&P 500	.06578	-.001097 [.1663]	.126605 [.0534]	3.95733 [.0534]
DJIA	.02754	.001097 [.6725]	.521591 [.1466]	2.18966 [.1466]
CRSP EW	.18253	.003289 [.0146]	.446817 [.0025]	10.37789 [.0025]
CRSP VW	.15436	.000368373 [.7445]	.410597 [.0053]	8.66676 [.0053]
MSCI	.23687	.009953 [.0000]	.560557 [.0006]	14.03665 [.0006]

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Results of persistency tests for balanced funds are presented in table 4.6.3.2. β is

positive and significant indicating that superior performance persists for all indices. The

strongest correlation exists with the CRSP VW index and investors who use past

performance relative to that index can increase the probability of choosing a top performing

fund.

Table 4.6.3.2   Performance Persistency for Balanced Funds

Column one presents the index used, column two presents the adjusted R^2 of the OLS regression, column three presents the intercept, column four presents the slope, and column five presents the F-statistic of the regression. The P-value for the intercept, slope, and overall regression are in brackets [ ].

Index	R^2	α	β	F
S&P 500	.24344	-.0000263916 [.9127]	.269342 [.0008]	13.22719 [.0008]
DJIA	.25017	-.000331321 [.1509]	.267149 [.0007]	13.67817 [.0007]
CRSP EW	.20493	.001899 [.0000]	.196084 [.0022]	10.79456 [.0022]
CRSP VW	.26403	.000373658 [.0912]	.277689 [.0005]	14.63244 [.0005]
MSCI	.11109	.004294 [.0000]	.157281 [.0217]	5.74915 [.0217]

Persistency tests for bond and preferred stock funds are presented in table 4.6.3.3.

β is only significant for the CRSP EW Index, indicating that superior performance persists

only relative to that index. However, past performance relative to that index can increase

the probability of choosing a top performing fund.

Table 4.6.3.3   Performance Persistency for Bond and Preferred Funds

Column one presents the index used, column two presents the adjusted R^2 of the OLS regression, column three presents the intercept, column four presents the slope, and column five presents the F-statistic of the regression. The P-value for the intercept, slope, and overall regression are in brackets [ ].

Index	R^2	α	β	F
S&P 500	-.00750	.001029 [.0148]	.061347 [.4750]	.51636 [.4750]
DJIA	-.00218	.000869440 [.0190]	.069852 [.3576]	.85861 [.3576]
CRSP EW	.03832	.001891 [.0000]	.165707 [.0626]	3.59027 [.0626]
CRSP VW	.00383	.001922 [.0000]	.093204 [.2678]	1.24974 [.2678]
MSCI	-.01281	.003455 [.0000]	-.039747 [.6746]	.17784 [.6746]

Persistency tests for growth and income funds are presented in table 4.6.3.4. β is not significant against any index indicating that performance persistency does not exist within this group of funds.

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Table 4.6.3.4   Performance Persistency for Growth and Income Funds

Column one presents the index used, column two presents the adjusted R^2 of the OLS regression, column three presents the intercept, column four presents the slope, and column five presents the F-statistic of the regression. The P-value for the intercept, slope, and overall regression are in brackets [ ].

Index	R^2	α	β	F
S&P 500	-.01654	.00000215759 [.9907]	.010203 [.8778]	.02385 [.8778]
DJIA	-.01487	-.000541276 [.0044]	.023259 [.7296]	.12065 [.7296]
CRSP EW	-.00855	.001432 [.0000]	.049798 [.4861]	.49127 [.4861]
CRSP VW	-.01428	-.000292502 [.1712]	.030497 [.6949]	.15532 [.6949]
MSCI	-.01647	.006114 [.0000]	-.059490 [.8682]	.02780 [.8682]

Persistency tests for growth funds are presented in table 4.6.3.5. β is positive and significant against all but the CRSP EW and DJIA Indexes. Thus positive performance persistency exists for three of the five indices. The MSCI Index provides the strongest predictive power and is most useful in choosing a top performing fund.

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Table 4.6.3.5   Performance Persistency for Growth Funds

Column one presents the index used, column two presents the adjusted R^2 of the OLS regression, column three presents the intercept, column four presents the slope, and column five presents the F-statistic of the regression. The P-value for the intercept, slope, and overall regression are in brackets [ ].

Index	R^2	α	β	F
S&P 500	.02252	-.000623234 [.0003]	.105952 [.0594]	3.62679 [.0594]
DJIA	.01310	-.001199 [.0000]	.088400 [.1157]	2.51302 [.1157]
CRSP EW	.00988	.001248 [.0000]	.087823 [.1465]	2.13719 [.1465]
CRSP VW	.02742	-.001046 [.0000]	.117350 [.0424]	4.21444 [.0424]
MSCI	.02885	.007704 [.0000]	.545130 [.0385]	4.38682 [.0385]

Persistency tests for international funds are presented in table 4.6.3.6. β is never significant indicating that no performance persistency exists among international funds.

Table 4.6.3.6   Performance Persistency for International Funds

Column one presents the index used, column two presents the adjusted R^2 of the OLS regression, column three presents the intercept, column four presents the slope, and column five presents the F-statistic of the regression. The P-value for the intercept, slope, and overall regression are in brackets [ ].

Index	R^2	α	β	F
S&P 500	-.00781	.000439535 [.5649]	-.150106 [.3623]	.89156 [.3623]
DJIA	-.01755	-.000714385 [.3311]	-.141757 [.3996]	.75853 [.3996]
CRSP EW	.06292	.001174 [.0626]	-.201740 [.1870]	1.94001 [.1870]
CRSP VW	.02488	-.000116205 [.8661]	-.184024 [.2650]	1.35721 [.2650]
MSCI	.02716	.004594 [.0000]	-.211011 [.2594]	1.39093 [.2594]

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Persistency tests for municipal bond funds are presented in table 4.6.3.7. β is

positive and significant against all indices indicating performance persistency exists. The

strongest correlation is against the CRSP EW Index which provides the highest probability

of choosing a top performing fund.

Table 4.6.3.7   Performance Persistency for Municipal Bond Funds
    Column one presents the index used, column two presents the adjusted R^2 of the OLS regression, column three presents the intercept, column four presents the slope, and column five presents the F-statistic of the regression. The P-value for the intercept, slope, and overall regression are in brackets [ ].

Index	R^2	α	β	F
S&P 500	.28328	.000303601 [.0640]	.151700 [.0015]	12.46232 [.0015]
DJIA	.19420	.000229923 [.1496]	.119537 [.0086]	7.98915 [.0086]
CRSP EW	.67048	.001116 [.0000]	.441331 [.0000]	60.00813 [.0000]
CRSP VW	.61235	.000860014 [.0000]	.359850 [.0000]	46.80934 [.0000]
MSCI	.63324	.001011 [.0001]	.374065 [.0000]	51.07133 [.0000]

Persistency tests for precious metal funds are presented in table 4.6.3.8. β is positive

and significant against all indices, indicating performance is persistent. The strongest

correlation is with the MSCI Index which provides the highest probability of picking a top

performing fund.

Table 4.6.3.8   Performance Persistency for Precious Metal Funds

Column one presents the index used, column two presents the adjusted R^2 of the OLS regression, column three presents the intercept, column four presents the slope, and column five presents the F-statistic of the regression. The P-value for the intercept, slope, and overall regression are in brackets [ ].

Index	R^2	α	β	F
S&P 500	.34321	.003408 [.0765]	.519246 [.0743]	4.65786 [.0743]
DJIA	.34614	.002715 [.1709]	.502945 [.0731]	4.70564 [.0731]
CRSP EW	.37019	.005094 [.1361]	.776730 [.0644]	5.11451 [.0644]
CRSP VW	.40100	.004532 [.0889]	.721591 [.0544]	5.68622 [.0544]
MSCI	.40973	.007473 [.1424]	1.056613 [.0518]	5.85891 [.0518]

In summary, six of the eight groups of funds exhibit performance persistency using the Jensen measure. Only the growth and income and international groups fail to exhibit persistency. Of the six groups, the Jensen measure outperformed the Treynor measure except for bond and preferred stock funds. The Jensen measure also outperformed the Sharpe measure with the exception of growth funds. However, the Sharpe measure can provide assistance with growth and income funds. Table 4.6.3.9 provides a summary of the best measures for each fund group.

Table 4.6.3.9   Summary of Traditional Persistency Measures

Column one is the investment objective of the funds, column two is the best measure where S = Sharpe, J = Jensen, and T = Treynor, Column three is the reference index, column four is the correlation coefficient, and column five is the significance.

Investment Objective	Persistency Measure	Reference Index	Correlation Coefficient	Significance
AG	J	MSCI	.50502	.0006
B	J	CRSP VW	.53235	.0005
BP	T	CRSP EW	.6851	.000
G	S	N/A	.2687	.004
MB	J	CRSP EW	.82574	.0000
ME	J	MSCI	.70289	.0518
GI	S	N/A	.2510	.051
IN	NONE	NONE	N/A	N/A

4.6.4: Results of Persistency Tests for the Proposed Measure

Due to the systematic violation of the critical assumption of equal variance within CDA risk classes, and the inability to correct it, performance persistency tests would be meaningless. Only in the case of municipal bond funds for the first period were significant differences in value found once risk was equal. Had this result repeated in the second period, persistency tests could have been carried out. Since this pattern did not repeat, no persistency was exhibited for the proposed measure.

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Chapter Five

Conclusion

5.1: Summary and Conclusion

This dissertation reexamines the issue of whether mutual funds exhibit differential performance, and if they do, whether that performance is transitory or persistent. If capital markets are efficient, no differential performance should exist. The traditional efficient market hypothesis states that historical information cannot be used to earn abnormal returns. However, information is assumed to be costless and instantaneously available to all market participants. Grossman and Stiglitz (1980) show that in a world with costly information, informed traders can take advantage of uninformed traders by consistently being on the winning side of security trades. If this is reality, and mutual fund managers only undertake positive NPV investments in information, mutual funds may consistently outperform the market. Additionally, if some managers are better than others at determining the appropriate investment in information, they could consistently exhibit superior performance through either market timing or security selection. Differential performance could also be generated through differential fund expenses to the extent that one fund is more efficient than its competitors. This efficiency could arise from many areas including management, marketing,

and administration. In a world with costly information, uninformed investors may be unable to differentiate true fund relative performance from noise. Therefore, both superior and inferior funds could coexist. However, in a world of costless information, investors would know differential performance existed and only the single "best" fund would survive.

Recent studies by Grinblatt and Titman (1992, 93), Hendricks, Patel, and Zeckhauser (1993), and Goetzman and Ibbotson (1994) indicate that differential performance not only exists, but persists. These studies support earlier work by Sharpe (1966) and Klemkosky (1967) but are in direct conflict with those of Jensen (1968). However, past studies use the market model which is subject to CAPM anomalies. This tends to support the modified efficient market hypothesis over the efficient market hypothesis. However, performance is confounded with the issue of the choice of index as shown by Roll (1977, 78), Brown and Brown (1987), Lehmann and Modest (1987), and Grinblatt and Titman (1994). Additionally, the CAPM model has been shown to have pricing errors from anomalies such as P/E ratios, dividend yields, book to market equity, and size. The errors are so severe at times that Fama and French (1992) declared beta to be dead. Cumby and Glen (1990) tested the MSCI index and were unable to reject the hypothesis that it is mean variance efficient. Further, Droms and Walker (1994) find none of the international funds in their sample to have a significant α against the MSCI. In a world of integrated capital markets, the MSCI World Index intuitively is the most representative of the investment opportunity set faced by global investors. Therefore, in the face of mean variance efficiency and the logical consequence that the selected market index should be fully representative of opportunities faced by investors, it should provide the best proxy for the market for risky assets. However,

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we remain faced with anomalies, and possible biases if managers are attempting to time the market.

This manuscript examines performance over a 13 year period using the Sharpe, Treynor, and Jensen measures. Each of the index based measures are generated against five indices; the DJIA, S&P 500, CRSP EW, CRSP VW, and MSCI indices are selected for comparison. Additionally, to ameliorate the possible CAPM biases, evaluation is undertaken using one-way analysis of variance.

ANOVA was selected due to its ability to compare the end of period wealth achieved through investments in each fund in the sample. Klemkosky (1976) tested the discriminatory power of the CDA investment objectives and found that risk, as measured by beta, was homogeneous within investment objective class and heterogeneous between them. If risk is not significantly different within a class of funds, the end of period value should not be significantly different either if the efficient market hypothesis obtains. If risk is equal and end of period value is not, the modified efficient market hypothesis of Grossman and Stiglitz (1980) is supported.

If performance is detected through ANOVA, the Tukey test will allow grouping by statistical significance and effectively filter minor changes in rank due solely to chance. This may provide stronger support for performance persistency, if it exists, than past tests grouping performance by quartiles, quintiles, deciles, or other arbitrary ranking groups.

Results of traditional measures indicate differential performance exists. However, only the Jensen measure tests the significance of differences. Jensen's measure for the entire group of bond and preferred stock funds is positive for all 15 index time period

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combinations and significant at the .10 level for 13 of the 15. The individual fund α's are highly skewed toward positive performance as at minimum 59 of 66 funds are positive. Many are significantly positive at the .10 level but only one is ever significantly negative. The α for balanced funds as a group is positive for all 15 time period index combinations and significant at the .10 level for 4 of the 15. Further investigation shows that more individual fund α's are positive, and significantly positive than would be expected in the absence of differential performance. Municipal bond funds also have only positive α's and 6 of the 15 index time period combinations are significant at the .10 level. International funds provide similar results however, group α's are not all positive. Of the 15 index time period combinations, only 2 are significant at the .10 level and both of them are positive. Growth funds as a group have more negative α's than positive, and 4 of the 15 index time period combinations are significant at the .10 level. Also, more individual funds have both negative and significantly negative α's than would be expected by chance. The exception is the MSCI Index for the total and second period. It also appears that the total periods results are driven by the strong showing in the second period. Growth and income funds as a group have a mix of positive and negative α's. However, only 1 of the 15 exhibits performance significant at the .10 level and it is positive. The distribution of α for individual funds varies greatly. Aggressive growth funds as a group have negative α's for 13 of the 15 index time period combinations and 8 of the 15 are significantly so at the .10 level. Examination of individual funds shows that more α's are negative and significantly negatively than would be expected by chance. Metal funds as a group have consistently negative α's, and the α for each fund is always negative. However, none of the α's is ever

significant at the .10 level.

Worthy of note is that the R^2 is extremely poor for some individual funds and for the municipal bond, bond and preferred, and metal fund groups as a whole. The CAPM fit is so poor for metal funds that the F-statistic shows that the regression equation does not explain returns at standard significance levels.

Results of persistency tests with the traditional measures indicate that performance generally persists. However, rankings can be predicted better with some measure and indices than others. Generally the Jensen measure has the most predictive power but the predictive power varies by index and investment objective of the fund. This is an interesting result and leads the author to conclude that performance may have more to due with a persistent anomaly than true performance.

Investors may attempt to alleviate difficulties with traditional measures by applying ANOVA, if they believed that the work of Klemkosky (1976) indicating equal risk within investment objective class obtained. Naive application of ANOVA results in strong rejection of the null hypothesis of equal returns for all groups of funds and all time periods. Additionally, the Tukey test is able to segment those funds into groups of statistical significance. However, the critical assumption of equal risk is also strongly rejected. Partial refinement of the sample to eliminate some funds that are classified by other sources as belonging to other groups was conducted, as was a transformation of the data. Results of the eight funds groups for the two periods indicate only three cases where equality of risk obtained. In two of the cases, equality of risk resulted in equality of end of period value. Therefore, there was no statistically significant difference in risk adjusted end of period

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value. This supports the traditional efficient market hypothesis. The only differential performance that was detected was for municipal bonds during the first period. The hypothesis of equal end of period value was rejected at the .01 level and the hypothesis of equal risk could not be rejected. The Tukey procedure resulted in producing two very large overlapping groups. This indicates that differences exist, however, they come from differences of funds at opposite ends of the performance spectrum and not from many levels of performance within the group. However, since the second period results indicate that there is no differential performance within this group once the equality of risk was corrected, no persistency is observed. These results are entirely consistent with the efficient market hypothesis but contrary to the recent works of Grinblatt and Titman (1992, 93), Hendricks, Patel, and Zeckhauser (1993), and Goetzman and Ibbotson (1994). This may be due to biases in CAPM based studies which cause anomalies to appear as performance.

5.2: Contributions to the Literature

This dissertation makes several contributions to the literature. First, it casts doubt on the equality of risk within the CDA investment objective classification system. This is contrary to the results of Klemkosky (1976) and suggests investors and practitioners attempting to compare the performance of funds based on returns alone are making a serious error. Neither risk nor return is equal among funds. Second, it casts doubt on whether differential performance really exists. Due to the poor fit of the CAPM model for many funds, and some entire groups of funds, performance based on Jensen's α can be misleading. It calls into question whether performance is the result of true performance differences, an

inefficient market proxy as suggested by Roll (1977, 78), or an anomaly of the CAPM. This anomaly could be a P/E ratio effect, dividend yield effect, size effect, or any number of other factors not yet reported in the literature. The same is true for the Treynor measure. Third, it shows that despite the large body of research devoted to this vital area, much more work in this area is required to resolve a very basic, but also very important issue of performance. A partial listing of required related research is provided in section 5.3 below. Fourth, it shows that when market related biases are eliminated by using the Sharpe measure, performance persistency decreases significantly. Finally, it shows that when the end of period value is the investors primary concern, there is no compelling evidence to support the contention that once variance risk is controlled for that the average end of period values differ by more than would reasonably be expected due to chance.

5.3: Recommendations for Further Study

Several areas of importance should be studied to ameliorate the difficulty in assessing mutual fund performance and are listed below.

1.   Results indicate that variance risk is not homogeneous within CDA investment objective subgroups and the beta's do not appear to be equal either. This is counter to the results of Klemkosky (1976). Additionally, relative performance comparison within investment subgroup is common. However, if risk is not equal, it will result in selecting the riskiest fund. Klemkosky's work should be updated since the CDA investment objective groups are used by academics and practitioners alike.

2. The issue of homogeneous risk within investment objective groups and heterogeneous risk between them should be extended to include other popular classifications such as *Morningstar* and the *Wall Street Journal* systems.

3. If current classification schemes are unable to properly classify funds by risk class, a new scheme that can requires development. This would provide investors with a greater understanding of relative risk and result in less ambiguous performance results.

4. If homogeneous risk classes can be developed, examine performance with ANOVA to determine if performance differences exist and persist to test the efficient market hypothesis against the modified efficient market hypothesis with costly information.

5. Results of recent studies finding persistent performance require further study. It is reasonable to believe that performance differentials discovered are merely CAPM anomalies. Due to the poor fit of the market model for many funds during the period of this study, differential performance may be more a factor of a poor model fit than true performance.

6. The issue of whether mutual funds outperform simple stock trading rules, such as the ones proposed by O'Higgins and Downes (1991) should be investigated.

7. A study of mutual fund return predictability is required to determine if fund returns can be predicted by macro-economic variables.

8.   The issue of whether fund managers can earn economic rent on investment in information requires study.

9.   Past studies indicate that mutual funds that attempt to time the market exhibit perverse timing. This may have serious consequences for the investment company's revenues. This work requires updating to determine if perverse timing persists. The poor fit of the CAPM model could be the result of attempts to time the market. The Treynor and Mazuy (1966) measure may be an adequate gage of the attempt to time the market and provide useful information.

10.   A final recommendation is to study the issue of SEC regulation, disclosure, investment objectives, and risk. The issue would be to determine whether the SEC disclosure provides a valid determination of inherent risk.

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APPENDIX A

This appendix contains a list of all mutual funds covered by CDA Investment

Technologies during the period September 1981 through September 1991. In total, 1,751

mutual funds were contained in this data base.

Fund Name	IO	Load	Data From
AAL Capital Growth Fund	G	4.75	7/87
AAL Income Fund	BP	4.75	7/87
AARP Capital Growth	AG	0.00	12/84
AARP GNMA/US Treas Fund	BP	0.00	12/84
AARP Growth and Income	GI	0.00	12/84
AARP High Quality Bond	BP	0.00	12/84
AARP Insd Txfr Gen Bond	MB	0.00	12/84
ABT Emerging Growth	AG	4.75	4/83
ABT Fl Tax Free Fund	MB	4.75	5/88
ABT Growth & Income Tr	GI	4.75	9/81
ABT Utility Income Fund	GI	4.75	9/81
Acorn Fund	G	0.00	9/81
Addison Capital Shares	G	3.00	9/86
Advance America Eqty Inc	G	4.75	1/89
Advance America US Gov	BP	4.75	12/88
Advest Advantage Govt	BP	0.00	2/86
Advest Advantage Growth	G	0.00	2/86
Advest Advantage Income	B	0.00	2/86
Advest Advantage Special	AG	0.00	2/86
Advisors Fund L.P. (The)	G	5.50	6/90
Aegon USA Capital Apprec	G	4.75	9/81
Aegon USA Growth Portf	GI	4.75	9/81
Aegon USA Hiyld Portf	BP	4.75	6/85
Affiliated Fund	GI	6.75	9/81
Afuture Fund	G	0.00	9/81
AGE High Income Fund	BP	4.00	9/81
AIM Charter Fund	G	5.50	9/81
AIM Constellation Fund	AG	5.50	9/81
AIM Convertible Secs Inc	G	4.75	9/81

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Fund Name	IO	Load	Data From
AIM High Yld Securities	BP	4.75	9/81
AIM Limited Maturity	BP	1.75	12/87
AIM Summit Fund	G	5.50	11/82
AIM Weingarten Fund	G	5.50	9/81
Alger Small Cap Portf	AG	0.00	11/86
Alliance Balanced Shrs A	B	5.50	9/81
Alliance Bd-Mthly Income	BP	4.75	9/81
Alliance Bd-US Govt	BP	4.75	12/85
Alliance Counterpoint	G	5.50	3/85
Alliance Fund A	AG	5.50	9/81
Alliance Global-Canadian	IN	5.50	9/81
Alliance Globl Sm Cap A	AG	5.50	9/81
Alliance Growth & Inc A	GI	5.50	9/81
Alliance High Yield Bond	BP	4.75	4/85
Alliance International A	IN	5.50	9/81
Alliance Mortgage Secs	BP	4.75	2/84
Alliance Muni Income-Ca	MB	4.50	12/86
Alliance Muni Income-Nat	MB	4.50	12/86
Alliance Muni Income-Ny	MB	4.50	12/86
Alliance Muni Insd Ca	MB	4.50	11/85
Alliance Muni Insd Natl	MB	4.50	12/86
Alliance Quasar A	AG	5.50	9/81
Alliance Sh-Term Multi A	BP	3.00	5/89
Alliance Sh-Term Multi B	BP	0.00	2/90
Alliance Technology	AG	5.50	6/82
Alpine Calif Muni Asset	MB	3.75	9/88
Alpine Natl Muni Asset	MB	3.75	2/87
AMA Balanced Fund	B	4.75	2/87
AMA Classic Growth	G	4.75	9/81
AMA Global Growth	IN	4.75	2/87
AMA Global Income Fund	BP	4.75	4/87
AMA USG Income Plus	BP	4.75	9/81
Amcap Fund	G	5. 75	9/81
American Balanced Fund	B	5.75	9/81
American Cap Comstock	G	8.50	9/81
American Cap Corp Bond	BP	4.75	9/81
American Cap Emerging Gr	AG	5.75	9/81
American Cap Enterprise	G	5.75	9/81

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Fund Name	IO	Load	Data From
American Cap Equity Inc	B	5.75	9/81
American Cap Gr & Income	G	5.75	9/81
American Capital Fed Mtg	BP	4.00	5/86
American Capital Gov Sec	BP	4.75	7/84
American Capital Harbor	B	5.75	9/81
American Capital Hiyld	BP	4.75	9/81
American Capital Muni Bd	MB	4.75	9/81
American Capital Pace Fd	G	5.75	9/81
American Capital Txe Hiy	MB	4.75	1/86
American Capital Txe Ins	MB	4.75	1/86
American Fds-Tx ex Ca	MB	4.75	10/86
American Fds-Tx ex Md	MB	4.75	8/86
American Fds-Tx ex Va	MB	4.75	8/86
American Gas Index	G	0.00	5/89
American Growth Fund	GI	8.50	9/81
American Heritage Fund	AG	0.00	9/81
American High-Inc Trust	BP	4.75	2/88
American Investors Gr Fd	AG	8.50	9/81
American Investors Incm	GI	5.00	9/81
American Leaders Fund	G	4.50	9/81
American Mutual Fund	GI	5.75	9/81
American National Growth	G	8.50	9/81
American Natl Inc Fund	GI	8.50	9/81
American Perf Bond Fund	BP	4.00	9/90
American Perf Equity Fd	G	4.00	9/90
American Perf Interm Bd	BP	4.00	9/90
Amev Advantage-Asset All	B	4.50	1/88
Amev Advantage-Cap Appre	AG	4.50	1/88
Amev Advantage-Gov T.R.	BP	4.50	5/86
Amev Advantage-High Yld	BP	4.50	12/87
Amev Capital Fund, Inc.	G	4.75	9/81
Amev Fiduciary Fund	G	4.50	1/82
Amev Growth Fund, Inc.	AG	4.75	9/81
Amev Special Stock Fund	AG	0.00	9/81
Amev Tax Free Mn Portf	MB	4.50	6/86
Amev Tax Free Natl Portf	MB	4.50	6/86
Amev US Gov Securities	BP	4.50	9/81
AMF Corporate Bond	BP	0.00	11/86

Fund Name	IO	Load	Data From
AMF Intermediate Liqdty	BP	0.00	11/82
AMF Mortgage Securities	BP	0.00	1/84
Analytic Optioned Equity	GI	0.00	9/81
Anchor Cap Accumulation	GI	0.00	9/81
API Trust Growth	AG	0.00	6/85
Armstrong Associates	GI	0.00	9/81
ASO Outlook Bond	BP	4.50	12/88
ASO Outlook Equity	G	4.50	12/88
ASO Outlook Ltd Maturity	BP	3.00	2/89
ASO Outlook Regional Eq	G	3.00	12/88
Associated Planners Stk	G	4.75	11/84
Atlas Ca Double Tax Free	MB	3.00	1/90
Atlas USG & Mortgage Sec	BP	3.00	1/90
Axe-Houghton Core Intl	IN	5.75	9/90
Axe-Houghton Fund B	B	5.75	9/81
Axe-Houghton Growth Fund	AG	5.75	9/81
Axe-Houghton Income Fund	BP	4.75	9/81
Axe-Houghton Ins Tx ex	MB	4.75	9/90
Babson Bond Tr-Long	BP	0.00	9/81
Babson Enterprise Fund	AG	0.00	12/83
Babson Growth Fund	G	0.00	9/81
Babson Value Fund	G	0.00	12/84
Baird Blue Chip Fund	G	5.75	12/86
Baird Captl Development	AG	5.75	6/84
Baker Fund - USG Series	BP	0.00	9/86
Baron Asset Fund	G	0.00	6/87
Bartlett Basic Value Fd	GI	0.00	5/83
Bartlett Fixed Income Fd	BP	0.00	4/86
Bascom Hill Balanced	B	0.00	12/86
Bascom Hill Investors	GI	0.00	9/81
BB&K Diversa Fund	B	0.00	12/86
Beacon Hill Mutual Fund	G	0.00	9/81
Benham Calif Tf-Intermed	MB	0.00	11/83
Benham Calif Tf-Long Trm	MB	0.00	11/83
Benham GNMA Income Fund	BP	0.00	10/85
Berger 100 Fund	AG	0.00	9/81
Berger 101 Fund	G	0.00	9/81
Bernstein Ca Muni	MB	0.00	8/90

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Fund Name	IO	Load	Data From
Bernstein Divers Muni	MB	0.00	1/89
Bernstein Gov Short Dur	BP	0.00	1/89
Bernstein Interm Dur	BP	0.00	1/89
Bernstein Ny Municipal	MB	0.00	1/89
Bernstein Short Dur plus	BP	0.00	12/88
Blanchard Precious Metal	ME	0.00	6/88
Blanchard Strategic Grow	B	0.00	5/86
Bond Fund of America	BP	4.75	9/81
Boston Co. Cap. Apprec.	G	0.00	9/81
Boston Co. Ca Tax Free	MB	0.00	3/88
Boston Co. GNMA	BP	0.00	3/86
Boston Co. Managed Inc.	BP	0.00	7/83
Boston Co. Ny Tax Free	MB	0.00	3/88
Boston Co. Spec Growth	AG	0.00	7/83
Boston Co. Tax Free	MB	0.00	10/85
Brandywine Fund	AG	0.00	12/85
Bridges Investment Fund	GI	0.00	1/84
Bruce Fund	G	0.00	9/81
Bull & Bear Cap Growth	AG	0.00	9/81
Bull & Bear Equity Inc.	GI	0.00	9/81
Bull & Bear Finl News	G	0.00	9/89
Bull & Bear Gold Invs	ME	0.00	9/81
Bull & Bear High Yield	BP	0.00	9/83
Bull & Bear Special Eqty	AG	0.00	4/86
Bull & Bear Tax Free	MB	0.00	3/84
Bull & Bear US Govt	BP	0.00	3/86
Burnham Fund	B	5.00	9/81
Calamos Convertible Inc	GI	0.00	7/85
Calvert Ariel Apprec	AG	4.75	1/90
Calvert Ariel Growth Fd	AG	4.75	10/86
Calvert Capital Value	G	4.75	10/82
Calvert Income	BP	4.75	10/82
Calvert Social Inv Bond	BP	4.75	8/87
Calvert Social Inv Eq Fd	G	4.75	8/87
Calvert Social Mgd Grow	B	4.75	10/82
Calvert Txfr Reserve-Lg	MB	4.75	8/83
Calvert Txfr Reserve-Ltd	MB	2.00	9/81
Calvert US Government Fd	BP	4.75	7/86

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Fund Name	IO	Load	Data From
Capital Income Builder	B	5.75	7/87
Capital Preservation Tnt	BP	0.00	6/82
Capital World Bond	BP	4.75	7/87
Capstone Govt Income Tr	BP	0.00	9/81
Cardinal Fund	GI	8.50	9/81
Cardinal Govt Obligation	BP	4.50	2/86
Carnegie Cap Divers High	BP	4.50	11/89
Carnegie Cap Emerging Gr	AG	4.50	12/89
Carnegie Cap Growth Fund	G	4.50	2/84
Carnegie Cap Tot Return	GI	4.50	12/85
Carnegie Govt Securities	BP	4.50	4/83
Carnegie Txe-Minnesota	MB	4.50	5/86
Carnegie Txe-Natl Hiyld	MB	4.50	8/86
Carnegie Txe-Ohio Genl	MB	4.50	8/86
Cashman Farrell Value Fd	G	4.75	3/86
Century Shares Trust	G	0.00	9/81
CGM Capital Development	AG	0.00	9/81
CGM Mutual Fund	GI	0.00	9/81
Charter Captl Blue Chip	GI	0.00	8/84
Chubb Govt Securities	BP	5.00	12/87
Chubb Growth Fund	G	5.00	12/87
Chubb Tax Exempt	MB	5.00	12/87
Chubb Total Return	B	5.00	12/87
Churchill Tax-Free Fd Ky	MB	4.00	5/87
Cigna Aggressive Growth	AG	5.00	5/84
Cigna Government Secs	BP	5.00	4/87
Cigna Growth Fund	G	5.00	9/81
Cigna High Yield	BP	5.00	9/81
Cigna Income Fund	BP	5.00	9/81
Cigna Municipal Bond	MB	5.00	9/81
Cigna Utilities Fund	GI	5.00	1/88
Cigna Value Fund	G	5.00	5/84
Clipper Fund, Inc.	G	0.00	2/84
Colonial Adv Strat Gold	ME	5.75	7/85
Colonial Ca Tx ex Trust	MB	4.75	6/86
Colonial Corp Cash I	B	2.00	9/81
Colonial Fund	GI	5.75	9/81
Colonial Gov Sec Plus Tr	BP	4.75	5/84

Fund Name	IO	Load	Data From
Colonial Growth Shares	G	5.75	9/81
Colonial High Yield Secs	BP	4.75	9/81
Colonial Income	BP	4.75	9/81
Colonial Intl Eq Index	IN	5.75	7/86
Colonial Mass Tx ex Tr	MB	4.75	7/87
Colonial Mich Tx ex Tr	MB	4.75	9/86
Colonial Minn Tx ex Tr	MB	4.75	9/86
Colonial Ny Tx ex Trust	MB	4.75	9/86
Colonial Ohio Tx ex	MB	4.75	9/86
Colonial Small Stk Index	AG	5.75	7/86
Colonial Strategic Inc	B	4.75	9/81
Colonial Tax Exempt Fund	MB	4.75	1/82
Colonial Tax Exempt Insd	MB	4.75	11/85
Colonial US Eq Index Tr	G	5.75	7/86
Colonial U.S. Govt Trust	BP	4.75	10/87
Colonial Vip-Divsd Retrn	G	0.00	4/88
Colonial Vip-Fed Secs	BP	0.00	4/88
Colonial Vip-Growth Fund	AG	0.00	4/88
Colonial Vip-High Income	BP	0.00	4/88
Colonial Vip-Hiyld Muni	MB	0.00	4/88
Colonial Vip-Infl Hedge	IN	0.00	4/88
Columbia Fixed Income	BP	0.00	1/83
Columbia Growth Fund	G	0.00	9/81
Columbia Municipal Bond	MB	0.00	1/85
Columbia Special Fund	AG	0.00	11/85
Common Sense Govt Fund	BP	6.75	3/87
Common Sense Gr & Income	G	8.50	3/87
Common Sense Growth Fund	G	8.50	3/87
Commonwealth Inv Tr-Bal	B	7.50	9/81
Composite Bond & Stock	B	4.00	9/81
Composite Growth Fund	GI	4.00	9/81
Composite Income Fund	BP	4.00	9/81
Composite Northwest 50	AG	4.50	11/86
Composite Tax Exempt Bd	MB	4.00	9/81
Composite USG Securities	BP	4.00	3/82
Concord Inc-Conv Portf	GI	4.50	1/88
Conn Mutual Inv Gov Secs	BP	4.00	9/85
Conn Mutual Inv Growth	G	6.25	9/85

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Fund Name	IO	Load	Data From
Conn Mutual Inv Income	BP	4.00	9/85
Conn Mutual Inv Tot Ret	B	5.00	9/85
Convertible Secs & Inc	B	4.50	1/87
Copley Fund	G	0.00	9/81
Counsellors Captl Apprec	G	0.00	8/87
Counsellors Emerging Gr	AG	0.00	1/88
Counsellors Fixed Income	BP	0.00	8/87
Counsellors Inter Gov Fd	BP	0.00	8/88
Counsellors Intl Equity	IN	0.00	5/89
Counsellors N.Y. Muni	MB	0.00	4/87
Country Capital Growth	GI	3.00	9/81
Cowen Income & Growth	GI	4.85	9/86
Cowen Opportunity Fund	AG	4.85	3/88
Dean Witter American Val	G	0.00	9/81
Dean Witter Calif Tx Fr	MB	0.00	7/84
Dean Witter Cap Growth	G	0.00	3/90
Dean Witter Conv Sec Tr	GI	0.00	10/85
Dean Witter Develop Grow	AG	0.00	3/83
Dean Witter Dividend Gro	GI	0.00	9/81
Dean Witter European Gr	IN	0.00	6/90
Dean Witter Gov Sec plus	BP	0.00	3/87
Dean Witter High Yield	BP	5.50	9/81
Dean Witter Interm Inc	BP	0.00	5/89
Dean Witter Mgd Assets	B	0.00	6/88
Dean Witter Nat Resource	G	0.00	9/81
Dean Witter Ny Tx Fr Inc	MB	0.00	5/85
Dean Witter Option Inc	GI	0.00	4/85
Dean Witter Prec Met&Min	ME	0.00	8/90
Dean Witter Strategist	GI	0.00	10/88
Dean Witter Tx Advantage	BP	0.00	8/84
Dean Witter Tx ex Secs	MB	4.00	9/81
Dean Witter US Gov Trust	BP	0.00	6/84
Dean Witter Utilities Fd	GI	0.00	4/88
Dean Witter Val-Add Mkt	G	0.00	11/87
Dean Witter World Income	BP	0.00	3/89
Dean Witter World Invest	IN	0.00	12/83
Delaware Grp-Decatur I	GI	8.50	9/81
Delaware Grp-Decatur II	GI	4.75	8/86

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APPENDIX A   (Continued)

Fund Name	IO	Load	Data From
Delaware Grp-Delaware Fd	B	6.75	9/81
Delaware Grp-Delcap I	G	4.75	3/86
Delaware Grp-Delchstr I	BP	6.75	9/81
Delaware Grp-Delchstr II	BP	4.75	11/87
Delaware Grp-Delta Trend	AG	4.75	9/81
Delaware Grp-Govt Inc II	BP	4.75	8/85
Delaware Grp-Treasury I	BP	3.00	11/85
Delaware Grp-Treasury II	BP	0.00	11/85
Delaware Grp-Txfr USA	MB	4.75	1/84
Delaware Grp-Txfr USA in	MB	4.75	3/85
Delaware Grp-Value Fund	AG	4.75	6/87
Depositors Fund/Boston	G	0.00	9/81
DFA Continental Small Co	IN	0.00	3/88
DFA Fixed Inc Portfolio	BP	0.00	8/83
DFA Govt Fixed Income	BP	0.00	5/87
DFA Japanese Small Co	IN	0.00	1/86
DFA Small Co. Portfolio	AG	0.00	1/82
DFA United Kingdom Sm Co	IN	0.00	1/86
Diversification Fund	G	0.00	9/81
DMC Tax Free-Pa	MB	4.75	9/81
Dodge & Cox Balanced	B	0.00	9/81
Dodge & Cox Stock	G	0.00	9/81
Donoghue Money Mkt Avg	BP	0.00	9/81
Dreyfus A Bonds Plus	BP	0.00	9/81
Dreyfus Calif Tax Exempt	MB	0.00	7/83
Dreyfus Capital Value	B	4.50	10/85
Dreyfus Convertible Secs	GI	0.00	9/81
Dreyfus Fund	B	0.00	9/81
Dreyfus General Muni Bd	MB	0.00	3/84
Dreyfus GNMA	BP	0.00	6/85
Dreyfus Gr Opportunity	G	0.00	9/81
Dreyfus Index Fund	G	0.00	5/87
Dreyfus Insured Muni Bd	MB	0.00	6/85
Dreyfus Intermdiate Muni	MB	0.00	8/83
Dreyfus Leverage	GI	4.50	9/81
Dreyfus Mass Tax Exempt	MB	0.00	6/85
Dreyfus New Leaders Fund	G	0.00	1/85
Dreyfus Nj Tax Exempt Bd	MB	0.00	10/87

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Fund Name	IO	Load	Data From
Dreyfus Ny Tax Exempt Bd	MB	0.00	7/83
Dreyfus Premier Ca Tx ex	MB	4.50	10/86
Dreyfus Premier Ct Tx ex	MB	4.50	4/87
Dreyfus Premier Fl Tx ex	MB	4.50	4/87
Dreyfus Premier GNMA Fd	BP	4.50	1/87
Dreyfus Premier Ma Tx ex	MB	4.50	4/87
Dreyfus Premier Md Tx ex	MB	4.50	4/87
Dreyfus Premier Mi Tx ex	MB	4.50	4/87
Dreyfus Premier Mn Tx ex	MB	4.50	4/87
Dreyfus Premier Muni Bd	MB	4.50	10/86
Dreyfus Premier Ny Tx ex	MB	4.50	12/86
Dreyfus Premier Oh Tx ex	MB	4.50	4/87
Dreyfus Premier Pa Tx ex	MB	4.50	6/87
Dreyfus Premier Tx Tx ex	MB	4.50	5/87
Dreyfus Sh-Interm Govt	BP	0.00	4/87
Dreyfus Sh-Interm Tx ex	MB	0.00	4/87
Dreyfus Strategic Aggres	AG	3.00	3/87
Dreyfus Strategic Income	BP	4.50	10/86
Dreyfus Strategic Invest	G	4.50	10/86
Dreyfus Strategic World	IN	3.00	4/87
Dreyfus Tax Exempt Bond	MB	0.00	9/81
Dreyfus Third Century	GI	0.00	9/81
Dupree Kentucky Txfr Inc	MB	0.00	9/81
Eagle Growth Shares	AG	8.50	9/81
Eaton Vance Ca Muni	MB	0.00	12/85
Eaton Vance Equity Inc	GI	0.00	10/87
Eaton Vance Fl Tax Free	MB	0.00	8/90
Eaton Vance Gov Obligatn	BP	4.75	11/84
Eaton Vance Growth Fund	G	4.75	9/81
Eaton Vance High Income	BP	0.00	8/86
Eaton Vance Inc Fd/Bost	BP	4.75	9/81
Eaton Vance Investors Fd	B	4.75	9/81
Eaton Vance Municipal Bd	MB	4.75	9/81
Eaton Vance Natl Muni	MB	0.00	12/85
Eaton Vance Natural Res	G	0.00	10/87
Eaton Vance Ny Tax Free	MB	0.00	8/90
Eaton Vance Spl Equities	AG	4.75	9/81
Eaton Vance Stock Fund	GI	4.75	9/81

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Fund Name	IO	Load	Data From
Eaton Vance Total Return	GI	4.75	12/81
Eclipse Equity Fund	GI	0.00	1/87
Elfun Trusts	G	0.00	9/81
Emblem Earnings Momentum	AG	4.00	10/89
Emblem Interm Gov Oblign	BP	4.00	5/90
Emblem Ohio Regional Eq	G	4.00	10/89
Emblem Relative Value Eq	G	4.00	10/89
Emblem Sh-Interm Fx Inc	BP	4.00	10/89
Empire Builder Tax Free	MB	4.25	3/88
Enterprise Captl Apprec	G	4.75	12/87
Enterprise Govt Secs	BP	4.75	12/87
Enterprise Growth Fund	G	4.75	9/81
Enterprise Growth & Inc	GI	4.75	11/87
Enterprise High Yield	BP	4.75	11/87
Enterprise Intl Growth	IN	4.75	12/87
Enterprise Prec Metals	ME	4.75	12/87
Equitable Balanced Fd F	B	0.00	10/87
Equitable Govt Secs Fd B	BP	0.00	10/87
Equitable Growth Fd B	AG	0.00	10/87
Equitabler Sh-Trm Wrld F	BP	3.00	9/90
Equitable Tax Exempt B	MB	0.00	10/87
Europacific Growth Fund	IN	5.75	4/84
European Emerging Cos Fd	IN	5.75	12/88
European Fund (The)	IN	4.75	1/87
Evergreen Fund	G	0.00	9/81
Evergreen Globl Real Est	IN	0.00	2/89
Evergreen Total Return	GI	0.00	9/81
Excel Midas Gold Fund	ME	4.50	1/86
Excel Value Fund	G	4.50	11/82
Executive Investors Hyld	BP	4.75	2/87
Fairmont Fund	AG	0.00	9/81
FBL-Growth Common Stock	GI	0.00	9/81
Federated Bond Fund	BP	0.00	12/85
Federated Floating Rate	BP	0.00	7/86
Federated GNMA	BP	0.00	3/82
Federated Growth Trust	G	0.00	8/84
Federated High Yield Tr	BP	0.00	8/84
Federated Income Trust	BP	0.00	3/82

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Fund Name	IO	Load	Data From
Federated Intermed Gov	BP	0.00	2/83
Federated Intmed Muni Tr	MB	0.00	12/85
Federated Sh-Interm Gov	BP	0.00	3/84
Federated Sh-Interm Muni	MB	0.00	9/81
Federated Stock & Bond	B	0.00	9/81
Federated Stock Trust	G	0.00	3/82
Federated Tax Fr Income	MB	4.50	9/81
Federated U.S. Govt Fund	BP	0.00	12/85
Fenimore Intl-Eq Series	IN	5.00	2/86
Fidelity Aggress Tax Fr	MB	0.00	9/85
Fidelity Balanced Fund	B	0.00	11/86
Fidelity Blue Chip Grwth	G	3.00	12/87
Fidelity Capital Apprec	G	3.00	11/86
Fidelity Captl & Income	BP	0.00	9/81
Fidelity Ca Txfr Hyld	MB	0.00	7/84
Fidelity Congress Street	G	0.00	9/81
Fidelity Contrafund	AG	3.00	9/81
Fidelity Corp Tr-Arp	BP	0.00	10/84
Fidelity Destiny II	AG	8.50	12/85
Fidelity Destiny-Plan 1	G	8.50	9/81
Fidelity Eq Portf-Growth	AG	0.00	11/83
Fidelity Eq Portf-Income	GI	0.00	4/83
Fidelity Equity Income	GI	2.00	9/81
Fidelity Europe	IN	3.00	10/86
Fidelity Exchange Fund	G	0.00	9/81
Fidelity Fixed Inc-Ltd	BP	0.00	2/84
Fidelity Flexible Bond	BP	0.00	9/81
Fidelity Fund	GI	0.00	9/81
Fidelity Global Bond Fd	BP	0.00	12/86
Fidelity GNMA	BP	0.00	11/85
Fidelity Govt Secs	BP	0.00	9/81
Fidelity Growth Co.	AG	3.00	1/83
Fidelity Growth & Income	GI	2.00	12/85
Fidelity High Yield Muni	MB	0.00	9/81
Fidelity Insd Tx Fr Muni	MB	0.00	11/85
Fidelity Intermediate Bd	BP	0.00	9/81
Fidelity Intl Gr & Inc	IN	2.00	12/86
Fidelity Low-Priced Stk	G	0.00	12/89

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Fund Name	IO	Load	Data From
Fidelity Ltd Term Muns	MB	0.00	9/81
Fidelity Magellan Fund	G	3.00	9/81
Fidelity Mass Tax Free	MB	0.00	2/84
Fidelity Michigan Txfr	MB	0.00	11/85
Fidelity Minnesota Txfr	MB	0.00	11/85
Fidelity Mortgage Secs	BP	0.00	12/84
Fidelity Muni Bond Fund	MB	0.00	9/81
Fidelity N.J. High Yield	MB	0.00	1/88
Fidelity N.Y. Muni Trust	MB	0.00	9/85
Fidelity N.Y. Txfr Hyld	MB	0.00	7/84
Fidelity Ohio Txfr	MB	0.00	11/85
Fidelity OTC Portfolio	AG	3.00	12/84
Fidelity Overseas Fund	IN	3.00	12/84
Fidelity Pacific Basin	IN	3.00	10/86
Fidelity Puritan Fund	B	2.00	9/81
Fidelity Qualified Divd	GI	0.00	9/81
Fidelity Real Estate	GI	0.00	11/86
Fidelity Retirement Gr	G	0.00	4/83
Fidelity Sel Air Transp	AG	3.00	12/85
Fidelity Sel Amer Gold	ME	3.00	12/85
Fidelity Sel Automotive	AG	3.00	6/86
Fidelity Sel Biotech	AG	3.00	12/85
Fidelity Sel Brdcst/Med	AG	3.00	6/86
Fidelity Sel Brokerage	AG	3.00	7/85
Fidelity Sel Chemical	AG	3.00	7/85
Fidelity Sel Computer	AG	3.00	7/85
Fidelity Sel Constr&Hous	AG	3.00	9/86
Fidelity Sel Def & Aero	G	3.00	5/84
Fidelity Sel Electronics	AG	3.00	7/85
Fidelity Sel Elec Utils	GI	3.00	6/86
Fidelity Sel Energy	G	3.00	9/81
Fidelity Sel Energy Svcs	AG	3.00	12/85
Fidelity Sel Environment	G	3.00	6/89
Fidelity Sel Finl Svc	G	3.00	12/81
Fidelity Sel Food/Agri	G	3.00	7/85
Fidelity Sel Health	AG	3.00	9/81
Fidelity Sel Industrial	AG	3.00	9/86
Fidelity Sel Leisure Ent	AG	3.00	5/84

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Fund Name	IO	Load	Data From
Fidelity Sel Medical Del	AG	3.00	6/86
Fidelity Sel Paper/Forst	AG	3.00	6/86
Fidelity Sel Prec Met&Mn	ME	3.00	9/81
Fidelity Sel Regional Bk	G	3.00	6/86
Fidelity Sel Retailing	AG	3.00	12/85
Fidelity Sel Savings/Ln	AG	3.00	12/85
Fidelity Sel Software	AG	3.00	7/85
Fidelity Sel Technology	AG	3.00	9/81
Fidelity Sel Telecomm	G	3.00	7/85
Fidelity Sel Utilities	GI	3.00	12/81
Fidelity Sh-Term Bond	BP	0.00	9/86
Fidelity Spartan Pa Hyld	MB	0.00	8/86
Fidelity Spartan Si Muni	MB	0.00	12/86
Fidelity Spec Situations	GI	4.75	1/84
Fidelity Trend	AG	0.00	9/81
Fidelity Tx ex Ltd Term	MB	0.00	3/86
Fidelity US Equity Index	G	0.00	3/88
Fidelity Utilities Inc	GI	0.00	11/87
Fidelity Value Fund	G	0.00	9/81
Fiduciary Capital Growth	AG	0.00	12/81
Financial Bd-Hiyld Port	BP	0.00	3/84
Financial Bd-Select Inc	BP	0.00	7/82
Financial Bd-USG Port	BP	0.00	1/86
Financial Dynamics Fund	AG	0.00	9/81
Financial Indust. Fund	G	0.00	9/81
Financial Indust. Income	GI	0.00	9/81
Financial Tax Fr Inc Shs	MB	0.00	4/82
First American Fixed	BP	4.00	1/88
First American Specl Eq	GI	4.75	1/88
First Australia Inc Enhc	BP	4.75	12/89
First Australia Income	BP	4.75	12/89
First Australia Liqdity	BP	3.00	12/89
First Australia Pacific	IN	4.75	12/89
First Eagle of America	G	0.00	4/87
First Invest. Fd. Income	BP	6.90	9/81
First Invest. Global Fd	IN	6.90	6/83
First Invest. Gov Fund	BP	6.90	9/84
First Invest. High Yield	BP	6.90	8/86

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APPENDIX A (Continued)

Fund Name	IO	Load	Data From
First Invest. Insd Txe	MB	6.90	9/81
First Invest. Ny Tax Fr	MB	6.90	9/84
First Trust Txfr-Income	MB	4.50	11/86
First Trust Txfr-Insured	MB	4.50	11/86
First Trust USG Fund	BP	4.50	3/86
Flag Invs Emerging Grow	AG	4.50	12/87
Flag Invs International	IN	4.50	11/86
Flag Invs Quality Growth	G	4.50	8/89
Flag Invs Telephone Inc	GI	4.50	1/84
Flag Invs Tot Return UST	BP	4.50	8/88
Flagship All Amer Tax ex	MB	4.20	9/88
Flagship Arizona Dbl Tx	MB	4.20	11/86
Flagship Co Dbl Tx ex	MB	4.20	4/87
Flagship Corp Cash	BP	0.00	8/83
Flagship Ct Dbl Txex	MB	4.20	7/87
Flagship Fl Dbl Tx ex	MB	4.20	6/90
Flagship Georgia Dbl Tx	MB	4.20	4/86
Flagship Ky Triple Tax	MB	4.20	4/87
Flagship La Dbl Tx ex	MB	4.20	9/89
Flagship Ltd Term Txex	MB	2.50	10/87
Flagship Mich Triple Tx	MB	4.20	7/85
Flagship Mo Dbl Txex	MB	4.20	7/87
Flagship N.C. Triple Tx	MB	4.20	4/86
Flagship Ohio Double Tax	MB	4.20	7/85
Flagship Pa Triple Tx ex	MB	4.20	11/86
Flagship Tn Dbl Txex	MB	4.20	10/87
Flagship Virginia Dbl Tx	MB	4.20	4/86
Flex Fd-Bond Series	BP	0.00	5/85
Flex Fd-Growth	GI	0.00	3/85
Fontaine Cap Apprec Fd	B	0.00	9/89
Fortress Hi Qual Stock	GI	1.00	12/85
Fortress Muni Income Fd	MB	1.00	4/87
Fortress Totl Perf UST	BP	1.00	7/88
Fortress Utility Fund	GI	0.00	1/87
Forty-Four Wall St Eqty	AG	0.00	9/81
Forty-Four Wall St Fund	AG	0.00	9/81
Forum Investors Bond	BP	3.75	10/89
Forum Investors Stock Fd	G	3.75	10/89

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Fund Name	IO	Load	Data From
Founders Blue Chip Fund	G	0.00	9/81
Founders Equity Income	B	0.00	9/81
Founders Frontier Fund	AG	0.00	1/87
Founders Growth Fund	G	0.00	9/81
Founders Special Fund	AG	0.00	9/81
FPA Capital Fund	AG	6.50	9/81
FPA New Income	BP	4.50	9/81
FPA Paramount Fd Inc	GI	6.50	9/81
FPA Perennial Fund	GI	6.50	3/84
Franklin Adj USG Secs	BP	4.00	10/87
Franklin Alabama Txfr	MB	4.00	8/87
Franklin Arizona Txfr	MB	4.00	8/87
Franklin Calif Insd Txfr	MB	4.00	8/85
Franklin Calif Tax Free	MB	4.00	10/82
Franklin Colorado Tax Fr	MB	4.00	9/87
Franklin Convertible Sec	B	4.00	3/87
Franklin Ct Tx Free Inc	MB	4.00	9/88
Franklin Dynatech	G	4.00	9/81
Franklin Equity Fund	G	4.00	9/81
Franklin Federal Tax Fr	MB	4.00	10/83
Franklin Florida Txfr	MB	4.00	8/87
Franklin Georgia Tax Fr	MB	4.00	9/87
Franklin Global Opport	BP	4.00	3/88
Franklin Gold Fund	ME	4.00	9/81
Franklin Growth	G	4.00	9/81
Franklin High Yield Txfr	MB	4.00	4/86
Franklin Income	B	4.00	9/81
Franklin Insd Tax-Fr Inc	MB	4.00	9/85
Franklin La Tax Free	MB	4.00	9/87
Franklin Mass Tax Free	MB	4.00	4/85
Franklin Md Tax Free	MB	4.00	9/88
Franklin Mgd Tr Cp Cash	BP	1.50	1/87
Franklin Mgd Tr Inv Grde	BP	4.00	2/87
Franklin Mgd Tr Ris Divd	G	4.00	3/87
Franklin Mi Tax Free	MB	4.00	4/85
Franklin Mn Tax Free	MB	4.00	4/85
Franklin Mo Tax Free	MB	4.00	9/87
Franklin Nc Tax Free	MB	4.00	9/87

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Fund Name	IO	Load	Data From
Franklin New York Tax Fr	MB	4.00	3/83
Franklin Nj Tx Free Inc	MB	4.00	4/88
Franklin Ohio Tax Free	MB	4.00	4/85
Franklin Oregon Tax Free	MB	4.00	8/87
Franklin Penn Tax Free	MB	4.00	12/86
Franklin Premier Return	GI	4.00	9/81
Franklin Puerto Rico Txf	MB	4.00	3/85
Franklin Sh-Interm USG	BP	1.50	4/87
Franklin Special Equity	G	4.00	3/88
Franklin Tx Advantge Hi	BP	4.00	4/87
Franklin Tx Advantge USG	BP	4.00	5/87
Franklin U.S. Govt. Sec.	BP	4.00	9/81
Franklin Utilities	GI	4.00	9/81
Franklin Virginia Txfr	MB	4.00	8/87
Freedom Environmental Fd	G	4.50	10/89
Freedom Equity Value Fd	G	0.00	6/87
Freedom Global Fund	IN	0.00	8/86
Freedom Global Income	BP	0.00	12/86
Freedom Gold & Gov Trust	ME	0.00	1/85
Freedom Gov Income Fd	BP	0.00	5/86
Freedom Mgd Tx ex Fd	MB	0.00	4/87
Freedom Regional Bank Fd	G	0.00	10/85
Fremont Multi Asset	IN	0.00	11/88
FSP-Energy Portfolio	G	0.00	1/84
FSP-European Portfolio	IN	0.00	6/86
FSP-Financial Svcs Portf	G	0.00	6/86
FSP-Gold Portfolio	ME	0.00	1/84
FSP-Health Sciences	AG	0.00	1/84
FSP-Leisure Portfolio	AG	0.00	1/84
FSP-Pacific Basin Port	IN	0.00	1/84
FSP-Technology Portfolio	AG	0.00	1/84
FSP-Utilities Portfolio	GI	0.00	6/86
Fundamental Investors	G	5.75	9/81
Fund for U.S. Govt. Sec.	BP	4.50	9/81
Fund of the Southwest	G	4.75	9/81
Fundtrust Aggressive	G	1.50	12/84
Fundtrust Growth	G	1.50	12/84
Fundtrust Growth & Inc	GI	1.50	12/84

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Fund Name	IO	Load	Data From
Fundtrust Income	BP	1.50	12/84
Fundtrust Mgd Tot Return	G	1.50	8/88
Gabelli Asset Fund	GI	0.00	2/86
Gabelli Convertible Secs	GI	4.50	6/89
Gabelli Growth Fund	G	0.00	4/87
Gabelli Value Fund	GI	5.50	9/89
Galaxy Equity Value Fund	G	0.00	8/88
Galaxy Intermediate Bond	BP	0.00	8/88
GAM Global Fund	IN	5.00	5/86
GAM International	IN	5.00	1/85
Gateway Growth plus Fund	G	0.00	5/86
Gateway Index plus Fund	GI	0.00	9/81
General Aggressive Grow	G	0.00	1/84
General Elec S&S Lt Bond	BP	0.00	9/81
General Elec S&S Program	GI	0.00	9/81
General N.Y. Muni Bond	MB	0.00	11/84
General Securities	GI	5.00	9/81
Gintel Cap Appreciation	G	0.00	1/86
Gintel Erisa	G	0.00	3/82
Gintel Fund	G	0.00	9/81
GIT Equity Tr Spl Growth	G	0.00	7/83
GIT Income Trust Maximum	BP	0.00	7/83
GIT Tax Free High Yield	MB	0.00	7/83
GNA Investors Tr-USG	BP	0.00	4/87
Government Inc Secs Fd	BP	1.00	4/86
Gradison Established Gr.	GI	0.00	8/83
Gradison Opportunity Gr	G	0.00	8/83
Greenspring Fund	GI	0.00	7/83
Growth Fd of Washington	G	5.00	8/85
Growth Fund of America	G	5.75	9/81
GS Capital Growth Fund	GI	5.50	4/90
GS Short-Interm Govt	BP	0.00	8/88
G. T. America Growth	AG	4.75	6/87
G. T. Europe Growth Fund	IN	4.75	7/85
G. T. Global Bond Fund	BP	4.75	4/88
G. T. Global Govt Income	BP	4.75	4/88
G. T. Global Gr & Income	IN	4.75	9/90
G. T. Global Health Care	IN	4.75	8/89

Fund Name	IO	Load	Data From
G. T. Intl Growth Fund	IN	4.75	7/85
G. T. Japan Growth Fund	IN	4.75	7/85
G. T. Pacific Growth Fd	IN	4.75	9/81
G. T. Worldwide Growth	IN	4.75	6/87
Guardian Park Ave Fund	G	4.50	9/81
GW Sierra Calif Muni	MB	4.50	7/89
GW Sierra Corporate Inc	BP	4.50	7/90
GW Sierra Eq Opportunity	AG	4.50	7/90
GW Sierra Gr & Income	GI	4.50	7/89
GW Sierra National Muni	MB	4.50	7/90
GW Sierra Strategic Intl	IN	4.50	7/90
GW Sierra US Govt Secs	BP	4.50	7/89
Hancock J. Asset Alloca	B	4.50	10/88
Hancock J. Bond Fund	BP	4.50	9/81
Hancock J. Global Trust	IN	4.50	6/85
Hancock J. Govt Spectrum	BP	4.50	1/85
Hancock J. Growth Fund	G	4.50	9/81
Hancock J. Pacific Basin	IN	4.50	9/87
Hancock J. Spec Equity	AG	4.50	2/85
Hancock J. Strategic Inc	BP	4.50	8/86
Hancock J. Tax Exempt-Ca	MB	4.50	9/87
Hancock J. Tax Exempt-Ma	MB	4.50	9/87
Hancock J. Tax Exempt-Ny	MB	4.50	9/87
Hancock J. Tax ex Income	MB	4.50	9/81
Hancock J. US Govt Trust	BP	4.50	9/81
Harbor Bond Fund	BP	0.00	12/87
Harbor Capital Apprec	AG	0.00	12/87
Harbor Growth Fund	AG	0.00	11/86
Harbor International	IN	0.00	12/87
Harbor Value Fund	GI	0.00	12/87
Hartwell Emerging Growth	AG	4.75	9/81
Hartwell Growth Fund	AG	4.75	9/81
Hawaiian Tax-Free Trust	MB	4.00	3/85
Heartland USG Fund	BP	4.50	4/87
Heartland Value Fund	G	4.50	12/84
Helmsman Disciplined Eq	G	0.00	12/89
Helmsman Growth Equity	G	0.00	12/89
Helmsman Income Equity	GI	0.00	12/89

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Fund Name	IO	Load	Data From
Helmsman Income Fund	BP	0.00	12/89
Helmsman Ltd Volatility	BP	0.00	9/90
Helmsman Tx Fr Income	MB	0.00	9/90
Heritage Captl Apprec Tr	G	4.00	12/85
Heritage Diversified Inc	BP	4.00	3/90
Heritage Govt Income Tr	BP	4.00	3/90
Heritage Income Growth	GI	4.00	12/86
Highmark Income Equity	GI	0.00	6/88
Home Invs Govt Income	BP	0.00	2/85
HT Insight Equity Fund	G	4.50	2/88
Huntington Cpi+ Fund	G	3.00	1/89
Huntington Global Portf	BP	2.25	7/86
Huntington Hard Currency	BP	2.25	11/89
Huntington High Income	BP	2.25	11/89
IAI Bond Fund	BP	0.00	9/81
IAI International	IN	0.00	4/87
IAI Regional Fund	G	0.00	9/81
IAI Reserve Fund	BP	0.00	1/86
IAI Stock Fund	G	0.00	9/81
IAI Value Fund	G	0.00	12/83
Idex Fund	G	8.50	6/85
Idex Fund 3	G	8.50	4/87
Idex Fund II	AG	5.50	5/86
Idex Total Income Tr	BP	7.00	7/87
IDS Bond Fund	BP	5.00	9/81
IDS Calif Tax Exempt	MB	5.00	8/86
IDS Discovery Fund	AG	5.00	10/81
IDS Equity Plus Fd Inc.	G	5.00	9/81
IDS Extra Income	BP	5.00	11/83
IDS Federal Income Fund	BP	5.00	8/85
IDS Global Bond Fund	BP	5.00	3/89
IDS Growth Fund	G	5.00	9/81
IDS High Yield Tax ex	MB	5.00	9/81
IDS Insured Tax-Exempt	MB	5.00	8/86
IDS International Fund	IN	5.00	11/84
IDS Managed Retirement	G	5.00	1/85
IDS Mn Tax Exempt Fund	MB	5.00	8/86
IDS Mutual Fund	B	5.00	9/81

Fund Name	IO	Load	Data From
IDS New Dimensions Fund	G	5.00	9/81
IDS Ny Tx ex Fund	MB	5.00	8/86
IDS Precious Metals	ME	5.00	4/85
IDS Progressive Fund	GI	5.00	9/81
IDS Selective	BP	5.00	9/81
IDS Stock Fund	GI	5.00	9/81
IDS Strategy-Aggres Port	AG	0.00	5/84
IDS Strategy-Equity Port	GI	0.00	5/84
IDS Strategy-Income Port	BP	0.00	5/84
IDS Strategy-Short Term	BP	0.00	5/84
IDS Strategy-Worldwide	IN	0.00	4/87
IDS Tax Exempt Bond	MB	5.00	9/81
IDS Utilities Income	GI	5.00	7/88
Income Fund of America	B	5.75	9/81
Intermed Bd Fd America	BP	4.75	2/88
International Equity Fd	IN	4.50	8/84
Invest Co of America	GI	5.75	9/81
Investors Preference Inc	BP	4.00	4/87
Investors Research	G	6.75	9/81
ITB-Growth Opportunities	G	5.75	9/81
ITB-Hi Income Portfolio	BP	4.50	2/84
ITB-Massachusetts Tax Fr	MB	4.25	5/84
ITB-Premium Income Portf	BP	2.50	1/89
Ivy Growth Fund	G	0.00	9/81
Ivy Growth with Income	GI	0.00	4/84
Ivy International	IN	0.00	4/86
Janus Fund	G	0.00	9/81
Janus Twenty Fund	AG	0.00	4/85
Janus Venture Fund	G	0.00	4/85
Japan Fund	IN	0.00	1/84
JP Growth Fund	G	5.50	9/81
JP Income	BP	5.50	9/81
Kaufmann Fund	AG	0.00	2/86
Kemper Blue Chip Fund	G	5.75	11/87
Kemper Calif Tax Free	MB	4.50	7/83
Kemper Diversified Inc	BP	4.50	9/81
Kemper Enhanced Govt Inc	BP	4.50	9/87
Kemper Global Income	BP	4.50	10/89

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Fund Name	IO	Load	Data From
Kemper Growth Fund	G	5.75	9/81
Kemper High Yield Fund	BP	4.50	9/81
Kemper Inc & Cap Preserv	BP	4.50	9/81
Kemper Intl Fund	IN	5.75	9/81
Kemper Ip Diversified	BP	0.00	10/84
Kemper Ip Equity	G	0.00	2/84
Kemper Ip Government	BP	0.00	10/84
Kemper Ip High Yield	BP	0.00	2/84
Kemper Ip Total Return	GI	0.00	11/86
Kemper Muni Bond Fund	MB	4.50	9/81
Kemper New York Tax Free	MB	4.50	5/88
Kemper Summit Fund	AG	5.75	9/81
Kemper Technology Fund	G	5.75	9/81
Kemper Total Return Fund	GI	5.75	9/81
Kemper US Govt Secs	BP	4.50	9/81
Keystone Amer Eq Income	B	4.75	4/87
Keystone Amer Glbl Oppty	IN	4.75	3/88
Keystone Amer Gov Sec	BP	2.00	4/87
Keystone Amer Growth Stk	G	4.75	11/87
Keystone Amer Hiyld Bond	BP	2.00	4/87
Keystone Amer Inv Grade	BP	4.75	4/87
Keystone Amer Omega	G	4.75	9/81
Keystone Amer Txfr In	MB	2.00	4/87
Keystone Amer World Bond	BP	4.75	4/89
Keystone B-1	BP	0.00	9/81
Keystone B-2	BP	0.00	9/81
Keystone B-4	BP	0.00	9/81
Keystone Intl Fund	IN	0.00	9/81
Keystone K-1	B	0.00	9/81
Keystone K-2	G	0.00	9/81
Keystone Precious Metals	ME	0.00	9/81
Keystone S-1	G	0.00	9/81
Keystone S-3	G	0.00	9/81
Keystone S-4	AG	0.00	9/81
Keystone Tax Exempt Tr	MB	0.00	10/85
Keystone Tax Free Bond	MB	0.00	1/82
Kidder Equity Income	GI	4.00	11/85
Kidder Government Income	BP	4.00	11/85

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Fund Name	IO	Load	Data From
Kleinwort Benson Intl Eq	IN	0.00	9/81
Landmark Ny Tax Free	MB	0.00	9/86
Landmark US Government	BP	0.00	9/86
Laurel Funds Stock Portf	G	0.00	12/87
Legg Mason Inv Grade Inc	BP	0.00	8/87
Legg Mason Spec Invmt Tr	G	0.00	12/85
Legg Mason Total Ret Tr	G	0.00	11/85
Legg Mason USG Interm	BP	0.00	8/87
Legg Mason Value Trust	G	0.00	4/82
Lepercq-Istel Fund	B	0.00	9/81
Lexington Corp Leaders	GI	0.00	9/81
Lexington Global Fund	IN	0.00	3/87
Lexington GNMA New Inc	BP	0.00	9/81
Lexington Goldfund	ME	0.00	9/81
Lexington Growth & Inc.	G	0.00	9/81
Lexington Tech Strategy	G	0.00	10/87
Lexington Txex Bond Tr	MB	0.00	7/86
Lexington World Emerging	IN	0.00	9/81
Liberty High Income Bond	BP	4.50	9/81
Liberty Utility Fund	B	4.50	5/87
Limited Term Muni-Ca	MB	2.75	2/87
Limited Term Muni-Natl	MB	2.75	9/84
Limited Term US Gov	BP	2.25	11/87
Lindner Dividend Fund	B	0.00	9/81
Lindner Fund	GI	0.00	9/81
LMH Fund, Ltd.	GI	0.00	9/83
Lord Abbett Bond-Deben.	BP	4.75	9/81
Lord Abbett Dev Growth	AG	6.75	9/81
Lord Abbett Funda Value	G	6.75	7/86
Lord Abbett Global Eqty	IN	6.75	9/88
Lord Abbett Global Inc	BP	4.75	9/88
Lord Abbett Tx Free Ca	MB	4.75	9/85
Lord Abbett Tx Free Natl	MB	4.75	4/84
Lord Abbett Tx Free Ny	MB	4.75	4/84
Lord Abbett Tx Free Tx	MB	4.75	1/87
Lord Abbett US Gov Secs	BP	4.75	9/81
Lord Abbett Value Apprec	G	6.75	7/83
Lutheran Brother. Fund	G	5.00	9/81

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Fund Name	IO	Load	Data From
Lutheran Brother. Hi Yld	BP	5.00	12/86
Lutheran Brother. Income	BP	5.00	9/81
Lutheran Brother. Mun Bd	MB	5.00	9/81
Mackenzie American Fund	G	5.75	9/85
Mackenzie Ca Muni Fund	MB	4.75	6/88
Mackenzie Canada Fund	IN	5.75	11/87
Mackenzie Fixed Income	BP	4.75	8/85
Mackenzie Growth & Inc	GI	2.75	10/88
Mackenzie National Muni	MB	4.75	6/88
Mackenzie N.A. Total Ret	B	5.75	9/85
Mackenzie Ny Muni Fund	MB	4.75	6/88
Mainstay Capital Apprec	AG	0.00	5/86
Mainstay Convertible Fd	GI	0.00	5/86
Mainstay Global Fund	IN	0.00	6/87
Mainstay Gold & Prec Mtl	ME	0.00	12/87
Mainstay Gov Plus Fund	BP	0.00	5/86
Mainstay Hyld Corp Bond	BP	0.00	5/86
Mainstay Tax Free Bond	MB	0.00	5/86
Mainstay Total Return	B	0.00	12/87
Mainstay Value Fund	G	0.00	5/86
Mas-Equity Portfolio	G	0.00	11/84
Mas-Fixed Inc Portfolio	BP	0.00	11/84
Mass. Capital Devel.	G	5.75	9/81
Mass. Finl Bond	BP	4.75	9/81
Mass. Finl Development	G	5.75	9/81
Mass. Finl Emerg Growth	AG	5.75	12/81
Mass. Finl Hi Income	BP	4.75	9/81
Mass. Finl Hi Income II	BP	4.75	6/87
Mass. Finl Special	G	5.75	7/83
Mass. Finl Total Return	B	4.75	9/81
Mass. Inv. Growth Stock	AG	5.75	9/81
Mass. Inv. Trust	G	5.75	9/81
Mas-Small Cap Portfolio	G	0.00	7/86
Mas-Value Portfolio	G	0.00	11/84
Mathers Fund	B	0.00	9/81
Medical Research Invt Fd	AG	4.75	6/85
Merrill L Balanced Fd A	B	6.50	10/88
Merrill L Balanced Fd B	B	0.00	11/85

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Fund Name	IO	Load	Data From
Merrill L Basic Value A	GI	6.50	9/81
Merrill L Basic Value B	GI	0.00	10/88
Merrill L Bond-Interm Fd	BP	2.00	9/81
Merrill L Ca Muni Bd A	MB	4.00	10/88
Merrill L Ca Muni Bd B	MB	0.00	10/85
Merrill L Capital Fd A	B	6.50	9/81
Merrill L Capital Fd B	GI	0.00	10/88
Merrill L Corp Dividend	BP	2.00	4/84
Merrill L Dev Captl Mkts	IN	4.00	9/89
Merrill L Eurofund A	IN	6.50	10/88
Merrill L Eurofund B	IN	0.00	1/87
Merrill L Fd-Tomorrow A	G	6.50	10/88
Merrill L Fd-Tomorrow B	G	0.00	3/84
Merrill L Federal Secs	BP	4.00	9/84
Merrill L Global Alloc A	IN	6.50	2/89
Merrill L Global Alloc B	IN	0.00	2/89
Merrill L Global Bond A	BP	4.00	10/88
Merrill L Global Bond B	BP	0.00	9/86
Merrill L Global Conv A	IN	4.00	10/88
Merrill L Global Conv B	IN	0.00	2/88
Merrill L Growth Invt A	G	6.50	11/88
Merrill L Growth Invt B	AG	0.00	3/87
Merrill L Hi Inc Bond A	BP	4.00	9/81
Merrill L Hi Inc Bond B	BP	0.00	10/88
Merrill L Hi Qual Bond A	BP	4.00	9/81
Merrill L Hi Qual Bond B	BP	0.00	10/88
Merrill L Inst Interm	BP	0.00	11/86
Merrill L Intl A	IN	6.50	7/84
Merrill L Intl B	IN	0.00	10/88
Merrill L Muni-Bd Hyld A	MB	4.00	9/81
Merrill L Muni-Bd Hyld B	MB	0.00	10/88
Merrill L Muni-Bd Insd A	MB	4.00	9/81
Merrill L Muni-Bd Insd B	MB	0.00	10/88
Merrill L Muni Income A	MB	2.00	10/88
Merrill L Muni Income B	MB	0.00	11/86
Merrill L Muni-Ltd Mat	MB	0.75	9/81
Merrill L Nat Resource A	AG	6.50	10/88
Merrill L Nat Resource B	G	0.00	8/85

Fund Name	IO	Load	Data From
Merrill L Nj Muni Bond A	MB	4.00	8/90
Merrill L Nj Muni Bond B	MB	4.00	8/90
Merrill L Ny Muni Bond A	MB	4.00	10/88
Merrill L Ny Muni Bond B	MB	0.00	11/85
Merrill L Pacific Fund A	IN	6.50	9/81
Merrill L Pacific Fund B	IN	0.00	10/88
Merrill L Pa Muni Bond A	MB	4.00	8/90
Merrill L Pa Muni Bond B	MB	4.00	8/90
Merrill L Phoenix A	GI	6.50	11/82
Merrill L Phoenix B	GI	0.00	10/88
Merrill L Retr/Income B	BP	0.00	3/86
Merrill L Sh-Trm Globl A	BP	3.00	8/90
Merrill L Sh-Trm Globl B	BP	0.00	8/90
Merrill L Specl Value A	AG	6.50	9/81
Merrill L Specl Value B	AG	0.00	10/88
Merrill L Strateg Div A	GI	6.50	11/88
Merrill L Strateg Div B	GI	0.00	11/87
Merriman Asset Allocatn	B	0.00	5/89
Merriman Blue Chip	G	0.00	1/89
Merriman Capital Apprec	G	0.00	5/89
Merriman Timed Govt	BP	0.00	10/88
Metlife-SS Captl Apprec	AG	4.50	8/86
Metlife-SS Equity Income	GI	4.50	8/86
Metlife-SS Equity Invts	G	4.50	8/86
Metlife-SS Global Energy	IN	4.50	3/90
Metlife-SS Govt Income	BP	0.00	3/87
Metlife-SS Govt Secs	BP	4.50	9/86
Metlife-SS High Income	BP	4.50	8/86
Metlife-SS Mgd Assets	B	4.50	12/88
Metlife-SS Tax Exempt Fd	MB	4.50	8/86
MFS Gov Guaranteed Secs	BP	4.75	10/84
MFS Gov Income Plus Tr	BP	4.75	1/86
MFS Gov Premium Account	BP	3.75	12/88
MFS Lifetime Cap Growth	G	0.00	12/86
MFS Lifetime Emerging Gr	AG	0.00	12/86
MFS Lifetime Global Eqty	IN	0.00	12/86
MFS Lifetime Gold & Prec	ME	0.00	8/88
MFS Lifetime Gov In Plus	BP	0.00	12/86

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Fund Name	IO	Load	Data From
MFS Lifetime High Inc Tr	BP	0.00	12/86
MFS Lifetime Interm Inc	BP	0.00	10/88
MFS Lifetime Mgd Muni Bd	MB	0.00	12/86
MFS Lifetime Mgd Sectors	AG	0.00	12/86
MFS Lifetime Tot Return	B	0.00	12/86
MFS Managed Sectors Tr	AG	5.75	4/86
MFS Mgd Calif Tax Exempt	MB	4.75	10/85
MFS Mgd Multi-St Al Muni	MB	4.75	2/90
MFS Mgd Multi-St Ga Muni	MB	4.75	6/88
MFS Mgd Multi-St Ma Muni	MB	4.75	7/85
MFS Mgd Multi-St Md Muni	MB	4.75	10/84
MFS Mgd Multi-St Nc Muni	MB	4.75	1/85
MFS Mgd Multi-St Ny Muni	MB	4.75	6/88
MFS Mgd Multi-St Sc Muni	MB	4.75	10/84
MFS Mgd Multi-St Tn Muni	MB	4.75	10/88
MFS Mgd Multi-St Va Muni	MB	4.75	1/85
MFS Mgd Multi-St Wv Muni	MB	4.75	10/84
MFS Mgd Muni-Bd Trust	MB	4.75	9/81
MFS Mgd Muni-Bond Hiyld	MB	4.75	5/84
MFS Worldwide Govts Tr	BP	4.75	9/81
Midwest Growth Fund	AG	4.75	4/83
Midwest Interm Term Govt	BP	1.00	9/81
Midwest Ohio Insured Txf	MB	4.00	4/85
Midwest Tax-Free Interm	MB	1.00	10/81
Midwest US Govt Secs Fd	BP	4.00	6/84
Midwest US Treas Alloca	BP	4.00	1/88
Midwest Utility Income	GI	4.75	8/89
MIM Bond Income	BP	0.00	7/86
Mimlic Asset Allocation	B	5.00	11/87
Mimlic Investors Fund I	G	5.00	1/85
Mimlic Mortgage Secs Fd	BP	5.00	5/85
MIM Stock Appreciation	AG	0.00	7/87
MIM Stock Conv & Opt Gr	GI	0.00	7/86
MIM Stock Conv & Opt Inc	GI	0.00	7/86
Monetta Fund	G	0.00	5/86
Monitrend Summation Indx	G	3.50	2/88
Montgomery Small Cap	AG	0.00	7/90
M.S.B. Fund	G	0.00	9/81

Fund Name	IO	Load	Data From
Muirfield Fund	G	0.00	8/88
Mutual Beacon Fund	GI	0.00	9/81
Mutual Benefit Fund	G	4.75	9/81
Mutual of Omaha America	BP	4.75	9/81
Mutual of Omaha Growth	AG	4.75	9/81
Mutual of Omaha Income	B	4.75	9/81
Mutual of Omaha Tax Free	MB	4.75	9/81
Mutual Qualified Income	B	0.00	9/81
Mutual Shares Corp.	B	0.00	9/81
National Aviation & Tech	AG	4.75	9/81
National Industries Fund	G	0.00	9/81
National Telecommunicat	AG	4.75	1/83
Nationwide Bond Fund	BP	7.50	9/81
Nationwide Fund	G	7.50	9/81
Nationwide Growth Fund	G	7.50	9/81
Nationwide Tax Free Fund	MB	0.00	3/86
Natl Secs Bond	BP	4.75	9/81
Natl Secs Ca Tax Exempt	MB	4.75	1/84
Natl Secs Federal	BP	4.75	12/84
Natl Secs Global Alloca	IN	5.75	6/87
Natl Secs Multi-Sector	BP	4.75	12/89
Natl Secs Stock	G	5.75	9/81
Natl Secs Tax Exempt Bd	MB	4.75	9/81
Natl Secs Total Income	B	5.75	9/81
Natl Secs Total Return	GI	5.75	9/81
Natl Secs World Opporty	IN	5.75	9/81
Nautilus Fund	AG	4.75	9/81
Neuberger B. Genesi Fd	G	0.00	9/88
Neuberger B. Guardian	G	0.00	9/81
Neuberger B. Ltd Bd	BP	0.00	6/86
Neuberger B. Manhattan	G	0.00	9/81
Neuberger B. Partners	GI	0.00	9/81
Neuberger B. Sel Sectors	G	0.00	9/81
Neuwirth Fund	G	0.00	9/81
New Alternatives Fund	G	5.66	9/82
New Economy Fund	G	5.75	11/83
New England Balanced Fd	B	6.50	9/81
New England Bond Income	BP	4.50	9/81

Fund Name	IO	Load	Data From
New England Global Govt	BP	4.50	4/88
New England Gov Security	BP	4.50	9/85
New England Growth Fund	AG	6.50	9/81
New England Retir Equity	G	6.50	9/81
New England Txex Income	MB	4.50	9/81
New Perspective Fund	IN	5.75	9/81
Newport Tiger Fund	IN	5.00	6/89
Newton Growth Fund	G	0.00	9/81
Newton Income Fund	BP	0.00	9/81
New York Venture Fund	G	4.75	9/81
Nicholas Fund	G	0.00	9/81
Nicholas II	G	0.00	10/83
Nicholas Income Fund	BP	0.00	9/81
Nicholas Limited Edition	G	0.00	5/87
Noddings Conv Strategies	GI	3.00	7/85
Nomura Pacific Basin Fd	IN	0.00	7/85
North Amer Sec-Aggress	B	4.75	7/88
North Amer Sec-Conserv	B	4.75	10/86
North Amer Sec-Grow Port	G	4.75	10/86
North Amer Sec-Mod Asset	B	4.75	10/86
North Amer Sec-USG Bond	BP	4.75	4/87
Northeast Inv Growth	G	0.00	9/81
Northeast Inv Trust	BP	0.00	9/81
Nuveen Ca Tx-Fr Insured	MB	4.75	7/86
Nuveen Ca Tx-Fr Special	MB	4.75	7/86
Nuveen Municipal Bond	MB	4.75	9/81
Nuveen Tx-Fr Mass Insd	MB	4.75	12/86
Nuveen Tx-Fr Mass Specl	MB	4.75	12/86
Nuveen Tx-Fr Natl Insd	MB	4.75	12/86
Nuveen Tx-Fr Ny Insured	MB	4.75	12/86
Nuveen Tx-Fr Ny Special	MB	4.75	12/86
Nuveen Tx-Fr Ohio Specl	MB	4.75	12/86
Oberweis Emerging Growth	AG	4.00	1/87
Old Dominion Invts Tr	GI	5.75	9/81
Olympic Balanced Income	B	0.00	8/85
Olympic Equity Income Fd	GI	0.00	6/87
Olympic Small Cap Fund	AG	0.00	9/85
Olympus Equity plus	G	4.25	5/86

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Fund Name	IO	Load	Data From
Olympus Tx ex High Yield	MB	4.25	9/87
Oppenheimer Asset Alloca	B	5.75	4/87
Oppenheimer Blue Chip Fd	G	5.75	9/86
Oppenheimer Calif Tx ex	MB	4.75	11/88
Oppenheimer Champion Hi	BP	4.75	10/87
Oppenheimer Discovery Fd	G	5.75	9/86
Oppenheimer Equity Inc.	B	5.75	9/81
Oppenheimer Fund	G	5.75	9/81
Oppenheimer Glbl Biotech	IN	5.75	12/87
Oppenheimer Glbl Environ	IN	5.75	3/90
Oppenheimer Global Fund	IN	5.75	9/81
Oppenheimer GNMA	BP	4.75	9/86
Oppenheimer Gold & Spec.	ME	5.75	7/83
Oppenheimer High Yield	BP	4.75	9/81
Oppenheimer Invest Grade	BP	4.75	4/88
Oppenheimer Ny Tx Exempt	MB	4.75	1/85
Oppenheimer Special Fund	G	5.75	9/81
Oppenheimer Strat Income	BP	4.75	10/89
Oppenheimer Target Fund	G	5.75	9/81
Oppenheimer Tax Free Bd	MB	4.75	7/82
Oppenheimer Time Fund	G	5.75	9/81
Oppenheimer Total Return	GI	5.75	9/81
Oppenheimer US Govt Tr	BP	4.75	8/85
Oppenheimer Value Stock	GI	5.75	4/88
Overland Express Alloca	B	4.50	4/88
Overland Express Ca Txfr	MB	4.50	10/88
Overland Express US Govt	BP	4.50	4/88
Over-The-Counter Sec.	G	5.75	9/81
Pacifica Asset Preservtn	BP	4.50	7/90
Pacifica Balanced Fund	B	4.50	6/90
Pacifica Ca Tax Free	MB	4.50	7/90
Pacifica Growth Fund	G	4.50	6/90
Pacifica Income Fund	BP	4.50	7/90
Pacific Horizon Aggre Gr	AG	4.50	3/84
Pacific Horizon Cal Tax	MB	4.50	3/84
Pacific Horizon US Govt	BP	4.50	1/88
Parkstone Bond Fund	BP	4.50	10/88
Parkstone Equity Fund	G	4.50	10/88

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Fund Name	IO	Load	Data From
Parkstone High Inc Eqty	GI	4.50	10/88
Parkstone Interm Govt	BP	4.50	10/88
Parkstone Ltd Maturity	BP	4.50	10/88
Parkstone Mich Muni Bd	MB	4.50	7/90
Parkstone Muni Bond	MB	4.50	10/88
Parkstone Small Cap Valu	G	4.50	10/88
Parnassus Fund	AG	3.50	5/85
Pasadena Fundamental Val	B	5.50	6/87
Pasadena Growth	AG	5.50	6/86
Pax World Fund	B	0.00	9/81
PBHG Growth Fund	AG	4.75	12/85
Penn Square Mutual Fund	GI	4.75	9/81
Pennsylvania Mutual Fund	G	0.00	9/81
Permanent Portfolio	B	0.00	12/82
Permanent Portf T-Bill	BP	0.00	9/87
Perritt Capital Growth	G	0.00	5/88
Philadelphia Fund	GI	0.00	9/81
Phoenix Balanced Fd Ser	B	4.75	9/81
Phoenix Capital Apprec	G	4.75	10/89
Phoenix Convertible Fund	GI	4.75	9/81
Phoenix Growth Fund Ser	GI	4.75	9/81
Phoenix High Quality Fd	BP	4.75	10/82
Phoenix High Yield	BP	4.75	9/81
Phoenix International	IN	4.75	10/89
Phoenix Stock Fund	G	4.75	9/81
Phoenix Tax Exempt Bond	MB	4.75	7/88
Phoenix Total Return Fd	B	4.75	9/81
Pilgrim Corp Utilities	GI	3.00	3/83
Pilgrim GNMA	BP	4.75	8/84
Pilgrim High Yield Fund	BP	4.75	9/81
Pilgrim Magnacap Fund	G	4.75	9/81
Pilgrim Sh-Trm Multi Mkt	BP	3.50	7/90
Pimit Low Duration	BP	0.00	5/87
Pimit Total Return	BP	0.00	5/87
Pine Street Fund	GI	0.00	9/81
Pioneer Bond Fund	BP	4.50	9/81
Pioneer Fund	G	5.75	9/81
Pioneer II	G	5.75	9/81

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Fund Name	IO	Load	Data From
Pioneer Muni Bond Fund	MB	4.50	10/86
Pioneer Three	G	5.75	1/83
Piper Jaffray Balanced	B	4.00	3/87
Piper Jaffray Gov Income	BP	4.00	3/87
Piper Jaffray Inst Gov	BP	1.50	8/88
Piper Jaffray Minn Tx ex	MB	4.00	8/88
Piper Jaffray Natl Tx ex	MB	4.00	8/88
Piper Jaffray Sector Fd	G	4.00	3/87
Piper Jaffray Value Fund	G	4.00	3/87
Plymouth Europe Portf	IN	4.75	5/90
Plymouth Globl Natrl Res	IN	4.00	12/87
Plymouth Govt Securities	BP	4.00	1/87
Plymouth Gr Opportunity	AG	4.75	11/87
Plymouth High Inc Muni	MB	4.75	9/87
Plymouth High Yield	BP	4.75	1/87
Plymouth Income & Growth	B	4.75	1/87
Plymouth Short-Term Bond	BP	1.50	10/87
Plymouth Spec Situations	GI	4.75	1/84
PNC Capital Appreciation	G	4.50	10/89
PNC Managed Income	BP	4.50	10/89
Portico Bond Immdex	BP	0.25	1/90
Portico Equity Index	G	0.25	12/89
Portico Income & Growth	GI	0.00	1/90
Portico Sh-Interm Fx Inc	BP	0.00	1/90
Portico Special Growth	G	0.00	12/89
Price Rowe Calif Tax-Fr	MB	0.00	9/86
Price Rowe Captl Apprec	GI	0.00	6/86
Price Rowe Equity Income	GI	0.00	11/85
Price Rowe European Stk	IN	0.00	2/90
Price Rowe GNMA Fund	BP	0.00	11/85
Price Rowe Growth&Income	GI	0.00	12/82
Price Rowe Growth Stock	G	0.00	9/81
Price Rowe High Yield Bd	BP	0.00	1/85
Price Rowe Intl Bond	BP	0.00	9/86
Price Rowe Intl Discover	IN	0.00	12/88
Price Rowe Intl Stock	IN	0.00	9/81
Price Rowe Md Tax Free	MB	0.00	3/87
Price Rowe New America	AG	0.00	10/85

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Fund Name	IO	Load	Data From
Price Rowe New Era	G	0.00	9/81
Price Rowe New Horizon	AG	0.00	9/81
Price Rowe New Income	BP	0.00	9/81
Price Rowe Science Tech	AG	0.00	9/87
Price Rowe Sh-Int Tax Fr	MB	0.00	12/83
Price Rowe Sh-Term Bond	BP	0.00	3/84
Price Rowe Small Cap Fd	G	0.00	6/88
Price Rowe Tax Free Inc	MB	0.00	9/81
Price Rowe Tax Fr Hiyld	MB	0.00	1/85
Primary Trend Fund	GI	0.00	9/86
Prime Value Govt Income	BP	4.50	12/88
Prime Value Growth Stock	G	0.00	1/88
Prime Value Mn Muni Bond	MB	0.00	1/88
Principal Presv Div Achv	G	4.50	1/87
Principal Presv Gov Port	BP	4.50	1/86
Principal Presv Insd Tx	MB	4.50	9/86
Principal Presv S&P100	G	4.50	1/86
Principal Presv Tax-Ex	MB	4.50	8/84
Princor Aggressive Grwth	G	5.00	10/87
Princor Bond Fund	BP	5.00	10/87
Princor Cap Accumulation	G	5.00	9/81
Princor Gov Secs Income	BP	5.00	6/85
Princor Growth Fd, Inc.	AG	5.00	9/81
Princor High Yield Fund	BP	5.00	10/87
Princor Managed Fund	B	5.00	10/87
Princor Tax-Exempt Bond	MB	5.00	1/86
Princor World Fund	IN	5.00	1/84
Providentmutual Growth	G	6.00	9/81
Providentmutual Invt Shs	G	6.00	9/81
Providentmutual Pa Tx Fr	MB	4.50	9/86
Providentmutual Totl Ret	B	6.00	9/81
Providentmutual Txfr Bd	MB	4.50	10/84
Providentmutual USG	BP	4.50	9/86
Providentmutual Valu Shs	G	6.00	9/81
Providentmutual World	IN	6.00	5/85
Prudential Eqty Income B	G	0.00	1/87
Prudential Equity Fund B	G	0.00	3/82
Prudential Flexi-Consv B	B	0.00	9/87

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Fund Name	IO	Load	Data From
Prudential Flex-Strtgy B	B	0.00	9/87
Prudential Global Fund B	IN	0.00	5/84
Prudential GNMA Fund B	BP	0.00	4/82
Prudential Gov Plus B	BP	0.00	5/85
Prudential Govt Secs	BP	0.00	9/82
Prudential Grwth Oppty B	AG	0.00	9/81
Prudential High Yield B	BP	0.00	9/81
Prudential Invertible B	B	0.00	12/85
Prudential Natl Muni B	MB	0.00	7/85
Prudential Option Grw B	G	0.00	4/83
Prudential Research Fd B	G	0.00	6/83
Prudential US Govt Fd B	BP	0.00	12/86
Prudential Utility Fd B	GI	0.00	10/81
Prudent Speculator Levgd	AG	0.00	7/87
Putnam Adj Rate USG Fd	BP	4.75	1/88
Putnam Ca Tx Exempt	MB	4.75	1/84
Putnam Convert Inc-Gr Tr	GI	5.75	9/81
Putnam Corp Asset Trust	BP	2.50	1/84
Putnam Diversified Inc	BP	4.75	9/88
Putnam Dividend Growth	GI	5.75	2/90
Putnam Energy Resources	G	5.75	9/81
Putnam Fd for Growth/Inc	GI	5.75	9/81
Putnam George Fund	B	5.75	9/81
Putnam Global Gov Income	BP	4.75	5/87
Putnam Global Growth	IN	5.75	9/81
Putnam GNMA Plus	BP	4.75	5/86
Putnam Health Sciences	G	5.75	6/82
Putnam High Income Gov	BP	6.75	3/85
Putnam High Yield	BP	6.75	9/81
Putnam High Yield II	BP	6.75	3/86
Putnam Income Fund	BP	4.75	9/81
Putnam Infor Sciences	AG	5.75	7/83
Putnam Investors Fund	G	5.75	9/81
Putnam Mass Tx Exempt	MB	0.00	10/86
Putnam Mass Tx Exempt II	MB	4.75	11/89
Putnam Mich Tx Exempt	MB	0.00	10/86
Putnam Mich Tx Exempt II	MB	4.75	11/89
Putnam Minn Tx Exempt	MB	0.00	10/86

Fund Name	IO	Load	Data From
Putnam Minn Tx Exempt II	MB	4.75	11/89
Putnam Nj Tax Free	MB	4.75	2/90
Putnam Ny Tax Exempt	MB	4.75	1/84
Putnam Ohio Tx Exempt	MB	0.00	10/86
Putnam Ohio Tx Exempt II	MB	4.75	11/89
Putnam Option Income II	GI	6.75	5/85
Putnam OTC Emerging Gr	AG	5.75	10/82
Putnam Pa Tax Exempt	MB	4.75	7/89
Putnam Strategic Income	G	5.75	9/81
Putnam Tax Exempt Inc	MB	4.75	9/81
Putnam Tx-Fr High Inc	MB	4.75	5/89
Putnam Tx-Fr High Yld	MB	0.00	8/85
Putnam Tx-Fr Insured	MB	0.00	8/85
Putnam U.S. Gov Income	BP	4.75	1/84
Putnam Vista Fund	G	5.75	9/81
Putnam Voyager Fund	AG	5.75	9/81
PW Asset Allocation B	B	0.00	12/86
PW Atlas Global Growth A	IN	4.50	1/84
PW Blue Chip Growth B	G	0.00	7/86
PW Calif Tax-Free A	MB	4.00	9/85
PW Dividend Growth A	GI	4.50	1/84
PW Europe Growth A	IN	4.50	1/90
PW Global Energy B	IN	0.00	9/87
PW Global Gr/Income A	IN	4.50	5/89
PW Global Income B	BP	0.00	3/87
PW Growth Fund A	AG	4.50	3/85
PW High Income Fund A	BP	4.00	8/84
PW Income Fund B	BP	0.00	3/86
PW Investment Grade A	BP	4.00	8/84
PW Muni High Income A	MB	4.00	6/87
PW National Tax-Free A	MB	4.00	12/84
PW N.Y. Tax-Free A	MB	4.00	9/88
PW Regional Finl Gr A	G	4.50	4/90
PW USG Income Fd A	BP	4.00	8/84
Quest for Value Fund	G	5.50	9/81
Quest for Value Globl Eq	IN	5.50	6/90
Quest for Value Govt Inc	BP	4.75	5/88
Rainbow Fund	G	0.00	9/81

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Fund Name	IO	Load	Data From
Ray Equity Income Trust	G	4.75	8/86
RBB Safeguard Balanced	B	5.00	10/88
RBB Safeguard Eq Gr & In	GI	4.75	10/88
RBB Safeguard Fixed Inc	BP	5.00	10/88
RBB Safeguard Tax-Free	MB	5.00	10/88
Rea Graham Balanced Fund	B	4.75	8/82
Reich & Tang Equity Fund	G	0.00	1/85
Retirement Planning-Bond	BP	0.00	5/84
Retirement Planning-Eq	AG	0.00	5/84
Rightime Blue Chip Fund	G	4.75	7/87
Rightime Fund	G	0.00	9/85
Rightime Gov Securities	BP	4.75	12/86
Rightime Growth Fund	G	4.75	6/88
Rightime Social Awarenes	G	4.75	3/90
Robertson Stephens Em Gr	AG	0.00	11/87
Rochester Convert Fund	GI	3.25	6/86
Rochester Fd Municipals	MB	4.00	6/86
Rochester Tax Managed Fd	G	8.50	9/81
Rodney Sq Intl Equity	IN	5.75	11/87
Rodney Sq Multi-Mg Gr&In	GI	5.75	3/87
Rodney Sq Multi-Mg Grow	G	5.75	3/87
Royce Fund-Equity Income	GI	2.50	1/90
Royce Fund-Value Series	G	2.50	12/82
Rushmore Maryland Tax Fr	MB	0.00	1/84
Rushmore Nova	G	0.00	12/89
Rushmore OTC Index plus	AG	0.00	12/85
Rushmore Precious Metals	ME	0.00	8/89
Rushmore Stock Mkt plus	G	0.00	12/85
Rushmore USG Intermed	BP	0.00	12/85
Rushmore USG Long-Term	BP	0.00	12/85
Rushmore Virginia Tax Fr	MB	0.00	1/84
Safeco Equity Fund	G	0.00	9/81
Safeco Growth Fund	AG	0.00	9/81
Safeco Income Fund	GI	0.00	9/81
Safeco Municipal Bond Fd	MB	0.00	1/82
Salem Growth Invt Shares	GI	4.00	3/85
Salomon Capital Fund	AG	5.00	9/81
Salomon Investors Fund	G	5.00	9/81

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Fund Name	IO	Load	Data From
Salomon Opportunity Fund	G	0.00	9/81
SAM Small-Cap Fund	G	0.00	12/88
SAM Value Trust	G	0.00	4/87
SBSF Growth Fund	GI	0.00	10/83
Schield Aggress Growth	G	4.00	9/85
Schield Value Portfolio	G	4.00	9/85
Schroder U.S. Equity Fd	G	0.00	9/81
Sci-Tech Holdings Cl A	G	6.50	4/83
Sci-Tech Holdings Cl B	G	0.00	10/88
Scudder Calif Tax Free	MB	0.00	2/84
Scudder Capital Growth	AG	0.00	9/81
Scudder Development Fund	AG	0.00	9/81
Scudder Global	IN	0.00	8/86
Scudder GNMA	BP	0.00	7/85
Scudder Gold Fund	ME	0.00	9/88
Scudder Growth & Income	GI	0.00	9/81
Scudder Income Fund	BP	0.00	9/81
Scudder International Bd	BP	0.00	6/88
Scudder International Fd	IN	0.00	9/81
Scudder Managed Muni Bd	MB	0.00	9/81
Scudder Medium-Term Txfr	MB	0.00	4/83
Scudder New York Tax Fr	MB	0.00	7/83
Scudder Sh-Term Bond	BP	0.00	3/84
Scudder Tx Fr Targt 1993	MB	0.00	4/83
Seafirst Asset Allocatn	B	0.00	3/88
Seafirst Blue Chip	G	0.00	3/88
Seafirst Bond Fund	BP	0.00	3/88
Security Action Fund	AG	8.50	9/82
Security Equity Fund	G	5.75	9/81
Security Inc Fd-Corp Bd	BP	4.75	9/81
Security Inc Fd-Govt	BP	4.75	8/85
Security Inc Fd-Hi Yield	BP	4.75	8/86
Security Investment Fund	B	5.75	9/81
Security Tax Exempt Fund	MB	4.75	1/84
Security Ultra Fund	AG	5.75	9/81
SEI Bond Index Portfolio	BP	0.00	5/86
SEI Capital Appreciation	G	0.00	3/88
SEI Capital Growth	G	0.00	1/90

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Fund Name	IO	Load	Data From
SEI Equity Income	GI	0.00	6/88
SEI GNMA	BP	0.00	3/87
SEI Intermediate-Trm Gov	BP	0.00	2/87
SEI Intermediate-Trm Mun	MB	0.00	9/89
SEI International Trust	IN	0.00	12/89
SEI Ltd Volatility Bond	BP	0.00	4/87
SEI Pa Tax Exempt Fund	MB	0.00	9/89
SEI Short-Term Gov Portf	BP	0.00	2/87
SEI S&P 500 Index Portf	G	0.00	7/85
SEI Value Portfolio	G	0.00	5/87
Selected American Shares	G	0.00	9/81
Selected Special Shares	G	0.00	9/81
Seligman Capital Fund	AG	4.75	9/81
Seligman Common Stock Fd	G	4.75	9/81
Seligman Communications	AG	4.75	7/83
Seligman Gov Guaranteed	BP	4.75	4/85
Seligman Growth Fund	G	4.75	9/81
Seligman High Yield Bond	BP	4.75	3/85
Seligman Income Fund	B	4.75	9/81
Seligman Secured Mtg	BP	4.75	3/85
Seligman Tx ex Cal High	MB	4.50	5/85
Seligman Tx ex Cal Qual	MB	4.50	5/85
Seligman Tx ex Colorado	MB	4.75	5/86
Seligman Tx ex Florida	MB	4.75	11/86
Seligman Tx ex Georgia	MB	4.75	6/87
Seligman Tx ex Louisiana	MB	4.75	10/85
Seligman Tx ex Maryland	MB	4.75	10/85
Seligman Tx ex Mass	MB	4.75	5/84
Seligman Tx ex Michigan	MB	4.75	8/84
Seligman Tx ex Minnesota	MB	4.75	12/83
Seligman Tx ex Missouri	MB	4.75	7/86
Seligman Tx ex National	MB	4.75	8/84
Seligman Tx ex New York	MB	4.75	5/84
Seligman Tx ex NJ	MB	4.75	2/88
Seligman Tx ex Ohio	MB	4.75	12/83
Seligman Tx ex Oregon	MB	4.75	10/86
Seligman Tx ex Penn Qual	MB	4.75	7/86
Seligman Tx ex Scc	MB	4.75	6/87

Fund Name	IO	Load	Data From
Sentinel Balanced Fund	B	8.50	9/81
Sentinel Bond	BP	5.25	9/81
Sentinel Common Stock Fd	GI	8.50	9/81
Sentinel Gov Securities	BP	5.25	9/86
Sentinel Growth Fund	G	5.25	9/81
Sentry Fund	G	0.00	9/81
Sequoia Fund	GI	0.00	9/81
Shadow Stock Fund	G	0.00	10/87
Shearson 1990's Fund	G	5.00	2/90
Shearson Aggress Growth	AG	5.00	10/83
Shearson Appreciation Fd	G	5.00	9/81
Shearson Arizona Muni Fd	MB	5.00	6/87
Shearson Calif Muni Fund	MB	5.00	4/84
Shearson Convert Portf	B	0.00	9/86
Shearson Directions Valu	G	0.00	3/85
Shearson Diversified Str	BP	0.00	12/89
Shearson European Portf	IN	0.00	11/87
Shearson Fundamntl Value	G	5.00	11/81
Shearson Global Bd Portf	BP	0.00	10/86
Shearson Global Equity	IN	0.00	11/87
Shearson Global Oppty Fd	IN	5.00	7/84
Shearson Gov Secs Portf	BP	0.00	3/84
Shearson Growth & Oppty	G	0.00	3/86
Shearson Growth Portf	GI	0.00	1/82
Shearson High Yield Fund	BP	5.00	9/81
Shearson Hi Inc Portf	BP	0.00	9/86
Shearson Interm Gov Port	BP	0.00	9/85
Shearson Inv Grade Bond	BP	0.00	1/82
Shearson Managed Govts	BP	5.00	9/84
Shearson Managed Muni	MB	5.00	9/81
Shearson Mass Muni Fund	MB	5.00	12/87
Shearson Mortgage Portf	BP	0.00	11/85
Shearson Multi Oppty	G	0.00	3/87
Shearson New Jersey Muni	MB	5.00	4/88
Shearson New York Muni	MB	5.00	1/84
Shearson Option Inc Port	GI	0.00	9/85
Shearson Prec Metals	ME	0.00	3/85
Shearson Prec Metl & Min	ME	5.00	11/86

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Fund Name	IO	Load	Data From
Shearson Princpl Retn 96	B	0.00	1/89
Shearson Sector Analysis	GI	0.00	8/87
Shearson Short-Trm World	BP	3.00	6/90
Shearson Small Capital	AG	5.00	12/87
Shearson Special Equity	G	0.00	12/82
Shearson Spec Intl Eqty	IN	0.00	3/86
Shearson Strategic Invts	B	0.00	2/87
Shearson Tax-Ex Inc	MB	0.00	9/85
Shearson Telecomm Growth	G	5.00	1/84
Shearson Telecomm Income	GI	5.00	1/84
Shearson Utilities Portf	GI	0.00	3/88
Sheffield Intermed Bond	BP	0.00	7/90
Sheffield Total Return	G	0.00	7/90
Sherman, Dean Fund	AG	0.00	9/81
SIT New Beginning Growth	AG	0.00	10/81
Skyline Fd Balanced	B	3.85	4/87
Skyline Fd Special Eq	AG	3.85	4/87
Smallcap World Fund Inc	IN	5.75	4/90
Smith, Barney Ca Muni	MB	4.00	4/87
Smith, Barney Equity	G	4.50	9/81
Smith, Barney Inc. & Gr.	GI	4.50	9/81
Smith, Barney Income Rtn	BP	1.50	2/85
Smith, Barney Ltd Muni	MB	2.00	11/88
Smith, Barney Mthly Gov	BP	4.00	3/86
Smith, Barney Natl Muni	MB	4.00	8/86
Smith, Barney Ny Muni	MB	4.00	1/87
Smith, Barney USG Secs	BP	4.00	10/84
Sogen International Fund	IN	3.75	9/81
Sound Shore Fund Inc	GI	0.00	5/85
Southeastern Growth Fund	AG	0.00	4/85
Sovereign Investors	GI	5.00	9/81
State Bond Common Stock	G	4.75	9/81
State Bond Diversified	GI	4.75	9/81
State Bond Progress Fund	G	4.75	9/81
State Farm Balanced	B	0.00	9/81
State Farm Growth Fund	G	0.00	9/81
State Street Growth	G	0.00	9/81
State Street Inv. Corp.	G	4.50	9/81

Fund Name	IO	Load	Data From
Steadman American Indus.	AG	0.00	9/81
Steadman Associated	AG	0.00	9/81
Steadman Investment	AG	0.00	9/81
Steadman Oceanographic	AG	0.00	9/81
Steinroe Cap Opportunity	AG	0.00	9/81
Steinroe Government Inc	BP	0.00	3/86
Steinroe High-Yield Muni	MB	0.00	3/84
Steinroe Income Fund	BP	0.00	3/86
Steinroe Intermediate Bd	BP	0.00	3/82
Steinroe Intermed Muni	MB	0.00	10/85
Steinroe Intl Growth Fd	IN	0.00	10/87
Steinroe Managed Muni Fd	MB	0.00	9/81
Steinroe Prime Equities	G	0.00	3/87
Steinroe Special Fund	G	0.00	9/81
Steinroe Stock Fund	G	0.00	9/81
Steinroe Total Return Fd	B	0.00	9/81
Strategic Gold/Minerals	ME	8.50	7/88
Strategic Investments	ME	8.50	9/81
Strategic Silver	ME	8.50	4/85
Stratton Growth Fund	GI	0.00	9/81
Stratton Monthly Div Shs	B	0.00	9/81
Strong Common Stock Fund	G	2.00	12/89
Strong Discovery Fund	G	2.00	12/87
Strong Income Fund	BP	0.00	12/85
Strong Investment Fund	B	1.00	12/81
Strong Muni Fund	MB	0.00	10/86
Strong Opportunity Fund	GI	2.00	12/85
Strong Total Return Fund	B	1.00	12/81
Sunamerica Aggressive Gr	AG	5.75	1/87
Sunamerica Balncd Assets	B	0.00	4/85
Sunamerica Calif Muni Fd	MB	4.75	3/88
Sunamerica Captl Apprec	AG	0.00	3/85
Sunamerica Convert Secs	GI	4.75	2/87
Sunamerica Emerging Gr	AG	0.00	3/86
Sunamerica Govt Income	BP	4.75	2/87
Sunamerica Growth Fund	G	5.75	1/87
Sunamerica High Income	BP	0.00	3/86
Sunamerica High Yield	BP	4.75	9/86

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Fund Name	IO	Load	Data From
Sunamerica Income plus	BP	0.00	9/86
Sunamerica Ins Tx-Stripe	MB	4.75	11/85
Sunamerica Total Return	B	5.75	11/87
Sunamerica US Gov Secs	BP	0.00	3/86
Sunshine Growth Trust	AG	0.00	7/86
Tax Exempt Bd Fd/America	MB	4.75	9/81
Tax-Free Fd of Colorado	MB	4.00	5/87
Tax-Free Trust Arizona	MB	4.00	3/86
Tax-Free Trust of Oregon	MB	4.00	6/86
Templeton Foreign Fund	IN	8.50	9/82
Templeton Growth Fund	IN	8.50	9/81
Templeton Income Fund	BP	4.50	9/86
Templeton Real Est Secs	GI	8.50	9/89
Templeton Smaller Co Grw	IN	8.50	9/81
Templeton Value Fund	IN	8.50	10/88
Templeton World Fund	IN	8.50	9/81
Thomson Global Fund B	IN	0.00	8/86
Thomson Growth Fund B	G	0.00	1/84
Thomson Income Fund B	BP	0.00	3/84
Thomson Opportunity Fd B	AG	0.00	3/84
Thomson Tx Exempt Fund B	MB	0.00	11/85
Thomson US Govt Fund B	BP	0.00	9/85
Tocqueville Fund	B	0.00	1/87
Tower Capl Appreciation	G	4.50	11/88
Tower US Gov Income	BP	4.50	11/88
Transamerica Cap Appre A	AG	4.75	9/85
Transamerica Ca Tx Fr A	MB	4.75	12/89
Transamerica Govt Inc A	BP	2.50	1/86
Transamerica Govt Secs A	BP	4.75	1/85
Transamerica Gr & Inc A	GI	4.75	9/81
Transamerica Inv Qual A	BP	4.75	9/81
Transamerica Sp Blue B	G	0.00	1/87
Transamerica Sp Emrg B	AG	0.00	10/87
Transamerica Sp Govt B	BP	0.00	1/88
Transamerica Sp Hiyld B	BP	0.00	10/87
Transamerica Sp Hy Tx B	MB	0.00	8/86
Transamerica Sp Nat B	G	0.00	10/87
Transamerica Sunbelt Gr	G	4.75	1/82

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Fund Name	IO	Load	Data From
Transamerica Txfr Bond A	MB	4.75	1/90
Trustees Comm Eq-Intl	IN	0.00	5/83
Trustees Comm Eq-US Port	G	0.00	9/81
Twentieth Cent Balanced	B	0.00	10/88
Twentieth Cent Giftrust	AG	0.00	11/83
Twentieth Cent Growth	AG	0.00	9/81
Twentieth Cent Heritage	G	0.00	11/87
Twentieth Cent Long Bond	BP	0.00	3/87
Twentieth Cent Select	G	0.00	9/81
Twentieth Cent Txex Int	MB	0.00	3/87
Twentieth Cent Txex Long	MB	0.00	3/87
Twentieth Cent Ultra	AG	0.00	11/81
Twentieth Cent US Gov	BP	0.00	12/82
Twentieth Cent Vista	AG	0.00	11/83
UMB Bond Fund	BP	0.00	12/82
UMB Stock Fund	GI	0.00	12/82
Unified Growth Fund	G	4.50	9/81
Unified Income Fund	B	4.50	10/82
Unified Muni Fd-Indiana	MB	4.50	4/85
Unified Mutual Shares	GI	4.50	9/81
United Accumulative Fund	GI	8.50	9/81
United Bond Fund	BP	8.50	9/81
United Contl. Income Fd.	GI	8.50	9/81
United Gold & Government	ME	8.50	9/85
United Gov Securities Fd	BP	4.25	5/84
United High Income Fund	BP	8.50	9/81
United High Income II	BP	8.50	7/86
United Income Fund	G	8.50	9/81
United Intl. Growth Fund	IN	8.50	9/81
United Municipal Bond Fd	MB	4.25	9/81
United Muni High Income	MB	4.25	1/86
United New Concepts Fund	AG	8.50	6/83
United Retirement Shares	B	8.50	9/81
United Science & Energy	G	8.50	9/81
United Vanguard Fund	G	8.50	9/81
USAA Aggressive Growth	AG	0.00	3/82
USAA Balanced Portfolio	B	0.00	1/89
USAA Calif Bond Fund	MB	0.00	8/89

APPENDIX A   (Continued)

Fund Name	IO	Load	Data From
USAA Cornerstone Fund	GI	0.00	8/84
USAA Gold Fund	ME	0.00	8/84
USAA Income Stock Fund	GI	0.00	5/87
USAA International Fund	IN	0.00	7/88
USAA Mutual Fd Growth	G	0.00	9/81
USAA Mutual Fd Income	BP	0.00	9/81
USAA Tax ex High Yield	MB	0.00	3/82
USAA Tax ex Intermediate	MB	0.00	3/82
USAA Tax ex Sh-Term Fund	MB	0.00	3/82
US All American Equity	G	0.00	9/81
US Boston Foreign Gr	IN	0.00	8/87
US Boston Growth & Inc	G	0.00	5/85
US European Fund	IN	0.00	2/85
US Global Resources Fund	ME	0.00	8/83
US Gold Shares Fund	ME	0.00	9/81
U.S. Gov Guaranteed Secs	BP	4.75	10/85
US Growth Fund	AG	0.00	8/83
US Income Fund	GI	0.00	11/83
US Real Estate Fund	GI	0.00	7/87
US Tax Free Fund	MB	0.00	11/84
UST Master Equity Fund	G	4.50	3/86
UST Master Income & Gr	GI	4.50	1/87
UST Master International	IN	4.50	7/87
UST Master Managed Inc	BP	4.50	2/86
UST Master Tax ex Interm	MB	4.50	1/86
UST Master Tax ex Long	MB	4.50	3/86
U.S. Trend Fund, Inc.	G	4.75	9/81
US World Gold	ME	0.00	11/85
Valley Forge Fund	GI	0.00	9/81
Value Line Aggres Inc Tr	BP	0.00	2/86
Value Line Convertible	GI	0.00	6/85
Value Line Fund	G	0.00	9/81
Value Line Income	B	0.00	9/81
Value Line Leverage Gr	G	0.00	9/81
Value Line Spl Situation	AG	0.00	9/81
Value Line Tx ex Hi Yld	MB	0.00	1/85
Value Line US Gov Secs	BP	0.00	1/82
Van Eck Gold/Resources	ME	6.70	2/86

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Fund Name	IO	Load	Data From
Van Eck Intl Investors	ME	8.50	9/81
Van Eck World Income	BP	4.75	5/87
Van Eck World Trends	IN	5.75	9/85
Vanguard Asset Alloc Fd	B	0.00	11/88
Vanguard Bond Mkt Fund	BP	0.00	12/86
Vanguard Calif Ins Tx Fr	MB	0.00	4/86
Vanguard Convertible Sec	GI	0.00	6/86
Vanguard Equity Income	GI	0.00	3/88
Vanguard Explorer Fund	AG	0.00	9/81
Vanguard Fi Inc GNMA	BP	0.00	9/81
Vanguard Fi Inc Hi Yield	BP	0.00	9/81
Vanguard Fi Inc Inv Grad	BP	0.00	9/81
Vanguard Fi Inc Treasury	BP	0.00	5/86
Vanguard Fi Secs Sh-Term	BP	0.00	10/82
Vanguard Fi Sh-Gov Bond	BP	0.00	12/87
Vanguard Index 500 Fund	G	0.00	9/81
Vanguard Index-Europe	IN	0.00	6/90
Vanguard Index Extnd Mkt	G	0.00	12/87
Vanguard Index-Pacific	IN	0.00	6/90
Vanguard Morgan Growth	G	0.00	9/81
Vanguard Muni High Yield	MB	0.00	9/81
Vanguard Muni Insured Lt	MB	0.00	10/84
Vanguard Muni Interm-Trm	MB	0.00	9/81
Vanguard Muni-Limited	MB	0.00	8/87
Vanguard Muni Long-Term	MB	0.00	9/81
Vanguard Muni Short-Term	MB	0.00	9/81
Vanguard Nj Txfr-Insd	MB	0.00	2/88
Vanguard Ny Txfr-Insd	MB	0.00	4/86
Vanguard Penna Insd Txfr	MB	0.00	4/86
Vanguard Preferred Stock	BP	0.00	9/81
Vanguard Primecap Fund	AG	0.00	11/84
Vanguard Quantitative	G	0.00	12/86
Vanguard Small Cap Stock	AG	0.00	9/81
Vanguard Sp Port-Energy	G	0.00	5/84
Vanguard Sp Port-Gold	ME	0.00	5/84
Vanguard Sp Port-Health	G	0.00	5/84
Vanguard Sp Port-Service	G	0.00	5/84
Vanguard Sp Port-Tech	AG	0.00	5/84

APPENDIX A   (Continued)

Fund Name	IO	Load	Data From
Vanguard Star Fund	B	0.00	3/85
Vanguard World-Intl Gr	IN	0.00	9/81
Vanguard World-US Gr	G	0.00	9/81
Van Kampen Ca Insd Tx	MB	4.90	2/86
Van Kampen Gr & Inc	GI	4.90	10/86
Van Kampen High Yield	BP	4.90	6/86
Van Kampen Insd Tx Fr	MB	4.90	2/85
Van Kampen Pa Txfr in	MB	4.90	5/87
Van Kampen Short Globl A	BP	3.00	9/90
Van Kampen Tx Fr High	MB	4.90	9/85
Van Kampen US Govt	BP	4.90	7/84
Venture Income plus	BP	4.75	5/82
Venture Muni plus	MB	0.00	3/85
Vista Capital Growth	G	4.50	3/88
Vista Growth & Income	GI	4.50	3/88
Vista Ny Tx Fr Income	MB	4.50	10/87
Vista Tx Fr Income Fund	MB	4.50	10/87
Vista US Gov Income	BP	4.50	10/87
Vontobel Europacific	IN	5.00	12/84
Voyageur Colorado Tax Fr	MB	3.90	4/87
Voyageur Growth Stock	AG	5.75	7/85
Voyageur Mn Insured	MB	4.75	4/87
Voyageur Mn Interm Tx Fr	MB	2.75	10/85
Voyageur Mn Tax Free	MB	4.75	3/84
Voyageur US Govt Secs	BP	4.75	11/87
Wall Street Fund	AG	4.00	9/81
Wash. Mutual Investors	GI	5.75	9/81
Wellesley Income Fund	B	0.00	9/81
Wellington Fund	B	0.00	9/81
Westcore Basic Value	GI	4.50	12/87
Westcore Bond plus	BP	4.50	6/88
Westcore Interm-Term Bd	BP	4.50	6/88
Westcore Long-Term Bond	BP	4.50	6/88
Westcore Midco Growth	G	4.50	12/87
Westcore Modern Value Eq	GI	4.50	6/88
Westwood Fund	GI	4.00	1/87
Windsor Fund	GI	0.00	9/81
Windsor II	GI	0.00	6/85

Fund Name	IO	Load	Data From
Winthrop Fixed Income Fd	BP	0.00	12/86
Winthrop Growth Fund	G	0.00	12/86
Wm Blair Growth Shares	G	0.00	9/81
Wm Blair Income Series	BP	0.00	9/90
WPG Gov Securities	BP	0.00	2/86
WPG Growth Fund	G	0.00	4/86
WPG Growth & Income Fund	GI	0.00	9/81
WPG International Fund	IN	0.00	6/89
WPG Tudor Fund	AG	0.00	9/81
Zweig St Gov Securities	BP	4.75	3/85
Zweig St Priority Select	G	5.50	10/87
Zweig St Strategy Fund	G	5.50	12/89

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APPENDIX B

This appendix contains a list of all aggressive growth mutual funds (AG) covered by

CDA Investment Technologies during the period September 1981 through September 1991.

In total, 178 mutual funds were contained in this data base.

Fund Name	IO	Load	Data from
AARP Capital Growth	AG	0.00	12/84
ABT Emerging Growth	AG	4.75	4/83
Advest Advantage Special	AG	0.00	2/86
AIM Constellation Fund	AG	5.50	9/81
Alger Small Cap Portf	AG	0.00	11/86
Alliance Fund A	AG	5.50	9/81
Alliance Globl Sm Cap A	AG	5.50	9/81
Alliance Quasar A	AG	5.50	9/81
Alliance Technology	AG	5.50	6/82
American Cap Emerging Gr	AG	5.75	9/81
American Heritage Fund	AG	0.00	9/81
American Investors Gr Fd	AG	8.50	9/81
Amev Advantage-Cap Appre	AG	4.50	1/88
Amev Growth Fund, Inc.	AG	4.75	9/81
Amev Special Stock Fund	AG	0.00	9/81
API Trust Growth	AG	0.00	6/85
Axe-Houghton Growth Fund	AG	5.75	9/81
Babson Enterprise Fund	AG	0.00	12/83
Baird Captl Development	AG	5.75	6/84
Berger 100 Fund	AG	0.00	9/81
Boston Co. Spec Growth	AG	0.00	7/83
Brandywine Fund	AG	0.00	12/85
Bull & Bear Cap Growth	AG	0.00	9/81
Bull & Bear Special Eqty	AG	0.00	4/86
Calvert Ariel Apprec	AG	4.75	1/90
Calvert Ariel Growth Fd	AG	4.75	10/86
Carnegie Cap Emerging Gr	AG	4.50	12/89
CGM Capital Development	AG	0.00	9/81
Cigna Aggressive Growth	AG	5.00	5/84

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Fund Name	IO	Load	Data From
Colonial Small Stk Index	AG	5.75	7/86
Colonial Vip-Growth Fund	AG	0.00	4/88
Columbia Special Fund	AG	0.00	11/85
Composite Northwest 50	AG	4.50	11/86
Counsellors Emerging Gr	AG	0.00	1/88
Cowen Opportunity Fund	AG	4.85	3/88
Dean Witter Develop Grow	AG	0.00	3/83
Delaware Grp-Delta Trend	AG	4.75	9/81
Delaware Grp-Value Fund	AG	4.75	6/87
DFA Small Co. Portfolio	AG	0.00	1/82
Dreyfus Strategic Aggres	AG	3.00	3/87
Eagle Growth Shares	AG	8.50	9/81
Eaton Vance Spl Equities	AG	4.75	9/81
Emblem Earnings Momentum	AG	4.00	10/89
Equitable Growth Fd B	AG	0.00	10/87
Fairmont Fund	AG	0.00	9/81
Fidelity Contrafund	AG	3.00	9/81
Fidelity Destiny II	AG	8.50	12/85
Fidelity Eq Portf-Growth	AG	0.00	11/83
Fidelity Growth Co.	AG	3.00	1/83
Fidelity OTC Portfolio	AG	3.00	12/84
Fidelity Sel Air Transp	AG	3.00	12/85
Fidelity Sel Automotive	AG	3.00	6/86
Fidelity Sel Biotech	AG	3.00	12/85
Fidelity Sel Brdcst/Med	AG	3.00	6/86
Fidelity Sel Brokerage	AG	3.00	7/85
Fidelity Sel Chemical	AG	3.00	7/85
Fidelity Sel Computer	AG	3.00	7/85
Fidelity Sel Constr&Hous	AG	3.00	9/86
Fidelity Sel Electronics	AG	3.00	7/85
Fidelity Sel Energy Svcs	AG	3.00	12/85
Fidelity Sel Health	AG	3.00	9/81
Fidelity Sel Industrial	AG	3.00	9/86
Fidelity Sel Leisure Ent	AG	3.00	5/84
Fidelity Sel Medical Del	AG	3.00	6/86
Fidelity Sel Paper/Forst	AG	3.00	6/86
Fidelity Sel Retailing	AG	3.00	12/85
Fidelity Sel Savings/Ln	AG	3.00	12/85

Fund Name	IO	Load	Data From
Fidelity Sel Software	AG	3.00	7/85
Fidelity Sel Technology	AG	3.00	9/81
Fidelity Trend	AG	0.00	9/81
Fiduciary Capital Growth	AG	0.00	12/81
Financial Dynamics Fund	AG	0.00	9/81
Flag Invs Emerging Grow	AG	4.50	12/87
Forty-Four Wall St Eqty	AG	0.00	9/81
Forty-Four Wall St Fund	AG	0.00	9/81
Founders Frontier Fund	AG	0.00	1/87
Founders Special Fund	AG	0.00	9/81
FPA Capital Fund	AG	6.50	9/81
FSP-Health Sciences	AG	0.00	1/84
FSP-Leisure Portfolio	AG	0.00	1/84
FSP-Technology Portfolio	AG	0.00	1/84
G. T. America Growth	AG	4.75	6/87
GW Sierra Eq Opportunity	AG	4.50	7/90
Hancock J. Spec Equity	AG	4.50	2/85
Harbor Capital Apprec	AG	0.00	12/87
Harbor Growth Fund	AG	0.00	11/86
Hartwell Emerging Growth	AG	4.75	9/81
Hartwell Growth Fund	AG	4.75	9/81
Idex Fund II	AG	5.50	5/86
IDS Discovery Fund	AG	5.00	10/81
IDS Strategy-Aggres Port	AG	0.00	5/84
Janus Twenty Fund	AG	0.00	4/85
Kaufmann Fund	AG	0.00	2/86
Kemper Summit Fund	AG	5.75	9/81
Keystone S-4	AG	0.00	9/81
Lord Abbett Dev Growth	AG	6.75	9/81
Mainstay Capital Apprec	AG	0.00	5/86
Mass. Finl Emerg Growth	AG	5.75	12/81
Mass. Inv. Growth Stock	AG	5.75	9/81
Medical Research Invt Fd	AG	4.75	6/85
Merrill L Growth Invt B	AG	0.00	3/87
Merrill L Nat Resource A	AG	6.50	10/88
Merrill L Specl Value A	AG	6.50	9/81
Merrill L Specl Value B	AG	0.00	10/88
Metlife-SS Captl Apprec	AG	4.50	8/86

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Fund Name	IO	Load	Data From
MFS Lifetime Emerging Gr	AG	0.00	12/86
MFS Lifetime Mgd Sectors	AG	0.00	12/86
MFS Managed Sectors Tr	AG	5.75	4/86
Midwest Growth Fund	AG	4.75	4/83
MIM Stock Appreciation	AG	0.00	7/87
Montgomery Small Cap	AG	0.00	7/90
Mutual of Omaha Growth	AG	4.75	9/81
National Aviation & Tech	AG	4.75	9/81
National Telecommunicat	AG	4.75	1/83
Nautilus Fund	AG	4.75	9/81
New England Growth Fund	AG	6.50	9/81
Oberweis Emerging Growth	AG	4.0J	1/87
Olympic Small Cap Fund	AG	0.00	9/85
Pacific Horizon Aggre Gr	AG	4.50	3/84
Parnassus Fund	AG	3.50	5/85
Pasadena Growth	AG	5.50	6/86
PBHG Growth Fund	AG	4.75	12/85
Plymouth Gr Opportunity	AG	4.75	11/87
Price Rowe New America	AG	0.00	10/85
Price Rowe New Horizon	AG	0.00	9/81
Price Rowe Science Tech	AG	0.00	9/87
Princor Growth Fd, Inc.	AG	5.00	9/81
Providentmutual Growth	AG	6.00	9/81
Prudential Grwth Oppty B	AG	0.00	9/81
Prudent Speculator Levgd	AG	0.00	7/87
Putnam Infor Sciences	AG	5.75	7/83
Putnam OTC Emerging Gr	AG	5.75	10/82
Putnam Voyager Fund	AG	5.75	9/81
PW Growth Fund A	AG	4.50	3/85
Retirement Planning-Eq	AG	0.00	5/84
Robertson Stephens Em Gr	AG	0.00	11/87
Rushmore OTC Index plus	AG	0.00	12/85
Safeco Growth Fund	AG	0.00	9/81
Salomon Capital Fund	AG	5.00	9/81
Scudder Capital Growth	AG	0.00	9/81
Scudder Development Fund	AG	0.00	9/81
Security Action Fund	AG	8.50	9/82
Security Ultra Fund	AG	5.75	9/81

Fund Name	IO	Load	Data From
Seligman Capital Fund	AG	4.75	9/81
Seligman Communications	AG	4.75	7/83
Shearson Aggress Growth	AG	5.00	10/83
Shearson Small Capital	AG	5.00	12/87
Sherman, Dean Fund	AG	0.00	9/81
SIT New Beginning Growth	AG	0.00	10/81
Skyline Fd Special Eq	AG	3.85	4/87
Southeastern Growth Fund	AG	0.00	4/85
Steadman American Indus.	AG	0.00	9/81
Steadman Associated	AG	0.00	9/81
Steadman Investment	AG	0.00	9/81
Steadman Oceanographic	AG	0.00	9/81
Steinroe Cap Opportunity	AG	0.00	9/81
Sunamerica Aggressive Gr	AG	5.75	1/87
Sunamerica Captl Apprec	AG	0.00	3/85
Sunamerica Emerging Gr	AG	0.00	3/86
Sunshine Growth Trust	AG	0.00	7/86
Thomson Opportunity Fd B	AG	0.00	3/84
Transamerica Cap Appre A	AG	4.75	9/85
Transamerica Sp Emrg B	AG	0.00	10/87
Twentieth Cent Giftrust	AG	0.00	11/83
Twentieth Cent Growth	AG	0.00	9/81
Twentieth Cent Ultra	AG	0.00	11/81
Twentieth Cent Vista	AG	0.00	11/83
United New Concepts Fund	AG	8.50	6/83
USAA Aggressive Growth	AG	0.00	3/82
US Growth Fund	AG	0.00	8/83
Value Line Spl Situation	AG	0.00	9/81
Vanguard Explorer Fund	AG	0.00	9/81
Vanguard Primecap Fund	AG	0.00	11/84
Vanguard Small Cap Stock	AG	0.00	9/81
Vanguard Sp Port-Tech	AG	0.00	5/84
Voyageur Growth Stock	AG	5.75	7/85
Wall Street Fund	AG	4.00	9/81
WPG Tudor Fund	AG	0.00	9/81

APPENDIX C

This appendix contains a list of all growth mutual funds (G) covered by CDA Investment Technologies during the period September 1981 through September 1991. In total, 346 mutual funds were contained in this data base.

Fund Name	IO	Load	Data From
AAL Capital Growth Fund	G	4.75	7/87
Acorn Fund	G	0.00	9/81
Addison Capital Shares	G	3.00	9/86
Advance America Eqty Inc	G	4.75	1/89
Advest Advantage Growth	G	0.00	2/86
Advisors Fund L.P. (The)	G	5.50	6/90
Aegon USA Capital Apprec	G	4.75	9/81
Afuture Fund	G	0.00	9/81
AIM Charter Fund	G	5.50	9/81
AIM Convertible Secs Inc	G	4.75	9/81
AIM Summit Fund	G	5.50	11/82
AIM Weingarten Fund	G	5.50	9/81
Alliance Counterpoint	G	5.50	3/85
AMA Classic Growth	G	4.75	9/81
Amcap Fund	G	5.75	9/81
American Cap Comstock	G	8.50	9/81
American Cap Enterprise	G	5.75	9/81
American Cap Gr & Income	G	5.75	9/81
American Capital Pace Fd	G	5.75	9/81
American Gas Index	G	0.00	5/89
American Leaders Fund	G	4.50	9/81
American National Growth	G	8.50	9/81
American Perf Equity Fd	G	4.00	9/90
Amev Capital Fund, Inc.	G	4.75	9/81
Amev Fiduciary Fund	G	4.50	1/82
ASO Outlook Equity	G	4.50	12/88
ASO Outlook Regional Eq	G	3.00	12/88
Associated Planners Stk	G	4.75	11/84
Babson Growth Fund	G	0.00	9/81

Fund Name	IO	Load	Data From
Babson Value Fund	G	0.00	12/84
Baird Blue Chip Fund	G	5.75	12/86
Baron Asset Fund	G	0.00	6/87
Beacon Hill Mutual Fund	G	0.00	9/81
Berger 101 Fund	G	0.00	9/81
Boston Co. Cap. Apprec.	G	0.00	9/81
Bruce Fund	G	0.00	9/81
Bull & Bear Finl News	G	0.00	9/89
Calvert Capital Value	G	4.75	10/82
Calvert Social Inv Eq Fd	G	4.75	8/87
Carnegie Cap Growth Fund	G	4.50	2/84
Cashman Farrell Value Fd	G	4.75	3/86
Century Shares Trust	G	0.00	9/81
Chubb Growth Fund	G	5.00	12/87
Cigna Growth Fund	G	5.00	9/81
Cigna Value Fund	G	5.00	5/84
Clipper Fund, Inc.	G	0.00	2/84
Colonial Growth Shares	G	5.75	9/81
Colonial US Eq Index Tr	G	5.75	7/86
Colonial Vip-Divsd Retrn	G	0.00	4/88
Columbia Growth Fund	G	0.00	9/81
Common Sense Gr & Income	G	8.50	3/87
Common Sense Growth Fund	G	8.50	3/87
Conn Mutual Inv Growth	G	6.25	9/85
Copley Fund	G	0.00	9/81
Counsellors Captl Apprec	G	0.00	8/87
Dean Witter American Val	G	0.00	9/81
Dean Witter Cap Growth	G	0.00	3/90
Dean Witter Nat Resource	G	0.00	9/81
Dean Witter Val-Add Mkt	G	0.00	11/87
Delaware Grp-Delcap I	G	4.75	3/86
Depositors Fund/Boston	G	0.00	9/81
Diversification Fund	G	0.00	9/81
Dodge & Cox Stock	G	0.00	9/81
Dreyfus Gr Opportunity	G	0.00	9/81
Dreyfus Index Fund	G	0.00	5/87
Dreyfus New Leaders Fund	G	0.00	1/85
Dreyfus Strategic Invest	G	4.50	10/86

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Fund Name	IO	Load	Data From
Eaton Vance Growth Fund	G	4.75	9/81
Eaton Vance Natural Res	G	0.00	10/87
Elfun Trusts	G	0.00	9/81
Emblem Ohio Regional Eq	G	4.00	10/89
Emblem Relative Value Eq	G	4.00	10/89
Enterprise Captl Apprec	G	4.75	12/87
Enterprise Growth Fund	G	4.75	9/81
Evergreen Fund	G	0.00	9/81
Excel Value Fund	G	4.50	11/82
Federated Growth Trust	G	0.00	8/84
Federated Stock Trust	G	0.00	3/82
Fidelity Blue Chip Grwth	G	3.00	12/87
Fidelity Capital Apprec	G	3.00	11/86
Fidelity Congress Street	G	0.00	9/81
Fidelity Destiny-Plan 1	G	8.50	9/81
Fidelity Exchange Fund	G	0.00	9/81
Fidelity Low-Priced Stk	G	0.00	12/89
Fidelity Magellan Fund	G	3.00	9/81
Fidelity Retirement Gr	G	0.00	4/83
Fidelity Sel Def & Aero	G	3.00	5/84
Fidelity Sel Energy	G	3.00	9/81
Fidelity Sel Environment	G	3.00	6/89
Fidelity Sel Finl Svc	G	3.00	12/81
Fidelity Sel Food/Agri	G	3.00	7/85
Fidelity Sel Regional Bk	G	3.00	6/86
Fidelity Sel Telecomm	G	3.00	7/85
Fidelity US Equity Index	G	0.00	3/88
Fidelity Value Fund	G	0.00	9/81
Financial Indust. Fund	G	0.00	9/81
First Eagle of America	G	0.00	4/87
Flag Invs Quality Growth	G	4.50	8/89
Forum Investors Stock Fd	G	3.75	10/89
Founders Blue Chip Fund	G	0.00	9/81
Founders Growth Fund	G	0.00	9/81
Franklin Dynatech	G	4.00	9/81
Franklin Equity Fund	G	4.00	9/81
Franklin Growth	G	4.00	9/81
Franklin Mgd Tr Ris Divd	G	4.00	3/87

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Fund Name	IO	Load	Data From
Franklin Special Equity	G	4.00	3/88
Freedom Environmental Fd	G	4.50	10/89
Freedom Equity Value Fd	G	0.00	6/87
Freedom Regional Bank Fd	G	0.00	10/85
FSP-Energy Portfolio	G	0.00	1/84
FSP-Financial Svcs Portf	G	0.00	6/86
Fundamental Investors	G	5.75	9/81
Fund of The Southwest	G	4.75	9/81
Fundtrust Aggressive	G	1.50	12/84
Fundtrust Growth	G	1.50	12/84
Fundtrust Mgd Tot Return	G	1.50	8/88
Gabelli Growth Fund	G	0.00	4/87
Galaxy Equity Value Fund	G	0.00	8/88
Gateway Growth Plus Fund	G	0.00	5/86
General Aggressive Grow	G	0.00	1/84
Gintel Cap Appreciation	G	0.00	1/86
Gintel Erisa	G	0.00	3/82
Gintel Fund	G	0.00	9/81
GIT Equity Tr Spl Growth	G	0.00	7/83
Gradison Opportunity Gr	G	0.00	8/83
Growth Fd of Washington	G	5.00	8/85
Growth Fund of America	G	5.75	9/81
Guardian Park Ave Fund	G	4.50	9/81
Hancock J. Growth Fund	G	4.50	9/81
Heartland Value Fund	G	4.50	12/84
Helmsman Disciplined Eq	G	0.00	12/89
Helmsman Growth Equity	G	0.00	12/89
Heritage Captl Apprec Tr	G	4.00	12/85
HT Insight Equity Fund	G	4.50	2/88
Huntington Cpi+ Fund	G	3.00	1/89
IAI Regional Fund	G	0.00	9/81
IAI Stock Fund	G	0.00	9/81
IAI Value Fund	G	0.00	12/83
Idex Fund	G	8.50	6/85
Idex Fund 3	G	8.50	4/87
IDS Equity Plus Fd Inc.	G	5.00	9/81
IDS Growth Fund	G	5.00	9/81
IDS Managed Retirement	G	5.00	1/85

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Fund Name	IO	Load	Data From
IDS New Dimensions Fund	G	5.00	9/81
Investors Research	G	6.75	9/81
ITB-Growth Opportunities	G	5.75	9/81
Ivy Growth Fund	G	0.00	9/81
Janus Fund	G	0.00	9/81
Janus Venture Fund	G	0.00	4/85
JP Growth Fund	G	5.50	9/81
Kemper Blue Chip Fund	G	5.75	11/87
Kemper Growth Fund	G	5.75	9/81
Kemper Ip Equity	G	0.00	2/84
Kemper Technology Fund	G	5.75	9/81
Keystone Amer Growth Stk	G	4.75	11/87
Keystone Amer Omega	G	4.75	9/81
Keystone K-2	G	0.00	9/81
Keystone S-1	G	0.00	9/81
Keystone S-3	G	0.00	9/81
Laurel Funds Stock Portf	G	0.00	12/87
Legg Mason Spec Invmt Tr	G	0.00	12/85
Legg Mason Total Ret Tr	G	0.00	11/85
Legg Mason Value Trust	G	0.00	4/82
Lexington Growth & Inc.	G	0.00	9/81
Lexington Tech Strategy	G	0.00	10/87
Lord Abbett Funda Value	G	6.75	7/86
Lord Abbett Value Apprec	G	6.75	7/83
Lutheran Brother. Fund	G	5.00	9/81
Mackenzie American Fund	G	5.75	9/85
Mainstay Value Fund	G	0.00	5/86
Mas-Equity Portfolio	G	0.00	11/84
Mass. Capital Devel.	G	5.75	9/81
Mass. Finl Development	G	5.75	9/81
Mass. Finl Special	G	5.75	7/83
Mass. Inv. Trust	G	5.75	9/81
Mas-Small Cap Portfolio	G	0.00	7/86
Mas-Value Portfolio	G	0.00	11/84
Merrill L Fd-Tomorrow A	G	6.50	10/88
Merrill L Fd-Tomorrow B	G	0.00	3/84
Merrill L Growth Invt A	G	6.50	11/88
Merrill L Nat Resource B	G	0.00	8/85

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Fund Name	IO	Load	Data From
Merriman Blue Chip	G	0.00	1/89
Merriman Capital Apprec	G	0.00	5/89
Metlife-SS Equity Invts	G	4.50	8/86
MFS Lifetime Cap Growth	G	0.00	12/86
Mimlic Investors Fund I	G	5.00	1/85
Monetta Fund	G	0.00	5/86
Monitrend Summation Indx	G	3.50	2/88
M.S.B. Fund	G	0.00	9/81
Muirfield Fund	G	0.00	8/88
Mutual Benefit Fund	G	4.75	9/81
National Industries Fund	G	0.00	9/81
Nationwide Fund	G	7.50	9/81
Nationwide Growth Fund	G	7.50	9/81
Natl Secs Stock	G	5.75	9/81
Neuberger B. Genesis Fd	G	0.00	9/88
Neuberger B. Guardian	G	0.00	9/81
Neuberger B. Manhattan	G	0.00	9/81
Neuberger B. Sel Sectors	G	0.00	9/81
Neuwirth Fund	G	0.00	9/81
New Alternatives Fund	G	5.66	9/82
New Economy Fund	G	5.75	11/83
New England Retir Equity	G	6.50	9/81
Newton Growth Fund	G	0.00	9/81
New York Venture Fund	G	4.75	9/81
Nicholas Fund	G	0.00	9/81
Nicholas II	G	0.00	10/83
Nicholas Limited Edition	G	0.00	5/87
North Amer Sec-Grow Port	G	4.75	10/86
Northeast Inv Growth	G	0.00	9/81
Olympus Equity Plus	G	4.25	5/86
Oppenheimer Blue Chip Fd	G	5.75	9/86
Oppenheimer Discovery Fd	G	5.75	9/86
Oppenheimer Fund	G	5.75	9/81
Oppenheimer Special Fund	G	5.75	9/81
Oppenheimer Target Fund	G	5.75	9/81
Oppenheimer Time Fund	G	5.75	9/81
Over-The-Counter Sec.	G	5.75	9/81
Pacifica Growth Fund	G	4.50	6/90

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Fund Name	IO	Load	Data From
Parkstone Equity Fund	G	4.50	10/88
Parkstone Small Cap Valu	G	4.50	10/88
Pennsylvania Mutual Fund	G	0.00	9/81
Perritt Capital Growth	G	0.00	5/88
Phoenix Capital apprec	G	4.75	10/89
Phoenix Stock Fund	G	4.75	9/81
Pilgrim Magnacap Fund	G	4.75	9/81
Pioneer Fund	G	5.75	9/81
Pioneer II	G	5.75	9/81
Pioneer Three	G	5.75	1/83
Piper Jaffray Sector Fd	G	4.00	3/87
Piper Jaffray Value Fund	G	4.00	3/87
PNC Capital Appreciation	G	4.50	10/89
Portico Equity index	G	0.25	12/89
Portico Special Growth	G	0.00	12/89
Price Rowe Growth Stock	G	0.00	9/81
Price Rowe New Era	G	0.00	9/81
Price Rowe Small Cap Fd	G	0.00	6/88
Prime Value Growth Stock	G	0.00	1/88
Principal Presv Div Achv	G	4.50	1/87
Principal Presv S&P100	G	4.50	1/86
Princor Aggressive Grwth	G	5.00	10/87
Princor Cap Accumulation	G	5.00	9/81
Providentmutual Invt Shs	G	6.00	9/81
Providentmutual Valu Shs	G	6.00	9/81
Prudential Eqty Income B	G	0.00	1/87
Prudential Equity Fund B	G	0.00	3/82
Prudential Option Grw B	G	0.00	4/83
Prudential Research Fd B	G	0.00	6/83
Putnam Energy Resources	G	5.75	9/81
Putnam Health Sciences	G	5.75	6/82
Putnam Investors Fund	G	5.75	9/81
Putnam Strategic Income	G	5.75	9/81
Putnam Vista Fund	G	5.75	9/81
PW Blue Chip Growth B	G	0.00	7/86
PW Regional Finl Gr A	G	4.50	4/90
Quest For Value Fund	G	5.50	9/81
Rainbow Fund	G	0.00	9/81

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Fund Name	IO	Load	Data From
Ray Equity Income Trust	G	4.75	8/86
Reich & Tang Equity Fund	G	0.00	1/85
Rightime Blue Chip Fund	G	4.75	7/87
Rightime Fund	G	0.00	9/85
Rightime Growth Fund	G	4.75	6/88
Rightime Social awarenes	G	4.75	3/90
Rochester Tax Managed Fd	G	8.50	9/81
Rodney Sq Multi-Mg Grow	G	5.75	3/87
Royce Fund-Value Series	G	2.50	12/82
Rushmore Nova	G	0.00	12/89
Rushmore Stock Mkt plus	G	0.00	12/85
Safeco Equity Fund	G	0.00	9/81
Salomon Investors Fund	G	5.00	9/81
Salomon Opportunity Fund	G	0.00	9/81
SAM Small-Cap Fund	G	0.00	12/88
SAM Value Trust	G	0.00	4/87
Schield Aggress Growth	G	4.00	9/85
Schield Value Portfolio	G	4.00	9/85
Schroder U.S. Equity Fd	G	0.00	9/81
Sci-Tech Holdings Cl A	G	6.50	4/83
Sci-Tech Holdings Cl B	G	0.00	10/88
Seafirst Blue Chip	G	0.00	3/88
Security Equity Fund	G	5.75	9/81
SEI Capital Appreciation	G	0.00	3/88
SEI Capital Growth	G	0.00	1/90
SEI S&P 500 Index Portf	G	0.00	7/85
SEI Value Portfolio	G	0.00	5/87
Selected American Shares	G	0.00	9/81
Selected Special Shares	G	0.00	9/81
Seligman Common Stock Fd	G	4.75	9/81
Seligman Growth Fund	G	4.75	9/81
Sentinel Growth Fund	G	5.25	9/81
Sentry Fund	G	0.00	9/81
Shadow Stock Fund	G	0.00	10/87
Shearson 1990's Fund	G	5.00	2/90
Shearson Appreciation Fd	G	5.00	9/81
Shearson Directions Valu	G	0.00	3/85
Shearson Fundamntl Value	G	5.00	11/81

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Fund Name	IO	Load	Data From
Shearson Growth & Oppty	G	0.00	3/86
Shearson Multi Oppty	G	0.00	3/87
Shearson Special Equity	G	0.00	12/82
Shearson Telecomm Growth	G	5.00	1/84
Sheffield Total Return	G	0.00	7/90
Smith, Barney Equity	G	4.50	9/81
State Bond Common Stock	G	4.75	9/81
State Bond Progress Fund	G	4.75	9/81
State Farm Growth Fund	G	0.00	9/81
State Street Growth	G	0.00	9/81
State Street Inv. Corp.	G	4.50	9/81
Steinroe Prime Equities	G	0.00	3/87
Steinroe Special Fund	G	0.00	9/81
Steinroe Stock Fund	G	0.00	9/81
Strong Common Stock Fund	G	2.00	12/89
Strong Discovery Fund	G	2.00	12/87
Sunamerica Growth Fund	G	5.75	1/87
Thomson Growth Fund B	G	0.00	1/84
Tower Capl Appreciation	G	4.50	11/88
Transamerica Sp Blue B	G	0.00	1/87
Transamerica Sp Nat B	G	0.00	10/87
Transamerica Sunbelt Gr	G	4.75	1/82
Trustees Comm Eq-US Port	G	0.00	9/81
Twentieth Cent Heritage	G	0.00	11/87
Twentieth Cent Select	G	0.00	9/81
Unified Growth Fund	G	4.50	9/81
United Income Fund	G	8.50	9/81
United Science & Energy	G	8.50	9/81
United Vanguard Fund	G	8.50	9/81
USAA Mutual Fd Growth	G	0.00	9/81
US All american Equity	G	0.00	9/81
US Boston Growth & Inc	G	0.00	5/85
UST Master Equity Fund	G	4.50	3/86
U.S. Trend Fund, Inc.	G	4.75	9/81
Value Line Fund	G	0.00	9/81
Value Line Leverage Gr	G	0.00	9/81
Vanguard Index 500 Fund	G	0.00	9/81
Vanguard Index Extnd Mkt	G	0.00	12/87

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Fund Name	IO	Load	Data From
Vanguard Morgan Growth	G	0.00	9/81
Vanguard Quantitative	G	0.00	12/86
Vanguard Sp Port-Energy	G	0.00	5/84
Vanguard Sp Port-Health	G	0.00	5/84
Vanguard Sp Port-Service	G	0.00	5/84
Vanguard World-US Gr	G	0.00	9/81
Vista Capital Growth	G	4.50	3/88
Westcore Midco Growth	G	4.50	12/87
Winthrop Growth Fund	G	0.00	12/86
Wm Blair Growth Shares	G	0.00	9/81
WPG Growth Fund	G	0.00	4/86
Zweig St Priority Select	G	5.50	10/87
Zweig St Strategy Fund	G	5.50	12/89

APPENDIX D

This appendix contains a list of all growth and income mutual funds (GI) covered by CDA Investment Technologies during the period September 1981 through September 1991. In total, 180 mutual funds were contained in this data base.

Fund Name	IO	Load	Data From
AARP Growth & Income	GI	0.00	12/84
ABT Growth & Income Tr	GI	4.75	9/81
ABT Utility Income Fund	GI	4.75	9/81
Aegon USA Growth Portf	GI	4.75	9/81
Affiliated Fund	GI	6.75	9/81
Alliance Growth & Inc A	GI	5.50	9/81
American Growth Fund	GI	8.50	9/81
American Investors Incm	GI	5.00	9/81
American Mutual Fund	GI	5.75	9/81
American Natl Inc Fund	GI	8.50	9/81
Analytic Optioned Equity	GI	0.00	9/81
Anchor Cap Accumulation	GI	0.00	9/81
Armstrong Associates	GI	0.00	9/81
Bartlett Basic Value Fd	GI	0.00	5/83
Bascom Hill Investors	GI	0.00	9/81
Bridges Investment Fund	GI	0.00	1/84
Bull & Bear Equity Inc.	GI	0.00	9/81
Calamos Convertible Inc	GI	0.00	7/85
Cardinal Fund	GI	8.50	9/81
Carnegie Cap Tot Return	GI	4.50	12/85
CGM Mutual Fund	GI	0.00	9/81
Charter Captl Blue Chip	GI	0.00	8/84
Cigna Utilities Fund	GI	5.00	1/88
Colonial Fund	GI	5.75	9/81
Composite Growth Fund	GI	4.00	9/81
Concord Inc-Conv Portf	GI	4.50	1/88
Country Capital Growth	GI	3.00	9/81
Cowen Income & Growth	GI	4.85	9/86
Dean Witter Conv Sec Tr	GI	0.00	10/85

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Fund Name	IO	Load	Data From
Dean Witter Dividend Gro	GI	0.00	9/81
Dean Witter Option Inc	GI	0.00	4/85
Dean Witter Strategist	GI	0.00	10/88
Dean Witter Utilities Fd	GI	0.00	4/88
Delaware Grp-Decatur I	GI	8.50	9/81
Delaware Grp-Decatur II	GI	4.75	8/86
Dreyfus Convertible Secs	GI	0.00	9/81
Dreyfus Leverage	GI	4.50	9/81
Dreyfus Third Century	GI	0.00	9/81
Eaton Vance Equity Inc	GI	0.00	10/87
Eaton Vance Stock Fund	GI	4.75	9/81
Eaton Vance Total Return	GI	4.75	12/81
Eclipse Equity Fund	GI	0.00	1/87
Enterprise Growth & Inc	GI	4.75	11/87
Evergreen Total Return	GI	0.00	9/81
FBL-Growth Common Stock	GI	0.00	9/81
Fidelity Eq Portf-Income	GI	0.00	4/83
Fidelity Equity Income	GI	2.00	9/81
Fidelity Fund	GI	0.00	9/81
Fidelity Growth & Income	GI	2.00	12/85
Fidelity Qualified Divd	GI	0.00	9/81
Fidelity Real Estate	GI	0.00	11/86
Fidelity Sel Elec Utils	GI	3.00	6/86
Fidelity Sel Utilities	GI	3.00	12/81
Fidelity Spec Situations	GI	4.75	1/84
Fidelity Utilities Inc	GI	0.00	11/87
Financial Indust. Income	GI	0.00	9/81
First American Specl Eq	GI	4.75	1/88
Flag Invs Telephone Inc	GI	4.50	1/84
Flex Fd-Growth	GI	0.00	3/85
Fortress Hi Qual Stock	GI	1.00	12/85
Fortress Utility Fund	GI	0.00	1/87
FPA Paramount Fd Inc	GI	6.50	9/81
FPA Perennial Fund	GI	6.50	3/84
Franklin Premier Return	GI	4.00	9/81
Franklin Utilities	GI	4.00	9/81
FSP-Utilities Portfolio	GI	0.00	6/86
Fundtrust Growth & Inc	GI	1.50	12/84

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Fund Name	IO	Load	Data From
Gabelli Asset Fund	GI	0.00	2/86
Gabelli Convertible Secs	GI	4.50	6/89
Gabelli Value Fund	GI	5.50	9/89
Gateway Index Plus Fund	GI	0.00	9/81
General Elec S&S Program	GI	0.00	9/81
General Securities	GI	5.00	9/81
Gradison Established Gr.	GI	0.00	8/83
Greenspring Fund	GI	0.00	7/83
GS Capital Growth Fund	GI	5.50	4/90
GW Sierra Gr & Income	GI	4.50	7/89
Harbor Value Fund	GI	0.00	12/87
Helmsman Income Equity	GI	0.00	12/89
Heritage Income Growth	GI	4.00	12/86
Highmark Income Equity	GI	0.00	6/88
IDS Progressive Fund	GI	5.00	9/81
IDS Stock Fund	GI	5.00	9/81
IDS Strategy-Equity Port	GI	0.00	5/84
IDS Utilities Income	GI	5.00	7/88
Invest Co of America	GI	5.75	9/81
Ivy Growth with Income	GI	0.00	4/84
Kemper Ip Total Return	GI	0.00	11/86
Kemper Total Return Fund	GI	5.75	9/81
Kidder Equity Income	GI	4.00	11/85
Lexington Corp Leaders	GI	0.00	9/81
Lindner Fund	GI	0.00	9/81
LMH Fund, Ltd.	GI	0.00	9/83
Mackenzie Growth & Inc	GI	2.75	10/88
Mainstay Convertible Fd	GI	0.00	5/86
Merrill L Basic Value A	GI	6.50	9/81
Merrill L Basic Value B	GI	0.00	10/88
Merrill L Capital Fd B	GI	0.00	10/88
Merrill L Phoenix A	GI	6.50	11/82
Merrill L Phoenix B	GI	0.00	10/88
Merrill L Strateg Div A	GI	6.50	11/88
Merrill L Strateg Div B	GI	0.00	11/87
Metlife-SS Equity Income	GI	4.50	8/86
Midwest Utility Income	GI	4.75	8/89
MIM Stock Conv & Opt Gr	GI	0.00	7/86

Fund Name	IO	Load	Data From
MIM Stock Conv & Opt Inc	GI	0.00	7/86
Mutual Beacon Fund	GI	0.00	9/81
Natl Secs Total Return	GI	5.75	9/81
Neuberger B. Partners	GI	0.00	9/81
Noddings Conv Strategies	GI	3.00	7/85
Old Dominion Invts Tr	GI	5.75	9/81
Olympic Equity Income Fd	GI	0.00	6/87
Oppenheimer Total Return	GI	5.75	9/81
Oppenheimer Value Stock	GI	5.75	4/88
Parkstone High Inc Eqty	GI	4.50	10/88
Penn Square Mutual Fund	GI	4.75	9/81
Philadelphia Fund	GI	0.00	9/81
Phoenix Convertible Fund	GI	4.75	9/81
Phoenix Growth Fund Ser	GI	4.75	9/81
Pilgrim Corp Utilities	GI	3.00	3/83
Pine Street Fund	GI	0.00	9/81
Plymouth Spec Situations	GI	4.75	1/84
Portico Income & Growth	GI	0.00	1/90
Price Rowe Captl Apprec	GI	0.00	6/86
Price Rowe Equity Income	GI	0.00	11/85
Price Rowe Growth & Income	GI	0.00	12/82
Primary Trend Fund	GI	0.00	9/86
Prudential Utility Fd B	GI	0.00	10/81
Putnam Convert Inc-Gr Tr	GI	5.75	9/81
Putnam Dividend Growth	GI	5.75	2/90
Putnam Fd for Growth/Inc	GI	5.75	9/81
Putnam Option Income II	GI	6.75	5/85
PW Dividend Growth A	GI	4.50	1/84
RBB Safeguard Eq Gr & In	GI	4.75	10/88
Rochester Convert Fund	GI	3.25	6/86
Rodney Sq Multi-Mg Gr & In	GI	5.75	3/87
Royce Fund-Equity Income	GI	2.50	1/90
Safeco Income Fund	GI	0.00	9/81
Salem Growth Invt Shares	GI	4.00	3/85
SBSF Growth Fund	GI	0.00	10/83
Scudder Growth & Income	GI	0.00	9/81
SEI Equity Income	GI	0.00	6/88
Sentinel Common Stock Fd	GI	8.50	9/81

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Fund Name	IO	Load	Data From
Sequoia Fund	GI	0.00	9/81
Shearson Growth Portf	GI	0.00	1/82
Shearson Option Inc Port	GI	0.00	9/85
Shearson Sector Analysis	GI	0.00	8/87
Shearson Telecomm Income	GI	5.00	1/84
Shearson Utilities Portf	GI	0.00	3/88
Smith, Barney Inc. & Gr.	GI	4.50	9/81
Sound Shore Fund Inc	GI	0.00	5/85
Sovereign Investors	GI	5.00	9/81
State Bond Diversified	GI	4.75	9/81
Stratton Growth Fund	GI	0.00	9/81
Strong Opportunity Fund	GI	2.00	12/85
Sunamerica Convert Secs	GI	4.75	2/87
Templeton Real Est Secs	GI	8.50	9/89
Transamerica Gr & Inc A	GI	4.75	9/81
UMB Stock Fund	GI	0.00	12/82
Unified Mutual Shares	GI	4.50	9/81
United Accumulative Fund	GI	8.50	9/81
United Contl. Income Fd.	GI	8.50	9/81
USAA Cornerstone Fund	GI	0.00	8/84
USAA Income Stock Fund	GI	0.00	5/87
US Income Fund	GI	0.00	11/83
US Real Estate Fund	GI	0.00	7/87
UST Master Income & Gr	GI	4.50	1/87
Valley Forge Fund	GI	0.00	9/81
Value Line Convertible	GI	0.00	6/85
Vanguard Convertible Sec	GI	0.00	6/86
Vanguard Equity Income	GI	0.00	3/88
Van Kampen Gr & Inc	GI	4.90	10/86
Vista Growth & Income	GI	4.50	3/88
Wash. Mutual Investors	GI	5.75	9/81
Westcore Basic Value	GI	4.50	12/87
Westcore Modern Value Eq	GI	4.50	6/88
Westwood Fund	GI	4.00	1/87
Windsor Fund	GI	0.00	9/81
Windsor II	GI	0.00	6/85
WPG Growth & Income Fund	GI	0.00	9/81

APPENDIX E

This appendix contains a list of all balanced mutual funds (B) covered by CDA Investment Technologies during the period September 1981 through September 1991. In total, 108 mutual funds were contained in this data base.

Fund Name	IO	Load	Data From
Advest Advantage Income	B	0.00	2/86
Alliance Balanced Shrs A	B	5.50	9/81
AMA Balanced Fund	B	4.75	2/87
American Balanced Fund	B	5.75	9/81
American Cap Equity Inc	B	5.75	9/81
American Capital Harbor	B	5.75	9/81
Amev Advantage-Asset All	B	4.50	1/88
Axe-Houghton Fund B	B	5.75	9/81
Bascom Hill Balanced	B	0.00	12/86
BB&K Diversa Fund	B	0.00	12/86
Blanchard Strategic Grow	B	0.00	5/86
Burnham Fund	B	5.00	9/81
Calvert Social Mgd Grow	B	4.75	10/82
Capital Income Builder	B	5.75	7/87
Chubb total Return	B	5.00	12/87
Colonial Corp Cas Hi	B	2.00	9/81
Colonial Strategic Inc	B	4.75	9/81
Commonwealth Inv Tr-Bal	B	7.50	9/81
Composite Bond & Stock	B	4.00	9/81
Conn Mutual Inv Tot Ret	B	5.00	9/85
Convertible Secs & Inc	B	4.50	1/87
Dean Witter Mgd assets	B	0.00	6/88
Delaware Grp-Delaware Fd	B	6.75	9/81
Dodge & Cox Balanced	B	0.00	9/81
Dreyfus Capital Value	B	4.50	10/85
Dreyfus Fund	B	0.00	9/81
Eaton Vance Investors Fd	B	4.75	9/81
Equitable Balanced Fd F	B	0.00	10/87
Federated Stock & Bond	B	0.00	9/81

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Fund Name	IO	Load	Data From
Fidelity Balanced Fund	B	0.00	11/86
Fidelity Puritan Fund	B	2.00	9/81
Fontaine Cap Apprec Fd	B	0.00	9/89
Founders Equity Income	B	0.00	9/81
Franklin Convertible Sec	B	4.00	3/87
Franklin Income	B	4.00	9/81
Hancock J. Asset Alloca	B	4.50	10/88
IDS Mutual Fund	B	5.00	9/81
Income Fund of America	B	5.75	9/81
Keystone Amer Eq Income	B	4.75	4/87
Keystone K-1	B	0.00	9/81
Lepercq-Istel Fund	B	0.00	9/81
Liberty Utility Fund	B	4.50	5/87
Lindner Dividend Fund	B	0.00	9/81
Mackenzie N.A. Total Ret	B	5.75	9/85
Mainstay Total Return	B	0.00	12/87
Mass. Finl Total Return	B	4.75	9/81
Mathers Fund	B	0.00	9/81
Merrill L Balanced Fd A	B	6.50	10/88
Merrill L Balanced Fd B	B	0.00	11/85
Merrill L Capital Fd A	B	6.50	9/81
Merriman Asset Allocatn	B	0.00	5/89
Metlife-SS Mgd assets	B	4.50	12/88
MFS Lifetime Tot Return	B	0.00	12/86
Mimlic Asset Allocation	B	5.00	11/87
Mutual of Omaha Income	B	4.75	9/81
Mutual Qualified Income	B	0.00	9/81
Mutual Shares Corp.	B	0.00	9/81
Natl Secs Total Income	B	5.75	9/81
New England Balanced Fd	B	6.50	9/81
North Amer Sec-Aggress	B	4.75	7/88
North Amer Sec-Conserv	B	4.75	10/86
North Amer Sec-Mod Asset	B	4.75	10/86
Olympic Balanced Income	B	0.00	8/85
Oppenheimer Asset Alloca	B	5.75	4/87
Oppenheimer Equity Inc.	B	5.75	9/81
Overland Express Alloca	B	4.50	4/88
Pacifica Balanced Fund	B	4.50	6/90

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Fund Name	IO	Load	Data From
Pasadena Fundamental Val	B	5.50	6/87
PAX World Fund	B	0.00	9/81
Permanent Portfolio	B	0.00	12/82
Phoenix Balanced Fd Ser	B	4.75	9/81
Phoenix Total Return Fd	B	4.75	9/81
Piper Jaffray Balanced	B	4.00	3/87
Plymouth Income & Growth	B	4.75	1/87
Princor Managed Fund	B	5.00	10/87
Providentmutual Totl Ret	B	6.00	9/81
Prudential Flexi-Consv B	B	0.00	9/87
Prudential Flex-Strtgy B	B	0.00	9/87
Prudential Invertible B	B	0.00	12/85
Putnam George Fund	B	5.75	9/81
PW Asset Allocation B	B	0.00	12/86
RBB Safeguard Balanced	B	5.00	10/88
REA Graham Balanced Fund	B	4.75	8/82
Seafirst Asset Allocatn	B	0.00	3/88
Security Investment Fund	B	5.75	9/81
Seligman Income Fund	B	4.75	9/81
Sentinel Balanced Fund	B	8.50	9/81
Shearson Convert Portf	B	0.00	9/86
Shearson Princpl Retn 96	B	0.00	1/89
Shearson Strategic Invts	B	0.00	2/87
Skyline Fd Balanced	B	3.85	4/87
State Farm Balanced	B	0.00	9/81
Steinroe Total Return Fd	B	0.00	9/81
Stratton Monthly Div Shs	B	0.00	9/81
Strong Investment Fund	B	1.00	12/81
Strong Total Return Fund	B	1.00	12/81
Sunamerica Balncd Assets	B	0.00	4/85
Sunamerica Total Return	B	5.75	11/87
Tocqueville Fund	B	0.00	1/87
Twentieth Cent Balanced	B	0.00	10/88
Unified Income Fund	B	4.50	10/82
United Retirement Shares	B	8.50	9/81
USAA Balanced Portfolio	B	0.00	1/89
Value Line Income	B	0.00	9/81
Vanguard Asset Alloc Fd	B	0.00	11/88

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Fund Name	IO	Load	Data From
Vanguard Star Fund	B	0.00	3/85
Wellesley Income Fund	B	0.00	9/81
Wellington Fund	B	0.00	9/81

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APPENDIX F

This appendix contains a list of all international mutual funds (IN) covered by CDA

Investment Technologies during the period September 1981 through September 1991. In

total, 123 mutual funds were contained in this data base.

Fund Name	IO	Load	Data From
Alliance Global-Canadian	IN	5.50	9/81
Alliance International A	IN	5.50	9/81
AMA Global Growth	IN	4.75	2/87
Axe-Houghton Core Intl	IN	5.75	9/90
Colonial Intl Eq Index	IN	5.75	7/86
Colonial Vip-Infl Hedge	IN	0.00	4/88
Counsellors Intl Equity	IN	0.00	5/89
Dean Witter European Gr	IN	0.00	6/90
Dean Witter World Invest	IN	0.00	12/83
DFA Continental Small Co	IN	0.00	3/88
DFA Japanese Small Co	IN	0.00	1/86
DFA United Kingdom Sm Co	IN	0.00	1/86
Dreyfus Strategic World	IN	3.00	4/87
Enterprise Intl Growth	IN	4.75	12/87
Europacific Growth Fund	IN	5.75	4/84
European Emerging Cos Fd	IN	5.75	12/88
European Fund (The)	IN	4.75	1/87
Evergreen Globl Real Est	IN	0.00	2/89
Fenimore Intl-Eq Series	IN	5.00	2/86
Fidelity Europe	IN	3.00	10/86
Fidelity Intl Gr & Inc	IN	2.00	12/86
Fidelity Overseas Fund	IN	3.00	12/84
Fidelity Pacific Basin	IN	3.00	10/86
First Australia Pacific	IN	4.75	12/89
First Invest. Global Fd	IN	6.90	6/83
Flag Invst. International	IN	4.50	11/86
Freedom Global Fund	IN	0.00	8/86
Fremont Multi Asset	IN	0.00	11/88
FSP-European Portfolio	IN	0.00	6/86

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Fund Name	IO	Load	Data From
FSP-Pacific Basin Port	IN	0.00	1/84
GAM Global Fund	IN	5.00	5/86
GAM International	IN	5.00	1/85
G. T. Europe Growth Fund	IN	4.75	7/85
G. T. Global Gr & In come	IN	4.75	9/90
G. T. Global Health Care	IN	4.75	8/89
G. T. Intl Growth Fund	IN	4.75	7/85
G. T. Japan Growth Fund	IN	4.75	7/85
G. T. Pacific Growth Fd	IN	4.75	9/81
G. T. Worldwide Growth	IN	4.75	6/87
GW Sierra Strategic Intl	IN	4.50	7/90
Hancock J. Global Trust	IN	4.50	6/85
Hancock J. Pacific Basin	IN	4.50	9/87
Harbor International	IN	0.00	12/87
IAI International	IN	0.00	4/87
IDS International Fund	IN	5.00	11/84
IDS Strategy-Worldwide	IN	0.00	4/87
International Equity Fd	IN	4.50	8/84
Ivy International	IN	0.00	4/86
Japan Fund	IN	0.00	1/84
Kemper Intl Fund	IN	5.75	9/81
Keystone Amer Glbl Oppty	IN	4.75	3/88
Keystone Intl Fund	IN	0.00	9/81
Kleinwort Benson Intl Eq	IN	0.00	9/81
Lexington Global Fund	IN	0.00	3/87
Lexington World Emerging	IN	0.00	9/81
Lord Abbett Global Eqty	IN	6.75	9/88
Mackenzie Canada Fund	IN	5.75	11/87
Mainstay Global Fund	IN	0.00	6/87
Merrill L Dev Captl Mkts	IN	4.00	9/89
Merrill L Eurofund A	IN	6.50	10/88
Merrill L Eurofund B	IN	0.00	1/87
Merrill L Global Alloc A	IN	6.50	2/89
Merrill L Global Alloc B	IN	0.00	2/89
Merrill L Global Conv A	IN	4.00	10/88
Merrill L Global Conv B	IN	0.00	2/88
Merrill L Intl A	IN	6.50	7/84
Merrill L Intl B	IN	0.00	10/88

Fund Name	IO	Load	Data From
Merrill L Pacific Fund A	IN	6.50	9/81
Merrill L Pacific Fund B	IN	0.00	10/88
Metlife-SS Global Energy	IN	4.50	3/90
MFS Lifetime Global Eqty	IN	0.00	12/86
Natl Secs Global Alloca	IN	5.75	6/87
Natl Secs World Opporty	IN	5.75	9/81
New Perspective Fund	IN	5.75	9/81
Newport Tiger Fund	IN	5.00	6/89
Nomura Pacific Basin Fd	IN	0.00	7/85
Oppenheimer Glbl Biotech	IN	5.75	12/87
Oppenheimer Glbl Environ	IN	5.75	3/90
Oppenheimer Global Fund	IN	5.75	9/81
Phoenix International	IN	4.75	10/89
Plymouth Europe Portf	IN	4.75	5/90
Plymouth Globl Natrl Res	IN	4.00	12/87
Price Rowe European Stk	IN	0.00	2/90
Price Row Intl Discover	IN	0.00	12/88
Price Rowe Intl Stock	IN	0.00	9/81
Princor World Fund	IN	5.00	1/84
Providentmutual World	IN	6.00	5/85
Prudential Global Fund B	IN	0.00	5/84
Putnam Global Growth	IN	5.75	9/81
PW Atlas Global Growth A	IN	4.50	1/84
PW Europe Growth A	IN	4.50	1/90
PW Global Energy B	IN	0.00	9/87
PW Global Gr/Income A	IN	4.50	5/89
Quest For Value Globl Eq	IN	5.50	6/90
Rodney Sq Intl Equity	IN	5.75	11/87
Scudder Global	IN	0.00	8/86
Scudder International Fd	IN	0.00	9/81
SEI International Trust	IN	0.00	12/89
Shearson European Portf	IN	0.00	11/87
Shearson Global Equity	IN	0.00	11/87
Shearson Global Oppty Fd	IN	5.00	7/84
Shearson Spec Intl Eqty	IN	0.00	3/86
Smallcap World Fund Inc	IN	5.75	4/90
Sogen International Fund	IN	3.75	9/81
Steinroe Intl Growth Fd	IN	0.00	10/87

Fund Name	IO	Load	Data From
Templeton Foreign Fund	IN	8.50	9/82
Templeton Growth Fund	IN	8.50	9/81
Templeton Smaller Co Grw	IN	8.50	9/81
Templeton Value Fund	IN	8.50	10/88
Templeton World Fund	IN	8.50	9/81
Thomson Global Fund B	IN	0.00	8/86
Trustees Comm Eq-Intl	IN	0.00	5/83
United Intl. Growth Fund	IN	8.50	9/81
USAA International Fund	IN	0.00	7/88
US Boston Foreign Gr	IN	0.00	8/87
US European Fund	IN	0.00	2/85
UST Master International	IN	4.50	7/87
Van Eck World Trends	IN	5.75	9/85
Vanguard Index-Europe	IN	0.00	6/90
Vanguard Index-Pacific	IN	0.00	6/90
Vanguard World-Intl Gr	IN	0.00	9/81
Vontobel Europacific	IN	5.00	12/84
WPG International Fund	IN	0.00	6/89

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APPENDIX G

This appendix contains a list of all precious metals mutual funds (ME) covered by

CDA Investment Technologies during the period September 1981 through September 1991.

In total, 32 mutual funds were contained in this data base.

Fund Name	IO	Load	Data From
Blanchard Precious Metal	ME	0.00	6/88
Bull & Bear Gold Invs	ME	0.00	9/81
Colonial Adv Strat Gold	ME	5.75	7/85
Dean Witter Prec Met&Min	ME	0.00	8/90
Enterprise Prec Metals	ME	4.75	12/87
Excel Midas Gold Fund	ME	4.50	1/86
Fidelity Sel Amer Gold	ME	3.00	12/85
Fidelity Sel Prec Met&Mn	ME	3.00	9/81
Franklin Gold Fund	ME	4.00	9/81
Freedom Gold & Gov Trust	ME	0.00	1/85
FSP-Gold Portfolio	ME	0.00	1/84
IDS Precious Metals	ME	5.00	4/85
Keystone Precious Metals	ME	0.00	9/81
Lexington Goldfund	ME	0.00	9/81
Mainstay Gold & Prec Mtl	ME	0.00	12/87
MFS Lifetime Gold & Prec	ME	0.00	8/88
Oppenheimer Gold & Spec.	ME	5.75	7/83
Rushmore Precious Metals	ME	0.00	8/89
Scudder Gold Fund	ME	0.00	9/88
Shearson Prec Metals	ME	0.00	3/85
Shearson Prec Metl & Min	ME	5.00	11/86
Strategic Gold/Minerals	ME	8.50	7/88
Strategic Investments	ME	8.50	9/81
Strategic Silver	ME	8.50	4/85
United Gold & Government	ME	8.50	9/85
USAA Gold Fund	ME	0.00	8/84
US Global Resources Fund	ME	0.00	8/83
US Gold Shares Fund	ME	0.00	9/81

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Fund Name	IO	Load	Data From
US World Gold	ME	0.00	11/85
Van Eck Gold/Resources	ME	6.70	2/86
Van Eck Intl Investors	ME	8.50	9/81
Vanguard Sp Port-Gold	ME	0.00	5/84

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APPENDIX H

This appendix contains a list of all bond (non-municipal) mutual funds (BP) covered by CDA Investment Technologies during the period September 1981 through September 1991. In total, 416 mutual funds were contained in this data base.

Fund Name	IO	Load	Data From
AAL Income Growth Fund	BP	4.75	7/87
AARP GNMA/US Treas Fund	BP	0.00	12/84
AARP High Quality Bond	BP	0.00	12/84
Advance America US Gov	BP	4.75	12/88
Advest Advantage Govt	BP	0.00	2/86
Aegon USA Hiyld Portf	BP	4.75	6/85
AGE High Income Fund	BP	4.00	9/81
AIM High Yld Securities	BP	4.75	9/81
AIM Limited Maturity	BP	1.75	12/87
Alliance Bd-Mthly Income	BP	4.75	9/81
Alliance Bd-US Govt	BP	4.75	12/85
Alliance High Yield Bond	BP	4.75	4/85
Alliance Mortgage Secs	BP	4.75	2/84
Alliance Sh-Term Multi A	BP	3.00	5/89
Alliance Sh-Term Multi B	BP	0.00	2/90
AMA Global Income Fund	BP	4.75	4/87
AMA USG Income plus	BP	4.75	9/81
American Cap Corp Bond	BP	4.75	9/81
American Capital Fed Mtg	BP	4.00	5/86
American Capital Gov Sec	BP	4.75	7/84
American Capital Hiyld	BP	4.75	9/81
American High-Inc Trust	BP	4.75	2/88
American Perf Bond Fund	BP	4.00	9/90
American Perf Interm Bd	BP	4.00	9/90
Amev Advantage-Gov T.r.	BP	4.50	5/86
Amev Advantage-High Yld	BP	4.50	12/87
Amev US Gov Securities	BP	4.50	9/81
AMF Corporate Bond	BP	0.00	11/86
AMF Intermediate Liqdty	BP	0.00	11/82

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Fund Name	IO	Load	Data From
AMF Mortgage Securities	BP	0.00	1/84
ASO Outlook Bond	BP	4.50	12/88
ASO Outlook Ltd Maturity	BP	3.00	2/89
Atlas USG & Mortgage Sec	BP	3.00	1/90
Axe-Houghton Income Fund	BP	4.75	9/81
Babson Bond Tr-Long	BP	0.00	9/81
Baker Fund - USG Series	BP	0.00	9/86
Bartlett Fixed Income Fd	BP	0.00	4/86
Benham GNMA Income Fund	BP	0.00	10/85
Bernstein Gov Short Dur	BP	0.00	1/89
Bernstein Interm Dur	BP	0.00	1/89
Bernstein Short Dur plus	BP	0.00	12/88
Bond Fund of America	BP	4.75	9/81
Boston Co. GNMA	BP	0.00	3/86
Boston Co. Managed Inc.	BP	0.00	7/83
Bull & Bear High Yield	BP	0.00	9/83
Bull & Bear US Govt	BP	0.00	3/86
Calvert Income	BP	4.75	10/82
Calvert Social Inv Bond	BP	4.75	8/87
Calvert US Government Fd	BP	4.75	7/86
Capital Preservation Tnt	BP	0.00	6/82
Capital World Bond	BP	4.75	7/87
Capstone Govt Income Tr	BP	0.00	9/81
Cardinal Govt Obligation	BP	4.50	2/86
Carnegie Cap Divers High	BP	4.50	11/89
Carnegie Govt Securities	BP	4.50	4/83
Chubb Govt Securities	BP	5.00	12/87
Cigna Government Secs	BP	5.00	4/87
Cigna High Yield	BP	5.00	9/81
Cigna Income Fund	BP	5.00	9/81
Colonial Gov Sec plus Tr	BP	4.75	5/84
Colonial High Yield Secs	BP	4.75	9/81
Colonial Income	BP	4.75	9/81
Colonial U.S. Govt Trust	BP	4.75	10/87
Colonial Vip-Fed Secs	BP	0.00	4/88
Colonial Vip-High Income	BP	0.00	4/88
Columbia Fixed Income	BP	0.00	1/83
Common Sense Govt Fund	BP	6.75	3/87

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Fund Name	IO	Load	Data From
Composite Income Fund	BP	4.00	9/81
Composite USG Securities	BP	4.00	3/82
Conn Mutual Inv Gov Secs	BP	4.00	9/85
Conn Mutual Inv Income	BP	4.00	9/85
Counsellors Fixed Income	BP	0.00	8/87
Counsellors Inter Gov Fd	BP	0.00	8/88
Dean Witter Gov Sec plus	BP	0.00	3/87
Dean Witter High Yield	BP	5.50	9/81
Dean Witter Interm Inc	BP	0.00	5/89
Dean Witter Tx Advantage	BP	0.00	8/84
Dean Witter US Gov Trust	BP	0.00	6/84
Dean Witter World Income	BP	0.00	3/89
Delaware Grp-Delchstr I	BP	6.75	9/81
Delaware Grp-Delchstr II	BP	4.75	11/87
Delaware Grp-Govt Inc II	BP	4.75	8/85
Delaware Grp-Treasury I	BP	3.00	11/85
Delaware Grp-Treasury II	BP	0.00	11/85
DFA Fixed Inc Portfolio	BP	0.00	8/83
DFA Govt Fixed Income	BP	0.00	5/87
Donoghue Money Mkt Avg	BP	0.00	9/81
Dreyfus A Bonds Plus	BP	0.00	9/81
Dreyfus GNMA	BP	0.00	6/85
Dreyfus Premier GNMA Fd	BP	4.50	1/87
Dreyfus Sh-Interm Govt	BP	0.00	4/87
Dreyfus Strategic Income	BP	4.50	10/86
Eaton Vance Gov Obligatn	BP	4.75	11/84
Eaton Vance High Income	BP	0.00	8/86
Eaton Vance Inc Fd/Bost	BP	4.75	9/81
Emblem Interm Gov Oblign	BP	4.00	5/90
Emblem Sh-Interm Fx Inc	BP	4.00	10/89
Enterprise Govt Secs	BP	4.75	12/87
Enterprise High Yield	BP	4.75	11/87
Equitable Govt Secs Fd B	BP	0.00	10/87
Equitabler Sh-Trm Wrld F	BP	3.00	9/90
Executive Investors Hyld	BP	4.75	2/87
Federated Bond Fund	BP	0.00	12/85
Federated Floating Rate	BP	0.00	7/86
Federated GNMA	BP	0.00	3/82

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Fund Name	IO	Load	Data From
Federated High Yield Tr	BP	0.00	8/84
Federated Income Trust	BP	0.00	3/82
Federated Intermed Gov	BP	0.00	2/83
Federated Sh-Interm Gov	BP	0.00	3/84
Federated U.S. Govt Fund	BP	0.00	12/85
Fidelity Captl & Income	BP	0.00	9/81
Fidelity Corp Tr-Arp	BP	0.00	10/84
Fidelity Fixed Inc-Ltd	BP	0.00	2/84
Fidelity Flexible Bond	BP	0.00	9/81
Fidelity Global Bond Fd	BP	0.00	12/86
Fidelity GNMA	BP	0.00	11/85
Fidelity Govt Secs	BP	0.00	9/81
Fidelity Intermediate Bd	BP	0.00	9/81
Fidelity Mortgage Secs	BP	0.00	12/84
Fidelity Sh-Term Bond	BP	0.00	9/86
Financial Bd-Hiyld Port	BP	0.00	3/84
Financial Bd-Select Inc	BP	0.00	7/82
Financial Bd-USG Port	BP	0.00	1/86
First American Fixed	BP	4.00	1/88
First Australia Inc Enhc	BP	4.75	12/89
First Australia Income	BP	4.75	12/89
First Australia Liqdity	BP	3.00	12/89
First Invest. Fd. Income	BP	6.90	9/81
First Invest. Gov Fund	BP	6.90	9/84
First Invest. High Yield	BP	6.90	8/86
First Trust USG Fund	BP	4.50	3/86
Flag Invs Tot Return UST	BP	4.50	8/88
Flagship Corp Cash	BP	0.00	8/83
Flex Fd-Bond Series	BP	0.00	5/85
Fortress Totl Perf UST	BP	1.00	7/88
Forum Investors Bond	BP	3.75	10/89
FPA New Income	BP	4.50	9/81
Franklin Adj USG Secs	BP	4.00	10/87
Franklin Global Opport	BP	4.00	3/88
Franklin Mgd Tr Cp Cash	BP	1.50	1/87
Franklin Mgd Tr Inv Grde	BP	4.00	2/87
Franklin Sh-Interm USG	BP	1.50	4/87
Franklin Tx Advantge Hi	BP	4.00	4/87

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Fund Name	IO	Load	Data From
Franklin Tx Advantge USG	BP	4.00	5/87
Franklin U.S. Govt. Sec.	BP	4.00	9/81
Freedom Global Income	BP	0.00	12/86
Freedom Gov Income Fd	BP	0.00	5/86
Fund for U.S. Govt. Sec.	BP	4.50	9/81
Fundtrust Income	BP	1.50	12/84
Galaxy Intermediate Bond	BP	0.00	8/88
General Elec S&S Lt Bond	BP	0.00	9/81
GIT Income Trust Maximum	BP	0.00	7/83
GNA Investors Tr-USG	BP	0.00	4/87
Government Inc Secs Fd	BP	1.00	4/86
GS Short-Interm Govt	BP	0.00	8/88
G. T. Global Bond Fund	BP	4.75	4/88
G. T. Global Govt Income	BP	4.75	4/88
GW Sierra Corporate Inc	BP	4.50	7/90
GW Sierra US Govt Secs	BP	4.50	7/89
Hancock J. Bond Fund	BP	4.50	9/81
Hancock J. Govt Spectrum	BP	4.50	1/85
Hancock J. Strategic Inc	BP	4.50	8/86
Hancock J. US Govt Trust	BP	4.50	9/81
Harbor Bond Fund	BP	0.00	12/87
Heartland USG Fund	BP	4.50	4/87
Helmsman Income Fund	BP	0.00	12/89
Helmsman Ltd Volatility	BP	0.00	9/90
Heritage Diversified Inc	BP	4.00	3/90
Heritage Govt Income Tr	BP	4.00	3/90
Home Invs Govt Income	BP	0.00	2/85
Huntington Global Portf	BP	2.25	7/86
Huntington Hard Currency	BP	2.25	11/89
Huntington High Income	BP	2.25	11/89
IAI Bond Fund	BP	0.00	9/81
IAI Reserve Fund	BP	0.00	1/86
Idex Total Income Tr	BP	7.00	7/87
IDS Bond Fund	BP	5.00	9/81
IDS Extra Income	BP	5.00	11/83
IDS Federal Income Fund	BP	5.00	8/85
IDS Global Bond Fund	BP	5.00	3/89
IDS Selective	BP	5.00	9/81

Fund Name	IO	Load	Data From
IDS Strategy-Income Port	BP	0.00	5/84
IDS Strategy-Short Term	BP	0.00	5/84
Intermed Bd Fd America	BP	4.75	2/88
Investors Preference Inc	BP	4.00	4/87
ITB-Hi Income Portfolio	BP	4.50	2/84
ITB-Premium Income Portf	BP	2.50	1/89
JP Income	BP	5.50	9/81
Kemper Diversified Inc	BP	4.50	9/81
Kemper Enhanced Govt Inc	BP	4.50	9/87
Kemper Global Income	BP	4.50	10/89
Kemper High Yield Fund	BP	4.50	9/81
Kemper Inc & Cap Preserv	BP	4.50	9/81
Kemper Ip Diversified	BP	0.00	10/84
Kemper Ip Government	BP	0.00	10/84
Kemper Ip High Yield	BP	0.00	2/84
Kemper US Govt Secs	BP	4.50	9/81
Keystone Amer Gov Sec	BP	2.00	4/87
Keystone Amer Hiyld Bond	BP	2.00	4/87
Keystone Amer Inv Grade	BP	4.75	4/87
Keystone Amer World Bond	BP	4.75	4/89
Keystone B-1	BP	0.00	9/81
Keystone B-2	BP	0.00	9/81
Keystone B-4	BP	0.00	9/81
Kidder Government Income	BP	4.00	11/85
Landmark US Government	BP	0.00	9/86
Legg Mason Inv Grade Inc	BP	0.00	8/87
Legg Mason USG Interm	BP	0.00	8/87
Lexington GNMA New Inc	BP	0.00	9/81
Liberty High Income Bond	BP	4.50	9/81
Limited Term US Gov	BP	2.25	11/87
Lord Abbett Bond-Deben.	BP	4.75	9/81
Lord Abbett Global Inc	BP	4.75	9/88
Lord Abbett US Gov Secs	BP	4.75	9/81
Lutheran Brother. Hi Yld	BP	5.00	12/86
Lutheran Brother. Income	BP	5.00	9/81
Mackenzie Fixed Income	BP	4.75	8/85
Mainstay Gov Plus Fund	BP	0.00	5/86
Mainstay Hyld Corp Bond	BP	0.00	5/86

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Fund Name	IO	Load	Data From
Mas-Fixed Inc Portfolio	BP	0.00	11/84
Mass. Finl Bond	BP	4.75	9/81
Mass. Finl Hi Income	BP	4.75	9/81
Mass. Finl Hi Income II	BP	4.75	6/87
Merrill L Bond-Interm Fd	BP	2.00	9/81
Merrill L Corp Dividend	BP	2.00	4/84
Merrill L Federal Secs	BP	4.00	9/84
Merrill L Global Bond A	BP	4.00	10/88
Merrill L Global Bond B	BP	0.00	9/86
Merrill L Hi Inc Bond A	BP	4.00	9/81
Merrill L Hi Inc Bond B	BP	0.00	10/88
Merrill L Hi Qual Bond A	BP	4.00	9/81
Merrill L Hi Qual Bond B	BP	0.00	10/88
Merrill L Inst Interm	BP	0.00	11/86
Merrill L Retr/Income B	BP	0.00	3/86
Merrill L Sh-Trm Globl A	BP	3.00	8/90
Merrill L Sh-Trm Globl B	BP	0.00	8/90
Merriman Timed Govt	BP	0.00	10/88
Metlife-SS Govt Income	BP	0.00	3/87
Metlife-SS Govt Secs	BP	4.50	9/86
Metlife-SS High Income	BP	4.50	8/86
MFS Gov Guaranteed Secs	BP	4.75	10/84
MFS Gov Income Plus Tr	BP	4.75	1/86
MFS Gov Premium Account	BP	3.75	12/88
MFS Lifetime Gov In Plus	BP	0.00	12/86
MFS Lifetime High Inc Tr	BP	0.00	12/86
MFS Lifetime Interm Inc	BP	0.00	10/88
MFS Worldwide Govts Tr	BP	4.75	9/81
Midwest Interm Term Govt	BP	1.00	9/81
Midwest US Govt Secs Fd	BP	4.00	6/84
Midwest US Treas Alloca	BP	4.00	1/88
MIM Bond Income	BP	0.00	7/86
Mimlic Mortgage Secs Fd	BP	5.00	5/85
Mutual of Omaha America	BP	4.75	9/81
Nationwide Bond Fund	BP	7.50	9/81
Natl Secs Bond	BP	4.75	9/81
Natl Secs Federal	BP	4.75	12/84
Natl Secs Multi-Sector	BP	4.75	12/89

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Fund Name	IO	Load	Data From
Neuberger B. Ltd Mat Bd	BP	0.00	6/86
New England Bond Income	BP	4.50	9/81
New England Global Govt	BP	4.50	4/88
New England Gov Security	BP	4.50	9/85
Newton Income Fund	BP	0.00	9/81
Nicholas Income Fund	BP	0.00	9/81
North Amer Sec-USG Bond	BP	4.75	4/87
Northeast Inv Trust	BP	0.00	9/81
Oppenheimer Champion Hi	BP	4.75	10/87
Oppenheimer GNMA	BP	4.75	9/86
Oppenheimer High Yield	BP	4.75	9/81
Oppenheimer Invest Grade	BP	4.75	4/88
Oppenheimer Strat Income	BP	4.75	10/89
Oppenheimer US Govt Tr	BP	4.75	8/85
Overland Express US Govt	BP	4.50	4/88
Pacifica Asset Preservtn	BP	4.50	7/90
Pacifica Income Fund	BP	4.50	7/90
Pacific Horizon US Govt	BP	4.50	1/88
Parkstone Bond Fund	BP	4.50	10/88
Parkstone Interm Govt	BP	4.50	10/88
Parkstone Ltd Maturity	BP	4.50	10/88
Permanent Portf T-Bill	BP	0.00	9/87
Phoenix High Quality Fd	BP	4.75	10/82
Phoenix High Yield	BP	4.75	9/81
Pilgrim GNMA	BP	4.75	8/84
Pilgrim High Yield Fund	BP	4.75	9/81
Pilgrim Sh-Trm Multi Mkt	BP	3.50	7/90
Pimit Low Duration	BP	0.00	5/87
Pimit Total Return	BP	0.00	5/87
Pioneer Bond Fund	BP	4.50	9/81
Piper Jaffray Gov Income	BP	4.00	3/87
Piper Jaffray Inst Gov	BP	1.50	8/88
Plymouth Govt Securities	BP	4.00	1/87
Plymouth High Yield	BP	4.75	1/87
Plymouth Short-Term Bond	BP	1.50	10/87
PNE Managed Income	BP	4.50	10/89
Portico Bond Immdex	BP	0.25	1/90
Portico Sh-Interm Fx Inc	BP	0.00	1/90

Fund Name	IO	Load	Data From
Price Rowe GNMA Fund	BP	0.00	11/85
Price Rowe High Yield Bd	BP	0.00	1/85
Price Rowe Intl Bond	BP	0.00	9/86
Price Rowe New Income	BP	0.00	9/81
Price Rowe Sh-Term Bond	BP	0.00	3/84
Prime Value Govt Income	BP	4.50	12/88
Principal Presv Gov Port	BP	4.50	1/86
Princor Bond Fund	BP	5.00	10/87
Princor Gov Secs Income	BP	5.00	6/85
Princor High Yield Fund	BP	5.00	10/87
Providentmutual USG	BP	4.50	9/86
Prudential GNMA Fund B	BP	0.00	4/82
Prudential Gov Plus B	BP	0.00	5/85
Prudential Govt Secs	BP	0.00	9/82
Prudential High Yield B	BP	0.00	9/81
Prudential US Govt Fd B	BP	0.00	12/86
Putnam Adj Rate USG Fd	BP	4.75	1/88
Putnam Corp Asset Trust	BP	2.50	1/84
Putnam Diversified Inc	BP	4.75	9/88
Putnam Global Gov Income	BP	4.75	5/87
Putnam GNMA plus	BP	4.75	5/86
Putnam High Income Gov	BP	6.75	3/85
Putnam High Yield	BP	6.75	9/81
Putnam High Yield II	BP	6.75	3/86
Putnam Income Fund	BP	4.75	9/81
Putnam U.S. Gov Income	BP	4.75	1/84
PW Global Income B	BP	0.00	3/87
PW High Income Fund A	BP	4.00	8/84
PW Income Fund B	BP	0.00	3/86
PW Investment Grade A	BP	4.00	8/84
PW USG Income Fd A	BP	4.00	8/84
Quest for Value Govt Inc	BP	4.75	5/88
RBB Safeguard Fixed Inc	BP	5.00	10/88
Retirement Planning-Bond	BP	0.00	5/84
Rightime Gov Securities	BP	4.75	12/86
Rushmore USG Intermed	BP	0.00	12/85
Rushmore USG Long-Term	BP	0.00	12/85
Scudder GNMA	BP	0.00	7/85

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Fund Name	IO	Load	Data From
Scudder Income Fund	BP	0.00	9/81
Scudder International Bd	BP	0.00	6/88
Scudder Sh-Term Bond	BP	0.00	3/84
Seafirst Bond Fund	BP	0.00	3/88
Security Inc Fd-Corp Bd	BP	4.75	9/81
Security Inc Fd-Govt	BP	4.75	8/85
Security Inc Fd-Hi Yield	BP	4.75	8/86
SEI Bond Index Portfolio	BP	0.00	5/86
SEI GNMA	BP	0.00	3/87
SEI Intermediate-Trm Gov	BP	0.00	2/87
SEI Ltd Volatility Bond	BP	0.00	4/87
SEI Short-Term Gov Portf	BP	0.00	2/87
Seligman Gov Guaranteed	BP	4.75	4/85
Seligman High Yield Bond	BP	4.75	3/85
Seligman Secured Mtg	BP	4.75	3/85
Sentinel Bond	BP	5.25	9/81
Sentinel Gov Securities	BP	5.25	9/86
Shearson Diversified Str	BP	0.00	12/89
Shearson Global Bd Portf	BP	0.00	10/86
Shearson Gov Secs Portf	BP	0.00	3/84
Shearson High Yield Fund	BP	5.00	9/81
Shearson Hi Inc Portf	BP	0.00	9/86
Shearson Interm Gov Port	BP	0.00	9/85
Shearson Inv Grade Bond	BP	0.00	1/82
Shearson Managed Govts	BP	5.00	9/84
Shearson Mortgage Portf	BP	0.00	11/85
Shearson Short-Trm World	BP	3.00	6/90
Sheffield Intermed Bond	BP	0.00	7/90
Smith, Barney Income Rtn	BP	1.50	2/85
Smith, Barney Mthly Gov	BP	4.00	3/86
Smith, Barney USG Secs	BP	4.00	10/84
Steinroe Government Inc	BP	0.00	3/86
Steinroe Income Fund	BP	0.00	3/86
Steinroe Intermediate Bd	BP	0.00	3/82
Strong Income Fund	BP	0.00	12/85
Sunamerica Govt Income	BP	4.75	2/87
Sunamerica High Income	BP	0.00	3/86
Sunamerica High Yield	BP	4.75	9/86

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Fund Name	IO	Load	Data From
Sunamerica Income Plus	BP	0.00	9/86
Sunamerica US Gov Secs	BP	0.00	3/86
Templeton Income Fund	BP	4.50	9/86
Thomson Income Fund B	BP	0.00	3/84
Thomson US Govt Fund B	BP	0.00	9/85
Tower US Gov Income	BP	4.50	11/88
Transamerica Govt Inc A	BP	2.50	1/86
Transamerica Govt Secs A	BP	4.75	1/85
Transamerica Inv Qual A	BP	4.75	9/81
Transamerica Sp Govt B	BP	0.00	1/88
Transamerica Sp Hiyld B	BP	0.00	10/87
Twentieth Cent Long Bond	BP	0.00	3/87
Twentieth Cent US Gov	BP	0.00	12/82
UMB Bond Fund	BP	0.00	12/82
United Bond Fund	BP	8.50	9/81
United Gov Securities Fd	BP	4.25	5/84
United High Income Fund	BP	8.50	9/81
United High Income II	BP	8.50	7/86
USAA Mutual Fd Income	BP	0.00	9/81
U.S. Gov Guaranteed Secs	BP	4.75	10/85
UST Master Managed Inc	BP	4.50	2/86
Value Line Aggres Inc Tr	BP	0.00	2/86
Value Line US Gov Secs	BP	0.00	1/82
Van Eck World Income	BP	4.75	5/87
Vanguard Bond Mkt Fund	BP	0.00	12/86
Vanguard Fi Inc GNMA	BP	0.00	9/81
Vanguard Fi Inc Hi Yield	BP	0.00	9/81
Vanguard Fi Inc Inv Grad	BP	0.00	9/81
Vanguard Fi Inc Treasury	BP	0.00	5/86
Vanguard Fi Secs Sh-Term	BP	0.00	10/82
Vanguard Fi Sh-Gov Bond	BP	0.00	12/87
Vanguard Preferred Stock	BP	0.00	9/81
Van Kampen High Yield	BP	4.90	6/86
Van Kampen Short Globl S	BP	3.00	9/90
Van Kampen US Govt	BP	4.90	7/84
Venture Income Plus	BP	4.75	5/82
Vista US Gov Income	BP	4.50	10/87
Voyageur US Govt Secs	BP	4.75	11/87

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Fund Name	IO	Load	Data From
Westcore Bond Plus	BP	4.50	6/88
Westcore Interm-Term Bd	BP	4.50	6/88
Westcore Long-Term Bond	BP	4.50	6/88
Winthrop Fixed Income Fd	BP	0.00	12/86
Wm Blair Income Series	BP	0.00	9/90
WPG Gov Securities	BP	0.00	2/86
Zweig St Gov Securities	BP	4.75	3/85

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APPENDIX I

This appendix contains a list of all municipal bond mutual funds (MB) covered by

CDA Investment Technologies during the period September 1981 through September 1991.

In total, 368 mutual funds were contained in this data base.

Fund Name	IO	Load	Data From
AARP Insd Txfr Gen Bond	MB	0.00	12/84
ABT Fl Tax Free Fund	MB	4.75	5/88
Alliance Muni Income-Ca	MB	4.50	12/86
Alliance Muni Income-Nat	MB	4.50	12/86
Alliance Muni Income-Ny	MB	4.50	12/86
Alliance Muni Insd Ca	MB	4.50	11/85
Alliance Muni Insd Natl	MB	4.50	12/86
Alpine Calif Muni Asset	MB	3.75	9/88
Alpine Natl Muni Asset	MB	3.75	2/87
American Capital Muni Bd	MB	4.75	9/81
American Capital Txe Hiy	MB	4.75	1/86
American Capital Txe Ins	MB	4.75	1/86
American Fds-Tx ex Ca	MB	4.75	10/86
American Fds-Tx ex Md	MB	4.75	8/86
American Fds-Tx ex Va	MB	4.75	8/86
Amev Tax Free Mn Portf	MB	4.50	6/86
Amev Tax Free Natl Portf	MB	4.50	6/86
Atlas Ca Double Tax Free	MB	3.00	1/90
Axe-Houghton Ins Tx ex	MB	4.75	9/90
Benham Calif Tf-Intermed	MB	0.00	11/83
Benham Calif Tf-Long Trm	MB	0.00	11/83
Bernstein Ca Muni	MB	0.00	8/90
Bernstein Divers Muni	MB	0.00	1/89
Bernstein Ny Municipal	MB	0.00	1/89
Boston Co. Ca Tax Free	MB	0.00	3/88
Boston Co. Ny Tax Free	MB	0.00	3/88
Boston Co. Tax Free	MB	0.00	10/85
Bull & Bear Tax Free	MB	0.00	3/84
Calvert Txfr Reserve-Lg	MB	4.75	8/83

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Fund Name	IO	Load	Data From
Calvert Txfr Reserve-Ltd	MB	2.00	9/81
Carnegie Txe-Minnesota	MB	4.50	5/86
Carnegie Txe-Natl Hiyld	MB	4.50	8/86
Carnegie Txe-Ohio Genl	MB	4.50	8/86
Chubb Tax Exempt	MB	5.00	12/87
Churchill Tax-Free Fd Ky	MB	4.00	5/87
Cigna Mnicipal Bond	MB	5.00	9/81
Colonial Ca Tx ex Trust	MB	4.75	6/86
Colonial Mass Tx ex Tr	MB	4.75	7/87
Colonial Mich Tx ex Tr	MB	4.75	9/86
Colonial Minn Tx ex Tr	MB	4.75	9/86
Colonial Ny Tx ex Trust	MB	4.75	9/86
Colonial Ohio Tx ex	MB	4.75	9/86
Colonial Tax Exempt Fund	MB	4.75	1/82
Colonial Tax Exempt Insd	MB	4.75	11/85
Colonial Vip-Hiyld Muni	MB	0.00	4/88
Columbia Municipal Bond	MB	0.00	1/85
Composite Tax Exempt Bd	MB	4.00	9/81
Counsellors N.Y. Muni	MB	0.00	4/87
Dean Witter Calif Tx Fr	MB	0.00	7/84
Dean Witter Ny Tx Fr Inc	MB	0.00	5/85
Dean Witter Tx ex Secs	MB	4.00	9/81
Delaware Grp-Txfr USA	MB	4.75	1/84
Delaware Grp-Txfr USA In	MB	4.75	3/85
DMC Tax Free-Pa	MB	4.75	9/81
Dreyfus Calif Tax Exempt	MB	0.00	7/83
Dreyfus General Muni Bd	MB	0.00	3/84
Dreyfus Insured Muni Bd	MB	0.00	6/85
Dreyfus Intermdiate Muni	MB	0.00	8/83
Dreyfus Mass Tax Exempt	MB	0.00	6/85
Dreyfus NJ Tax Exempt Bd	MB	0.00	10/87
Dreyfus NY Tax Exempt Bd	MB	0.00	7/83
Dreyfus Premier Ca Tx ex	MB	4.50	10/86
Dreyfus Premier Ct Tx ex	MB	4.50	4/87
Dreyfus Premier Fl Tx ex	MB	4.50	4/87
Dreyfus Premier Ma Tx ex	MB	4.50	4/87
Dreyfus Premier Md Tx ex	MB	4.50	4/87
Dreyfus Premier Mi Tx ex	MB	4.50	4/87

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Fund Name	IO	Load	Data From
Dreyfus Premier Mn Tx ex	MB	4.50	4/87
Dreyfus Premier Muni Bd	MB	4.50	10/86
Dreyfus Premier Ny Tx ex	MB	4.50	12/86
Dreyfus Premier Oh Tx ex	MB	4.50	4/87
Dreyfus Premier Pa Tx ex	MB	4.50	6/87
Dreyfus Premier Tx Tx ex	MB	4.50	5/87
Dreyfus Sh-Interm Tx ex	MB	0.00	4/87
Dreyfus Tax Exempt Bond	MB	0.00	9/81
Dupree Kentucky Txfr Inc	MB	0.00	9/81
Eaton Vance Ca Muni	MB	0.00	12/85
Eaton Vance Fl Tax Free	MB	0.00	8/90
Eaton Vance Municipal Bd	MB	4.75	9/81
Eaton Vance Natl Muni	MB	0.00	12/85
Eaton Vance Ny Tax Free	MB	0.00	8/90
Empire Builder Tax Free	MB	4.25	3/88
Equitable Tax Exempt B	MB	0.00	10/87
Federated Intmed Muni Tr	MB	0.00	12/85
Federated Sh-Interm Muni	MB	0.00	9/81
Federated Tax Fr Income	MB	4.50	9/81
Fidelity Aggress Tax Fr	MB	0.00	9/85
Fidelity Ca Txfr Hyld	MB	0.00	7/84
Fidelity High Yield Muni	MB	0.00	9/81
Fidelity Insd Tx Fr Muni	MB	0.00	11/85
Fidelity Ltd Term Muns	MB	0.00	9/81
Fidelity Mass Tax Free	MB	0.00	2/84
Fidelity Michigan Txfr	MB	0.00	11/85
Fidelity Minnesota Txfr	MB	0.00	11/85
Fidelity Muni Bond Fund	MB	0.00	9/81
Fidelity N.J. High Yield	MB	0.00	1/88
Fidelity N.Y. Muni Trust	MB	0.00	9/85
Fidelity N.Y. Txfr Hyld	MB	0.00	7/84
Fidelity Ohio Txfr	MB	0.00	11/85
Fidelity Spartan Pa Hyld	MB	0.00	8/86
Fidelity Spartan Si Muni	MB	0.00	12/86
Fidelity Tx ex Ltd Term	MB	0.00	3/86
Financial Tax Fr Inc Shs	MB	0.00	4/82
First Invest. Insd Txe	MB	6.90	9/81
First Invest. NY Tax Fr	MB	6.90	9/84

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Fund Name	IO	Load	Data From
First Trust Txfr-Income	MB	4.50	11/86
First Trust Txfr-Insured	MB	4.50	11/86
Flagship All Amer Tax ex	MB	4.20	9/88
Flagship Arizona Dbl Tx	MB	4.20	11/86
Flagship Co Dbl Tx ex	MB	4.20	4/87
Flagship Ct Dbl Txex	MB	4.20	7/87
Flagship Fl Dbl Tx ex	MB	4.20	6/90
Flagship Georgia Dbl Tx	MB	4.20	4/86
Flagship Ky Triple Tax	MB	4.20	4/87
Flagship La Dbl Tx ex	MB	4.20	9/89
Flagship Ltd Term Txex	MB	2.50	10/87
Flagship Mich Triple Tx	MB	4.20	7/85
Flagship Mo Dbl Txex	MB	4.20	7/87
Flagship N.C. Triple Tx	MB	4.20	4/86
Flagship Ohio Double Tax	MB	4.20	7/85
Flagship Pa Triple Tx ex	MB	4.20	11/86
Flagship Tn Dbl Txex	MB	4.20	10/87
Flagship Virginia Dbl Tx	MB	4.20	4/86
Fortress Muni Income Fd	MB	1.00	4/87
Franklin Alabama Txfr	MB	4.00	8/87
Franklin Arizona Txfr	MB	4.00	8/87
Franklin Calif Insd Txfr	MB	4.00	8/85
Franklin Calif Tax Free	MB	4.00	10/82
Franklin Colorado Tax Fr	MB	4.00	9/87
Franklin Ct Tx Free Inc	MB	4.00	9/88
Franklin Federal Tax Fr	MB	4.00	10/83
Franklin Florida Txfr	MB	4.00	8/87
Franklin Georgia Tax Fr	MB	4.00	9/87
Franklin High Yield Txfr	MB	4.00	4/86
Franklin Insd Tax-Fr Inc	MB	4.00	9/85
Franklin La Tax Free	MB	4.00	9/87
Franklin Mass Tax Free	MB	4.00	4/85
Franklin Md Tax Free	MB	4.00	9/88
Franklin Mi Tax Free	MB	4.00	4/85
Franklin Mn Tax Free	MB	4.00	4/85
Franklin Mo Tax Free	MB	4.00	9/87
Franklin NC Tax Free	MB	4.00	9/87
Franklin New York Tax Fr	MB	4.00	3/83

Fund Name	IO	Load	Data From
Franklin NJ Tx Free Inc	MB	4.00	4/88
Franklin Ohio Tax Free	MB	4.00	4/85
Franklin Oregon Tax Free	MB	4.00	8/87
Franklin Penn Tax Free	MB	4.00	12/86
Franklin Puerto Rico Txf	MB	4.00	3/85
Franklin Virginia Txfr	MB	4.00	8/87
Freedom Mgd Tx ex Fd	MB	0.00	4/87
General N.Y. Muni Bond	MB	0.00	11/84
GIT Tax Free High Yield	MB	0.00	7/83
GW Sierra Calif Muni	MB	4.50	7/89
GW Sierra National Muni	MB	4.50	7/90
Hancock J. Tax Exempt-Ca	MB	4.50	9/87
Hancock J. Tax Exempt-Ma	MB	4.50	9/87
Hancock J. Tax Exempt-Ny	MB	4.50	9/87
Hancock J. Tax ex Income	MB	4.50	9/81
Hawaiian Tax-Free Trust	MB	4.00	3/85
Helmsman Tx Fr Income	MB	0.00	9/90
IDS Calif Tax Exempt	MB	5.00	8/86
IDS High Yield Tax ex	MB	5.00	9/81
IDS Insured Tax-Exempt	MB	5.00	8/86
IDS Mn Tax Exempt Fund	MB	5.00	8/86
IDS NY Tx ex Fund	MB	5.00	8/86
IDS Tax Exempt Bond	MB	5.00	9/81
ITB-Massachusetts Tax Fr	MB	4.25	5/84
Kemper Calif Tax Free	MB	4.50	7/83
Kemper Muni Bond Fund	MB	4.50	9/81
Kemper New York Tax Free	MB	4.50	5/88
Keystone Amer Txfr In	MB	2.00	4/87
Keystone Tax Exempt Tr	MB	0.00	10/85
Keystone Tax Free Bond	MB	0.00	1/82
Landmark Ny Tax Free	MB	0.00	9/86
Lexington Txex Bond Tr	MB	0.00	7/86
Limited Term Muni-Ca	MB	2.75	2/87
Limited Term Muni-Natl	MB	2.75	9/84
Lord Abbett Tx Free Ca	MB	4.75	9/85
Lord Abbett Tx Free Natl	MB	4.75	4/84
Lord Abbett Tx Free NY	MB	4.75	4/84
Lord Abbett Tx Free Tx	MB	4.75	1/87

Fund Name	IO	Load	Data From
Lutheran Brother. Mun Bd	MB	5.00	9/81
Mackenzie Ca Muni Fund	MB	4.75	6/88
Mackenzie National Muni	MB	4.75	6/88
Mackenzie Ny Muni Fund	MB	4.75	6/88
Mainstay Tax Free Bond	MB	0.00	5/86
Merrill L Ca Muni Bd A	MB	4.00	10/88
Merrill L Ca Muni Bd B	MB	0.00	10/85
Merrill L Muni-Bd Hyld A	MB	4.00	9/81
Merrill L Muni-Bd Hyld B	MB	0.00	10/88
Merrill L Muni-Bd Insd A	MB	4.00	9/81
Merrill L Muni-Bd Insd B	MB	0.00	10/88
Merrill L Muni Income A	MB	2.00	10/88
Merrill L Muni Income B	MB	0.00	11/86
Merrill L Muni-Ltd Mat	MB	0.75	9/81
Merrill L Nj Muni Bond A	MB	4.00	8/90
Merrill L Nj Muni Bond B	MB	4.00	8/90
Merrill L Ny Muni Bond A	MB	4.00	10/88
Merrill L Ny Muni Bond B	MB	0.00	11/85
Merrill L Pa Muni Bond A	MB	4.00	8/90
Merrill L Pa Muni Bond B	MB	4.00	8/90
Metlife-SS Tax Exempt Fd	MB	4.50	8/86
MFS Lifetime Mgd Muni Bd	MB	0.00	12/86
MFS Mgd Calif Tax Exempt	MB	4.75	10/85
MFS Mgd Multi-St Al Muni	MB	4.75	2/90
MFS Mgd Multi-St Ga Muni	MB	4.75	6/88
MFS Mgd Multi-St Ma Muni	MB	4.75	7/85
MFS Mgd Multi-St Md Muni	MB	4.75	10/84
MFS Mgd Multi-St Nc Muni	MB	4.75	1/85
MFS Mgd Multi-St Ny Muni	MB	4.75	6/88
MFS Mgd Multi-St Sc Muni	MB	4.75	10/84
MFS Mgd Multi-St Tn Muni	MB	4.75	10/88
MFS Mgd Multi-St Va Muni	MB	4.75	1/85
MFS Mgd Multi-St Wv Muni	MB	4.75	10/84
MFS Mgd Muni-Bd Trust	MB	4.75	9/81
MFS Mgd Muni-Bond Hiyld	MB	4.75	5/84
Midwest Ohio Insured Txf	MB	4.00	4/85
Midwest Tax-Free Interm	MB	1.00	10/81
Mutual of Omaha Tax Free	MB	4.75	9/81

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Fund Name	IO	Load	Data From
Nationwide Tax Free Fund	MB	0.00	3/86
Natl Secs Ca Tax Exempt	MB	4.75	1/84
Natl Secs Tax Exempt Bd	MB	4.75	9/81
New England Txex Income	MB	4.50	9/81
Nuveen Ca Tx-Fr Insured	MB	4.75	7/86
Nuveen Ca Tx-Fr Special	MB	4.75	7/86
Nuveen Municipal Bond	MB	4.75	9/81
Nuveen Tx-Fr Mass Insd	MB	4.75	12/86
Nuveen Tx-Fr Mass Specl	MB	4.75	12/86
Nuveen Tx-Fr Natl Insd	MB	4.75	12/86
Nuveen Tx-Fr Ny Insured	MB	4.75	12/86
Nuveen Tx-Fr Ny Special	MB	4.75	12/86
Nuveen Tx-Fr Ohio Specl	MB	4.75	12/86
Olympus Tx ex High Yield	MB	4.25	9/87
Oppenheimer Calif Tx ex	MB	4.75	11/88
Oppenheimer Ny Tx Exempt	MB	4.75	1/85
Oppenheimer Tax Free Bd	MB	4.75	7/82
Overland Express Ca Txfr	MB	4.50	10/88
Pacifica Ca Tax Free	MB	4.50	7/90
Pacific Horizon Cal Tax	MB	4.50	3/84
Parkstone Mich Muni Bd	MB	4.50	7/90
Parkstone Muni Bond	MB	4.50	10/88
Phoenix Tax Exempt Bond	MB	4.75	7/88
Pioneer Muni Bond Fund	MB	4.50	10/86
Piper Jaffray Minn Tx ex	MB	4.00	8/88
Piper Jaffray Natl Tx ex	MB	4.00	8/88
Plymouth High Inc Muni	MB	4.75	9/87
Price Rowe Calif Tax-Fr	MB	0.00	9/86
Price Rowe Md Tax Free	MB	0.00	3/87
Price Rowe Sh-Int Tax Fr	MB	0.00	12/83
Price Rowe Tax Free Inc	MB	0.00	9/81
Price Rowe Tax Fr Hiyld	MB	0.00	1/85
Prime Value Mn Muni Bond	MB	0.00	1/88
Principal Presv Insd Tx	MB	4.50	9/86
Principal Presv Tax-Ex	MB	4.50	8/84
Princor Tax-Exempt Bond	MB	5.00	1/86
Providentmutual Pa Tx Fr	MB	4.50	9/86
Providentmutual Txfr Bd	MB	4.50	10/84

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Fund Name	IO	Load	Data From
Prudential Natl Muni B	MB	0.00	7/85
Putnam Ca Tx Exempt	MB	4.75	1/84
Putnam Mass Tx Exempt	MB	0.00	10/86
Putnam Mass Tx Exempt II	MB	4.75	11/89
Putnam Mich Tx Exempt	MB	0.00	10/86
Putnam Mich Tx Exempt II	MB	4.75	11/89
Putnam Minn Tx Exempt	MB	0.00	10/86
Putnam Minn Tx Exempt II	MB	4.75	11/89
Putnam NJ Tax Free	MB	4.75	2/90
Putnam NY Tax Exempt	MB	4.75	1/84
Putnam Ohio Tx Exempt	MB	0.00	10/86
Putnam Ohio Tx Exempt II	MB	4.75	11/89
Putnam Pa Tax Exempt	MB	4.75	7/89
Putnam Tax Exempt Inc	MB	4.75	9/81
Putnam Tx-Fr High Inc	MB	4.75	5/89
Putnam Tx-Fr High Yld	MB	0.00	8/85
Putnam Tx-Fr Insured	MB	0.00	8/85
PW Calif Tax-Free A	MB	4.00	9/85
PW Muni High Income A	MB	4.00	6/87
PW National Tax-Free A	MB	4.00	12/84
PW N.Y. Tax-Free A	MB	4.00	9/88
RBB Safeguard Tax-Free	MB	5.00	10/88
Rochester Fd Municipals	MB	4.00	6/86
Rushmore Maryland Tax Fr	MB	0.00	1/84
Rushmore Virginia Tax Fr	MB	0.00	1/84
Safeco Municipal Bond Fd	MB	0.00	1/82
Scudder Calif Tax Free	MB	0.00	2/84
Scudder Managed Muni Bd	MB	0.00	9/81
Scudder Medium-Term Txfr	MB	0.00	4/83
Scudder New York Tax Fr	MB	0.00	7/83
Scudder Tx Fr Targt 1993	MB	0.00	4/83
Security Tax Exempt Fund	MB	4.75	1/84
SEI Intermediate-Trm Mun	MB	0.00	9/89
SEI Pa Tax Exempt Fund	MB	0.00	9/89
Seligman Tx ex Cal High	MB	4.50	5/85
Seligman Tx ex Cal Qual	MB	4.50	5/85
Seligman Tx ex Colorado	MB	4.75	5/86
Seligman Tx ex Florida	MB	4.75	11/86

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Fund Name	IO	Load	Data From
Seligman Tx ex Georgia	MB	4.75	6/87
Seligman Tx ex Louisiana	MB	4.75	10/85
Seligman Tx ex Maryland	MB	4.75	10/85
Seligman Tx ex Mass	MB	4.75	5/84
Seligman Tx ex Michigan	MB	4.75	8/84
Seligman Tx ex Minnesota	MB	4.75	12/83
Seligman Tx ex Missouri	MB	4.75	7/86
Seligman Tx ex National	MB	4.75	8/84
Seligman Tx ex New York	MB	4.75	5/84
Seligman Tx ex Nj	MB	4.75	2/88
Seligman Tx ex Ohio	MB	4.75	12/83
Seligman Tx ex Oregon	MB	4.75	10/86
Seligman Tx ex Penn Qual	MB	4.75	7/86
Seligman Tx ex Sc	MB	4.75	6/87
Shearson Arizona Muni Fd	MB	5.00	6/87
Shearson Calif Muni Fund	MB	5.00	4/84
Shearson Managed Muni	MB	5.00	9/81
Shearson Mass Muni Fund	MB	5.00	12/87
Shearson New Jersey Muni	MB	5.00	4/88
Shearson New York Muni	MB	5.00	1/84
Shearson Tax-Ex Inc	MB	0.00	9/85
Smith, Barney Ca Muni	MB	4.00	4/87
Smith, Barney Ltd Muni	MB	2.00	11/88
Smith, Barney Natl Muni	MB	4.00	8/86
Smith, Barney Ny Muni	MB	4.00	1/87
Steinroe High-Yield Muni	MB	0.00	3/84
Steinroe Intermed Muni	MB	0.00	10/85
Steinroe Managed Muni Fd	MB	0.00	9/81
Strong Muni Fund	MB	0.00	10/86
Sunamerica Calif Muni Fd	MB	4.75	3/88
Sunamerica Ins Tx-Stripe	MB	4.75	11/85
Tax Exempt Bd Fd/America	MB	4.75	9/81
Tax-Free Fd of Colorado	MB	4.00	5/87
Tax-Free Trust Arizona	MB	4.00	3/86
Tax-Free Trust of Oregon	MB	4.00	6/86
Thomson Tx Exempt Fund B	MB	0.00	11/85
Transamerica Ca Tx Fr A	MB	4.75	12/89
Transamerica Sp Hy Tx B	MB	0.00	8/86

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Fund Name	IO	Load	Data From
Transamerica Txfr Bond A	MB	4.75	1/90
Twentieth Cent Txex Int	MB	0.00	3/87
Twentieth Cent Txex Long	MB	0.00	3/87
Unified Muni Fd-Indiana	MB	4.50	4/85
United Municipal Bond Fd	MB	4.25	9/81
United Muni High Income	MB	4.25	1/86
USAA Calif Bond Fund	MB	0.00	8/89
USAA Tax ex High Yield	MB	0.00	3/82
USAA Tax ex Intermediate	MB	0.00	3/82
USAA Tax ex Sh-Term Fund	MB	0.00	3/82
US Tax Free Fund	MB	0.00	11/84
UST Master Tax ex Interm	MB	4.50	1/86
UST Master Tax ex Long	MB	4.50	3/86
Value Line Tx ex Hi Yld	MB	0.00	1/85
Vanguard Calif Ins Tx Fr	MB	0.00	4/86
Vanguard Muni High Yield	MB	0.00	9/81
Vanguard Muni Insured Lt	MB	0.00	10/84
Vanguard Muni Interm-Trm	MB	0.00	9/81
Vanguard Muni-Limited	MB	0.00	8/87
Vanguard Muni Long-Term	MB	0.00	9/81
Vanguard Muni Short-Term	MB	0.00	9/81
Vanguard Nj Txfr-Insd	MB	0.00	2/88
Vanguard Ny Txfr-Insd	MB	0.00	4/86
Vanguard Penna Insd Txfr	MB	0.00	4/86
Van Kampen Ca Insd Tx	MB	4.90	2/86
Van Kampen Insd Tx Fr	MB	4.90	2/85
Van Kampen Pa Txfr in	MB	4.90	5/87
Van Kampen Tx Fr High	MB	4.90	9/85
Venture Muni Plus	MB	0.00	3/85
Vista Ny Tx Fr Income	MB	4.50	10/87
Vista Tx Fr Income Fund	MB	4.50	10/87
Voyageur Colorado Tax Fr	MB	3.90	4/87
Voyageur Mn Insured	MB	4.75	4/87
Voyageur Mn Interm Tx Fr	MB	2.75	10/85
Voyageur Mn Tax Free	MB	4.75	3/84

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APPENDIX J

This appendix contains a list of all mutual funds covered by CDA Investment

Technologies in operation as of September 1981. In total, 474 mutual funds were contained

in this data base.

Fund Name	IO	Load	Data From
ABT Growth & Income Tr	GI	4.75	9/81
ABT Utility Income Fund	GI	4.75	9/81
Acorn Fund	G	0.00	9/81
Aegon USA Capital Apprec	G	4.75	9/81
Aegon USA Growth Portf	GI	4.75	9/81
Affiliated Fund	GI	6.75	9/81
Afuture Fund	G	0.00	9/81
AGE High Income Fund	BP	4.00	9/81
AIM Charter Fund	G	5.50	9/81
AIM Constellation Fund	AG	5.50	9/81
AIM Convertible Secs Inc	G	4.75	9/81
AIM High Yld Securities	BP	4.75	9/81
AIM Weingarten Fund	G	5.50	9/81
Alliance Globl Sm Cap A	AG	5.50	9/81
Alliance Bd-Mthly Income	BP	4.75	9/81
Alliance Balanced Shrs A	B	5.50	9/81
Alliance Fund A	AG	5.50	9/81
Alliance Global-Canadian	IN	5.50	9/81
Alliance Quasar A	AG	5.50	9/81
Alliance International A	IN	5.50	9/81
Alliance Growth & Inc A	GI	5.50	9/81
AMA Classic Growth	G	4.75	9/81
AMA USG Income Plus	BP	4.75	9/81
Amcap Fund	G	5.75	9/81
American Capital Hiyld	BP	4.75	9/81
American Capital Muni Bd	MB	4.75	9/81
American Capital Pace Fd	G	5.75	9/81
American Cap Corp Bond	BP	4.75	9/81
American Growth Fund	GI	8.50	9/81

Fund Name	IO	Load	Data From
American Cap Emerging Gr	AG	5.75	9/81
American Heritage Fund	AG	0.00	9/81
American Cap Enterprise	G	5.75	9/81
American Investors Gr Fd	AG	8.50	9/81
American Cap Gr & Income	G	5.75	9/81
American Investors Incm	GI	5.00	9/81
American Natl Inc Fund	GI	8.50	9/81
American Leaders Fund	G	4.50	9/81
American Balanced Fund	B	5.75	9/81
American Mutual Fund	GI	5.75	9/81
American Capital Harbor	B	5.75	9/81
American Cap Equity Inc	B	5.75	9/81
American Cap Comstock	G	8.50	9/81
American National Growth	G	8.50	9/81
Amev Capital Fund, Inc.	G	4.75	9/81
Amev Growth Fund, Inc.	AG	4.75	9/81
Amev Special Stock Fund	AG	0.00	9/81
Amev US Gov Securities	BP	4.50	9/81
Analytic Optioned Equity	GI	0.00	9/81
Anchor Cap Accumulation	GI	0.00	9/81
Armstrong Associates	GI	0.00	9/81
Axe-Houghton Growth Fund	AG	5.75	9/81
Axe-Houghton Fund B	B	5.75	9/81
Axe-Houghton Income Fund	BP	4.75	9/81
Babson Bond Tr-Long	BP	0.00	9/81
Babson Growth Fund	G	0.00	9/81
Bascom Hill Investors	GI	0.00	9/81
Beacon Hill Mutual Fund	G	0.00	9/81
Berger 100 Fund	AG	0.00	9/81
Berger 101 Fund	G	0.00	9/81
Bond Fund of America	BP	4.75	9/81
Boston Co. Cap. Apprec.	G	0.00	9/81
Bruce Fund	G	0.00	9/81
Bull & Bear Equity Inc.	GI	0.00	9/81
Bull & Bear Cap Growth	AG	0.00	9/81
Bull & Bear Gold Invs	ME	0.00	9/81
Burnham Fund	B	5.00	9/81
Calvert Txfr Reserve-Ltd	MB	2.00	9/81

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Fund Name	IO	Load	Data From
Capstone Govt Income Tr	BP	0.00	9/81
Cardinal Fund	GI	8.50	9/81
Century Shares Trust	G	0.00	9/81
CGM Capital Development	AG	0.00	9/81
CGM Mutual Fund	GI	0.00	9/81
Cigna Growth Fund	G	5.00	9/81
Cigna High Yield	BP	5.00	9/81
Cigna Income Fund	BP	5.00	9/81
Cigna Municipal Bond	MB	5.00	9/81
Colonial High Yield Secs	BP	4.75	9/81
Colonial Income	BP	4.75	9/81
Colonial Growth Shares	G	5.75	9/81
Colonial Strategic Inc	B	4.75	9/81
Colonial Corp Cash I	B	2.00	9/81
Colonial Fund	GI	5.75	9/81
Columbia Growth Fund	G	0.00	9/81
Commonwealth Inv Tr-Bal	B	7.50	9/81
Composite Growth Fund	GI	4.00	9/81
Composite Bond & Stock	B	4.00	9/81
Composite Income Fund	BP	4.00	9/81
Composite Tax Exempt Bd	MB	4.00	9/81
Copley Fund	G	0.00	9/81
Country Capital Growth	GI	3.00	9/81
Dean Witter Dividend Gro	GI	0.00	9/81
Dean Witter High Yield	BP	5.50	9/81
Dean Witter American Val	G	0.00	9/81
Dean Witter Tx Ex Secs	MB	4.00	9/81
Dean Witter Nat Resource	G	0.00	9/81
Delaware Grp-Delchstr I	BP	6.75	9/81
Delaware Grp-Decatur I	GI	8.50	9/81
Delaware Grp-Delaware Fd	B	6.75	9/81
Delaware Grp-Delta Trend	AG	4.75	9/81
Depositors Fund/Boston	G	0.00	9/81
Diversification Fund	G	0.00	9/81
DMC Tax Free-Pa	MB	4.75	9/81
Dodge & Cox Balanced	B	0.00	9/81
Dodge & Cox Stock	G	0.00	9/81
Donoghue Money Mkt Avg	BP	0.00	9/81

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Fund Name	IO	Load	Data From
Dreyfus A Bonds Plus	BP	0.00	9/81
Dreyfus Leverage	GI	4.50	9/81
Dreyfus Gr Opportunity	G	0.00	9/81
Dreyfus Third Century	GI	0.00	9/81
Dreyfus Tax Exempt Bond	MB	0.00	9/81
Dreyfus Fund	B	0.00	9/81
Dreyfus Convertible Secs	GI	0.00	9/81
Dupree Kentucky Txfr Inc	MB	0.00	9/81
Eagle Growth Shares	AG	8.50	9/81
Eaton Vance Inc Fd/Bost	BP	4.75	9/81
Eaton Vance Growth Fund	G	4.75	9/81
Eaton Vance Stock Fund	GI	4.75	9/81
Eaton Vance Investors Fd	B	4.75	9/81
Eaton Vance Municipal Bd	MB	4.75	9/81
Eaton Vance Spl Equities	AG	4.75	9/81
Elfun Trusts	G	0.00	9/81
Enterprise Growth Fund	G	4.75	9/81
Evergreen Total Return	GI	0.00	9/81
Evergreen Fund	G	0.00	9/81
Fairmont Fund	AG	0.00	9/81
FBL-Growth Common Stock	GI	0.00	9/81
Federated Stock & Bond	B	0.00	9/81
Federated Sh-Interm Muni	MB	0.00	9/81
Federated Tax Fr Income	MB	4.50	9/81
Fidelity Flexible Bond	BP	0.00	9/81
Fidelity Sel Energy	G	3.00	9/81
Fidelity Exchange Fund	G	0.00	9/81
Fidelity Intermediate Bd	BP	0.00	9/81
Fidelity Sel Technology	AG	3.00	9/81
Fidelity Fund	GI	0.00	9/81
Fidelity Ltd Term Muns	MB	0.00	9/81
Fidelity Trend	AG	0.00	9/81
Fidelity Captl & Income	BP	0.00	9/81
Fidelity Muni Bond Fund	MB	0.00	9/81
Fidelity Value Fund	G	0.00	9/81
Fidelity Equity Income	GI	2.00	9/81
Fidelity Puritan Fund	B	2.00	9/81
Fidelity Govt Secs	BP	0.00	9/81

APPENDIX J   (Continued)

Fund Name	IO	Load	Data From
Fidelity Qualified Divd	GI	0.00	9/81
Fidelity High Yield Muni	MB	0.00	9/81
Fidelity Contrafund	AG	3.00	9/81
Fidelity Sel Prec Met&Mn	ME	3.00	9/81
Fidelity Congress Street	G	0.00	9/81
Fidelity Destiny-Plan 1	G	8.50	9/81
Fidelity Magellan Fund	G	3.00	9/81
Fidelity Sel Health	AG	3.00	9/81
Financial Dynamics Fund	AG	0.00	9/81
Financial Indust. Income	GI	0.00	9/81
Financial Indust. Fund	G	0.00	9/81
First Invest. Insd Txe	MB	6.90	9/81
First Invest. Fd. Income	BP	6.90	9/81
Forty-Four Wall St Fund	AG	0.00	9/81
Forty-Four Wall St Eqty	AG	0.00	9/81
Founders Special Fund	AG	0.00	9/81
Founders Blue Chip Fund	G	0.00	9/81
Founders Growth Fund	G	0.00	9/81
Founders Equity Income	B	0.00	9/81
FPA Capital Fund	AG	6.50	9/81
FPA New Income	BP	4.50	9/81
FPA Paramount Fd Inc	GI	6.50	9/81
Franklin Growth	G	4.00	9/81
Franklin Gold Fund	ME	4.00	9/81
Franklin Premier Return	GI	4.00	9/81
Franklin U.S. Govt. Sec.	BP	4.00	9/81
Franklin Utilities	GI	4.00	9/81
Franklin Income	B	4.00	9/81
Franklin Dynatech	G	4.00	9/81
Franklin Equity Fund	G	4.00	9/81
Fund for U.S. Govt. Sec.	BP	4.50	9/81
Fund of the Southwest	G	4.75	9/81
Fundamental Investors	G	5.75	9/81
Gateway Index Plus Fund	GI	0.00	9/81
General Elec S&S Program	GI	0.00	9/81
General Elec S&S Lt Bond	BP	0.00	9/81
General Securities	GI	5.00	9/81
Gintel Fund	G	0.00	9/81

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Fund Name	IO	Load	Data From
Growth Fund of America	G	5.75	9/81
Guardian Park Ave Fund	G	4.50	9/81
G. T. Pacific Growth Fd	IN	4.75	9/81
Hancock J. Growth Fund	G	4.50	9/81
Hancock J. Bond Fund	BP	4.50	9/81
Hancock J. Tax Ex Income	MB	4.50	9/81
Hancock J. US Govt Trust	BP	4.50	9/81
Hartwell Growth Fund	AG	4.75	9/81
Hartwell Emerging Growth	AG	4.75	9/81
IAI Bond Fund	BP	0.00	9/81
IAI Regional Fund	G	0.00	9/81
IAI Stock Fund	G	0.00	9/81
IDS Bond Fund	BP	5.00	9/81
IDS Equity Plus Fd Inc.	G	5.00	9/81
IDS Growth Fund	G	5.00	9/81
IDS High Yield Tax Ex	MB	5.00	9/81
IDS Mutual Fund	B	5.00	9/81
IDS New Dimensions Fund	G	5.00	9/81
IDS Progressive Fund	GI	5.00	9/81
IDS Selective	BP	5.00	9/81
IDS Stock Fund	GI	5.00	9/81
IDS Tax Exempt Bond	MB	5.00	9/81
Income Fund of America	B	5.75	9/81
Invest Co of America	GI	5.75	9/81
Investors Research	G	6.75	9/81
ITB-Growth Opportunities	G	5.75	9/81
Ivy Growth Fund	G	0.00	9/81
Janus Fund	G	0.00	9/81
JP Growth Fund	G	5.50	9/81
JP Income	BP	5.50	9/81
Kemper Diversified Inc	BP	4.50	9/81
Kemper Growth Fund	G	5.75	9/81
Kemper High Yield Fund	BP	4.50	9/81
Kemper Intl Fund	IN	5.75	9/81
Kemper Inc & Cap Preserv	BP	4.50	9/81
Kemper Muni Bond Fund	MB	4.50	9/81
Kemper Summit Fund	AG	5.75	9/81
Kemper Technology Fund	G	5.75	9/81

Fund Name	IO	Load	Data From
Kemper Total Return Fund	GI	5.75	9/81
Kemper US Govt Secs	BP	4.50	9/81
Keystone B-1	BP	0.00	9/81
Keystone K-1	B	0.00	9/81
Keystone B-2	BP	0.00	9/81
Keystone S-4	AG	0.00	9/81
Keystone S-3	G	0.00	9/81
Keystone Precious Metals	ME	0.00	9/81
Keystone Amer Omega	G	4.75	9/81
Keystone K-2	G	0.00	9/81
Keystone S-1	G	0.00	9/81
Keystone Intl Fund	IN	0.00	9/81
Keystone B-4	BP	0.00	9/81
Kleinwort Benson Intl Eq	IN	0.00	9/81
Lepercq-Istel Fund	B	0.00	9/81
Lexington Corp Leaders	GI	0.00	9/81
Lexington GMNA New Inc	BP	0.00	9/81
Lexington World Emerging	IN	0.00	9/81
Lexington Goldfund	ME	0.00	9/81
Lexington Growth & Inc.	G	0.00	9/81
Liberty High Income Bond	BP	4.50	9/81
Lindner Dividend Fund	B	0.00	9/81
Lindner Fund	GI	0.00	9/81
Lord Abbett Dev Growth	AG	6.75	9/81
Lord Abbett Bond-Deben.	BP	4.75	9/81
Lord Abbett US Gov Secs	BP	4.75	9/81
Lutheran Brother. Fund	G	5.00	9/81
Lutheran Brother. Income	BP	5.00	9/81
Lutheran Brother. Mun Bd	MB	5.00	9/81
Mass. Capital Devel.	G	5.75	9/81
Mass. Finl Hi Income	BP	4.75	9/81
Mass. Finl Total Return	B	4.75	9/81
Mass. Finl Development	G	5.75	9/81
Mass. Finl Bond	BP	4.75	9/81
Mass. Inv. Trust	G	5.75	9/81
Mass. Inv. Growth Stock	AG	5.75	9/81
Mathers Fund	B	0.00	9/81
Merrill L Basic Value A	GI	6.50	9/81

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Fund Name	IO	Load	Data From
Merrill L Specl Value A	AG	6.50	9/81
Merrill L Pacific Fund A	IN	6.50	9/81
Merrill L Bond-Interm Fd	BP	2.00	9/81
Merrill L Muni-Bd Insd A	MB	4.00	9/81
Merrill L Capital Fd A	B	6.50	9/81
Merrill L Hi Qual Bond A	BP	4.00	9/81
Merrill L Hi Inc Bond A	BP	4.00	9/81
Merrill L Muni-Bd Hyld A	MB	4.00	9/81
Merrill L Muni-Ltd Mat	MB	0.75	9/81
MFS Mgd Muni-Bd Trust	MB	4.75	9/81
MFS Worldwide Govts Tr	BP	4.75	9/81
Midwest Interm Term Govt	BP	1.00	9/81
Mutual Beacon Fund	GI	0.00	9/81
Mutual Benefit Fund	G	4.75	9/81
Mutual of Omaha Tax Free	MB	4.75	9/81
Mutual of Omaha Growth	AG	4.75	9/81
Mutual of Omaha Income	B	4.75	9/81
Mutual of Omaha America	BP	4.75	9/81
Mutual Qualified Income	B	0.00	9/81
Mutual Shares Corp.	B	0.00	9/81
M.S.B. Fund	G	0.00	9/81
National Industries Fund	G	0.00	9/81
National Aviation & Tech	AG	4.75	9/81
Nationwide Growth Fund	G	7.50	9/81
Nationwide Fund	G	7.50	9/81
Nationwide Bond Fund	BP	7.50	9/81
Natl Secs Total Return	GI	5.75	9/81
Natl Secs World Opporty	IN	5.75	9/81
Natl Secs Total Income	B	5.75	9/81
Natl Secs Stock	G	5.75	9/81
Natl Secs Tax Exempt Bd	MB	4.75	9/81
Natl Secs Bond	BP	4.75	9/81
Nautilus Fund	AG	4.75	9/81
Neuberger B. Partners	GI	0.00	9/81
Neuberger B. Sel Sectors	G	0.00	9/81
Neuberger B. Manhattan	G	0.00	9/81
Neuberger B. Guardian	G	0.00	9/81
Neuwirth Fund	G	0.00	9/81

Fund Name	IO	Load	Data From
New England Growth Fund	AG	6.50	9/81
New England Balanced Fd	B	6.50	9/81
New England Txex Income	MB	4.50	9/81
New England Retir Equity	G	6.50	9/81
New England Bond Income	BP	4.50	9/81
New Perspective Fund	IN	5.75	9/81
New York Venture Fund	G	4.75	9/81
Newton Growth Fund	G	0.00	9/81
Newton Income Fund	BP	0.00	9/81
Nicholas Income Fund	BP	0.00	9/81
Nicholas Fund	G	0.00	9/81
Northeast Inv Trust	BP	0.00	9/81
Northeast Inv Growth	G	0.00	9/81
Nuveen Municipal Bond	MB	4.75	9/81
Old Dominion Invts Tr	GI	5.75	9/81
Oppenheimer Global Fund	IN	5.75	9/81
Oppenheimer Total Return	GI	5.75	9/81
Oppenheimer Target Fund	G	5.75	9/81
Oppenheimer Equity Inc.	B	5.75	9/81
Oppenheimer High Yield	BP	4.75	9/81
Oppenheimer Special Fund	G	5.75	9/81
Oppenheimer Time Fund	G	5.75	9/81
Oppenheimer Fund	G	5.75	9/81
Over-The-Counter Sec.	G	5.75	9/81
Pax World Fund	B	0.00	9/81
Penn Square Mutual Fund	GI	4.75	9/81
Pennsylvania Mutual Fund	G	0.00	9/81
Philadelphia Fund	GI	0.00	9/81
Phoenix Growth Fund Ser	GI	4.75	9/81
Phoenix Convertible Fund	GI	4.75	9/81
Phoenix Stock Fund	G	4.75	9/81
Phoenix High Yield	BP	4.75	9/81
Phoenix Balanced Fd Ser	B	4.75	9/81
Phoenix Total Return Fd	B	4.75	9/81
Pilgrim Magnacap Fund	G	4.75	9/81
Pilgrim High Yield Fund	BP	4.75	9/81
Pine Street Fund	GI	0.00	9/81
Pioneer Fund	G	5.75	9/81

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Fund Name	IO	Load	Data From
Pioneer Bond Fund	BP	4.50	9/81
Pioneer II	G	5.75	9/81
Price Rowe Intl Stock	IN	0.00	9/81
Price Rowe Growth Stock	G	0.00	9/81
Price Rowe Tax Free Inc	MB	0.00	9/81
Price Rowe New Era	G	0.00	9/81
Price Rowe New Horizon	AG	0.00	9/81
Price Rowe New Income	BP	0.00	9/81
Princor Growth Fd, Inc.	AG	5.00	9/81
Princor Cap Accumulation	G	5.00	9/81
Providentmutual Invt Shs	G	6.00	9/81
Providentmutual Valu Shs	G	6.00	9/81
Providentmutual Totl Ret	B	6.00	9/81
Providentmutual Growth	AG	6.00	9/81
Prudential Grwth Oppty B	AG	0.00	9/81
Prudential High Yield B	BP	0.00	9/81
Putnam Convert Inc-Gr Tr	GI	5.75	9/81
Putnam Energy Resources	G	5.75	9/81
Putnam Fd for Growth/Inc	GI	5.75	9/81
Putnam George Fund	B	5.75	9/81
Putnam Global Growth	IN	5.75	9/81
Putnam High Yield	BP	6.75	9/81
Putnam Investors Fund	G	5.75	9/81
Putnam Income Fund	BP	4.75	9/81
Putnam Strategic Income	G	5.75	9/81
Putnam Tax Exempt Inc	MB	4.75	9/81
Putnam Vista Fund	G	5.75	9/81
Putnam Voyager Fund	AG	5.75	9/81
Quest for Value Fund	G	5.50	9/81
Rainbow Fund	G	0.00	9/81
Rochester Tax Managed Fd	G	8.50	9/81
Safeco Equity Fund	G	0.00	9/81
Safeco Growth Fund	AG	0.00	9/81
Safeco Income Fund	GI	0.00	9/81
Salomon Investors Fund	G	5.00	9/81
Salomon Capital Fund	AG	5.00	9/81
Salomon Opportunity Fund	G	0.00	9/81
Schroder U.S. Equity Fd	G	0.00	9/81

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Fund Name	IO	Load	Data From
Scudder Income Fund	BP	0.00	9/81
Scudder International Fd	IN	0.00	9/81
Scudder Growth & Income	GI	0.00	9/81
Scudder Development Fund	AG	0.00	9/81
Scudder Managed Muni Bd	MB	0.00	9/81
Scudder Capital Growth	AG	0.00	9/81
Security Equity Fund	G	5.75	9/81
Security Ultra Fund	AG	5.75	9/81
Security Inc Fd-Corp Bd	BP	4.75	9/81
Security Investment Fund	B	5.75	9/81
Selected American Shares	G	0.00	9/81
Selected Special Shares	G	0.00	9/81
Seligman Growth Fund	G	4.75	9/81
Seligman Common Stock Fd	G	4.75	9/81
Seligman Capital Fund	AG	4.75	9/81
Seligman Income Fund	B	4.75	9/81
Sentinel Common Stock Fd	GI	8.50	9/81
Sentinel Bond	BP	5.25	9/81
Sentinel Growth Fund	G	5.25	9/81
Sentinel Balanced Fund	B	8.50	9/81
Sentry Fund	G	0.00	9/81
Sequoia Fund	GI	0.00	9/81
Shearson Managed Muni	MB	5.00	9/81
Shearson High Yield Fund	BP	5.00	9/81
Shearson Appreciation Fd	G	5.00	9/81
Sherman, Dean Fund	AG	0.00	9/81
Smith, Barney Inc. & Gr.	GI	4.50	9/81
Smith, Barney Equity	G	4.50	9/81
Sogen International Fund	IN	3.75	9/81
Sovereign Investors	GI	5.00	9/81
State Bond Common Stock	G	4.75	9/81
State Bond Diversified	GI	4.75	9/81
State Bond Progress Fund	G	4.75	9/81
State Farm Growth Fund	G	0.00	9/81
State Farm Balanced	B	0.00	9/81
State Street Growth	G	0.00	9/81
State Street Inv. Corp.	G	4.50	9/81
Steadman Associated	AG	0.00	9/81

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Fund Name	IO	Load	Data From
Steadman American Indus.	AG	0.00	9/81
Steadman Investment	AG	0.00	9/81
Steadman Oceanographic	AG	0.00	9/81
Steinroe Total Return Fd	B	0.00	9/81
Steinroe Special Fund	G	0.00	9/81
Steinroe Stock Fund	G	0.00	9/81
Steinroe Managed Muni Fd	MB	0.00	9/81
Steinroe Cap Opportunity	AG	0.00	9/81
Strategic Investments	ME	8.50	9/81
Stratton Growth Fund	GI	0.00	9/81
Stratton Monthly Div Shs	B	0.00	9/81
Tax Exempt Bd Fd/America	MB	4.75	9/81
Templeton Smaller Co Grw	IN	8.50	9/81
Templeton Growth Fund	IN	8.50	9/81
Templeton World Fund	IN	8.50	9/81
Transamerica Inv Qual A	BP	4.75	9/81
Transamerica Gr & Inc A	GI	4.75	9/81
Trustees Comm Eq-US Port	G	0.00	9/81
Twentieth Cent Select	G	0.00	9/81
Twentieth Cent Growth	AG	0.00	9/81
Unified Growth Fund	G	4.50	9/81
Unified Mutual Shares	GI	4.50	9/81
United Accumulative Fund	GI	8.50	9/81
United Bond Fund	BP	8.50	9/81
United Contl. Income Fd.	GI	8.50	9/81
United High Income Fund	BP	8.50	9/81
United Income Fund	G	8.50	9/81
United Intl. Growth Fund	IN	8.50	9/81
United Municipal Bond Fd	MB	4.25	9/81
United Retirement Shares	B	8.50	9/81
United Science & Energy	G	8.50	9/81
United Vanguard Fund	G	8.50	9/81
US All American Equity	G	0.00	9/81
US Gold Shares Fund	ME	0.00	9/81
USAA Mutual Fd Income	BP	0.00	9/81
USAA Mutual Fd Growth	G	0.00	9/81
U.S. Trend Fund, Inc.	G	4.75	9/81
Valley Forge Fund	GI	0.00	9/81

Fund Name	IO	Load	Data From
Value Line Spl Situation	AG	0.00	9/81
Value Line Fund	G	0.00	9/81
Value Line Leverage Gr	G	0.00	9/81
Value Line Income	B	0.00	9/81
Van Eck Intl Investors	ME	8.50	9/81
Vanguard Fi Inc Inv Grad	BP	0.00	9/81
Vanguard Small Cap Stock	AG	0.00	9/81
Vanguard Explorer Fund	AG	0.00	9/81
Vanguard Preferred Stock	BP	0.00	9/81
Vanguard Fi Inc GNMA	BP	0.00	9/81
Vanguard Fi Inc Hi Yield	BP	0.00	9/81
Vanguard Index 500 Fund	G	0.00	9/81
Vanguard Morgan Growth	G	0.00	9/81
Vanguard Muni High Yield	MB	0.00	9/81
Vanguard Muni Interm-Trm	MB	0.00	9/81
Vanguard Muni Long-Term	MB	0.00	9/81
Vanguard World-Intl Gr	IN	0.00	9/81
Vanguard Muni Short-Term	MB	0.00	9/81
Vanguard World-US Gr	G	0.00	9/81
Wall Street Fund	AG	4.00	9/81
Wash. Mutual Investors	GI	5.75	9/81
Wellesley Income Fund	B	0.00	9/81
Wellington Fund	B	0.00	9/81
Windsor Fund	GI	0.00	9/81
Wm Blair Growth Shares	G	0.00	9/81
WPG Growth & Income Fund	GI	0.00	9/81
WPG Tudor Fund	AG	0.00	9/81

APPENDIX K

This appendix contains a list of all aggressive growth mutual funds (AG) covered by

CDA Investment Technologies in operation as of September 1981. In total, 60 mutual funds

were contained in this data base.

Fund Name	IO	Load		Data From
AIM Constellation Fund	AG	5.50	9/81	
Alliance Quasar A	AG	5.50	9/81	
Alliance Globl Sm Cap A	AG	5.50	9/81	
Alliance Fund A	AG	5.50	9/81	
American Cap Emerging Gr	AG	5.75	9/81	
American Investors Gr Fd	AG	8.50	9/81	
American Heritage Fund	AG	0.00	9/81	
Amev Growth Fund, Inc.	AG	4.75	9/81	
Amev Special Stock Fund	AG	0.00	9/81	
Axe-Houghton Growth Fund	AG	5.75	9/81	
Berger 100 Fund	AG	0.00	9/81	
Bull & Bear Cap Growth	AG	0.00	9/81	
CGM Capital Development	AG	0.00	9/81	
Delaware Grp-Delta Trend	AG	4.75	9/81	
Eagle Growth Shares	AG	8.50	9/81	
Eaton Vance Spl Equities	AG	4.75	9/81	
Fairmont Fund	AG	0.00	9/81	
Fidelity Sel Technology	AG	3.00	9/81	
Fidelity Trend	AG	0.00	9/81	
Fidelity Contrafund	AG	3.00	9/81	
Fidelity Sel Health	AG	3.00	9/81	
Financial Dynamics Fund	AG	0.00	9/81	
Forty-Four Wall St Eqty	AG	0.00	9/81	
Forty-Four Wall St Fund	AG	0.00	9/81	
Founders Special Fund	AG	0.00	9/81	
FPA Capital Fund	AG	6.50	9/81	
Hartwell Growth Fund	AG	4.75	9/81	
Hartwell Emerging Growth	AG	4.75	9/81	
Kemper Summit Fund	AG	5.75	9/81	

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Fund Name	IO	Load	Data From
Keystone S-4	AG	0.00	9/81
Lord Abbett Dev Growth	AG	6.75	9/81
Mass. Inv. Growth Stock	AG	5.75	9/81
Merrill L Specl Value A	AG	6.50	9/81
Mutual of Omaha Growth	AG	4.75	9/81
National Aviation & Tech	AG	4.75	9/81
Nautilus Fund	AG	4.75	9/81
New England Growth Fund	AG	6.50	9/81
Price Rowe New Horizon	AG	0.00	9/81
Princor Growth Fd, Inc.	AG	5.00	9/81
Providentmutual Growth	AG	6.00	9/81
Prudential Grwth Oppty B	AG	0.00	9/81
Putnam Voyager Fund	AG	5.75	9/81
Safeco Growth Fund	AG	0.00	9/81
Salomon Capital Fund	AG	5.00	9/81
Scudder Capital Growth	AG	0.00	9/81
Scudder Development Fund	AG	0.00	9/81
Security Ultra Fund	AG	5.75	9/81
Seligman Capital Fund	AG	4.75	9/81
Sherman, Dean Fund	AG	0.00	9/81
Steadman Investment	AG	0.00	9/81
Steadman Oceanographic	AG	0.00	9/81
Steadman American Indus.	AG	0.00	9/81
Steadman Associated	AG	0.00	9/81
Steinroe Cap Opportunity	AG	0.00	9/81
Twentieth Cent Growth	AG	0.00	9/81
Value Line Spl Situation	AG	0.00	9/81
Vanguard Explorer Fund	AG	0.00	9/81
Vanguard Small Cap Stock	AG	0.00	9/81
Wall Street Fund	AG	4.00	9/81
WPG Tudor Fund	AG	0.00	9/81

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APPENDIX L

This appendix contains a list of all growth mutual funds (G) covered by CDA Investment Technologies in operation as of September 1981. In total, 146 mutual funds were contained in this data base.

Fund Name	IO	Load	Data From
Acorn Fund	G	0.00	9/81
Aegon USA Capital Apprec	G	4.75	9/81
Afuture Fund	G	0.00	9/81
AIM Charter Fund	G	5.50	9/81
AIM Convertible Secs Inc	G	4.75	9/81
AIM Weingarten Fund	G	5.50	9/81
AMA Classic Growth	G	4.75	9/81
Amcap Fund	G	5.75	9/81
American National Growth	G	8.50	9/81
American Cap Enterprise	G	5.75	9/81
American Cap Gr & Income	G	5.75	9/81
American Cap Comstock	G	8.50	9/81
American Leaders Fund	G	4.50	9/81
American Capital Pace Fd	G	5.75	9/81
Amev Capital Fund, Inc.	G	4.75	9/81
Babson Growth Fund	G	0.00	9/81
Beacon Hill Mutual Fund	G	0.00	9/81
Berger 101 Fund	G	0.00	9/81
Boston Co. Cap. Apprec.	G	0.00	9/81
Bruce Fund	G	0.00	9/81
Century Shares Trust	G	0.00	9/81
Cigna Growth Fund	G	5.00	9/81
Colonial Growth Shares	G	5.75	9/81
Columbia Growth Fund	G	0.00	9/81
Copley Fund	G	0.00	9/81
Dean Witter Nat Resource	G	0.00	9/81
Dean Witter American Val	G	0.00	9/81
Depositors Fund/Boston	G	0.00	9/81
Diversification Fund	G	0.00	9/81

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Fund Name	IO	Load	Data From
Dodge & Cox Stock	G	0.00	9/81
Dreyfus Gr Opportunity	G	0.00	9/81
Eaton Vance Growth Fund	G	4.75	9/81
Elfun Trusts	G	0.00	9/81
Enterprise Growth Fund	G	4.75	9/81
Evergreen Fund	G	0.00	9/81
Fidelity Congress Street	G	0.00	9/81
Fidelity Magellan Fund	G	3.00	9/81
Fidelity Value Fund	G	0.00	9/81
Fidelity Exchange Fund	G	0.00	9/81
Fidelity Sel Energy	G	3.00	9/81
Fidelity Destiny-Plan 1	G	8.50	9/81
Financial Indust. Fund	G	0.00	9/81
Founders Blue Chip Fund	G	0.00	9/81
Founders Growth Fund	G	0.00	9/81
Franklin Growth	G	4.00	9/81
Franklin Equity Fund	G	4.00	9/81
Franklin Dynatech	G	4.00	9/81
Fund of the Southwest	G	4.75	9/81
Fundamental Investors	G	5.75	9/81
Gintel Fund	G	0.00	9/81
Growth Fund of America	G	5.75	9/81
Guardian Park Ave Fund	G	4.50	9/81
Hancock J. Growth Fund	G	4.50	9/81
IAI Regional Fund	G	0.00	9/81
IAI Stock Fund	G	0.00	9/81
IDS Equity Plus Fd Inc.	G	5.00	9/81
IDS Growth Fund	G	5.00	9/81
IDS New Dimensions Fund	G	5.00	9/81
Investors Research	G	6.75	9/81
ITB-Growth Opportunities	G	5.75	9/81
Ivy Growth Fund	G	0.00	9/81
Janus Fund	G	0.00	9/81
JP Growth Fund	G	5.50	9/81
Kemper Growth Fund	G	5.75	9/81
Kemper Technology Fund	G	5.75	9/81
Keystone Amer Omega	G	4.75	9/81
Keystone K-2	G	0.00	9/81

Fund Name	IO	Load	Data From
Keystone S-1	G	0.00	9/81
Keystone S-3	G	0.00	9/81
Lexington Growth & Inc.	G	0.00	9/81
Lutheran Brother. Fund	G	5.00	9/81
Mass. Capital Devel.	G	5.75	9/81
Mass. Finl Development	G	5.75	9/81
Mass. Inv. Trust	G	5.75	9/81
Mutual Benefit Fund	G	4.75	9/81
M.S.B. Fund	G	0.00	9/81
National Industries Fund	G	0.00	9/81
Nationwide Fund	G	7.50	9/81
Nationwide Growth Fund	G	7.50	9/81
Natl Secs Stock	G	5.75	9/81
Neuberger B. Sel Sectors	G	0.00	9/81
Neuberger B. Manhattan	G	0.00	9/81
Neuberger B. Guardian	G	0.00	9/81
Neuwirth Fund	G	0.00	9/81
New England Retir Equity	G	6.50	9/81
New York Venture Fund	G	4.75	9/81
Newton Growth Fund	G	0.00	9/81
Nicholas Fund	G	0.00	9/81
Northeast Inv Growth	G	0.00	9/81
Oppenheimer Time Fund	G	5.75	9/81
Oppenheimer Fund	G	5.75	9/81
Oppenheimer Special Fund	G	5.75	9/81
Oppenheimer Target Fund	G	5.75	9/81
Over-The-Counter Sec.	G	5.75	9/81
Pennsylvania Mutual Fund	G	0.00	9/81
Phoenix Stock Fund	G	4.75	9/81
Pilgrim Magnacap Fund	G	4.75	9/81
Pioneer II	G	5.75	9/81
Pioneer Fund	G	5.75	9/81
Price Rowe Growth Stock	G	0.00	9/81
Price Rowe New Era	G	0.00	9/81
Princor Cap Accumulation	G	5.00	9/81
Providentmutual Invt Shs	G	6.00	9/81
Providentmutual Valu Shs	G	6.00	9/81
Putnam Energy Resources	G	5.75	9/81

APPENDIX L   (Continued)

Fund Name	IO	Load	Data From
Putnam Investors Fund	G	5.75	9/81
Putnam Strategic Income	G	5.75	9/81
Putnam Vista Fund	G	5.75	9/81
Quest for Value Fund	G	5.50	9/81
Rainbow Fund	G	0.00	9/81
Rochester Tax Managed Fd	G	8.50	9/81
Safeco Equity Fund	G	0.00	9/81
Salomon Investors Fund	G	5.00	9/81
Salomon Opportunity Fund	G	0.00	9/81
Schroder U.S. Equity Fd	G	0.00	9/81
Security Equity Fund	G	5.75	9/81
Selected Special Shares	G	0.00	9/81
Selected American Shares	G	0.00	9/81
Seligman Common Stock Fd	G	4.75	9/81
Seligman Growth Fund	G	4.75	9/81
Sentinel Growth Fund	G	5.25	9/81
Sentry Fund	G	0.00	9/81
Shearson Appreciation Fd	G	5.00	9/81
Smith, Barney Equity	G	4.50	9/81
State Bond Common Stock	G	4.75	9/81
State Bond Progress Fund	G	4.75	9/81
State Farm Growth Fund	G	0.00	9/81
State Street Inv. Corp.	G	4.50	9/81
State Street Growth	G	0.00	9/81
Steinroe Stock Fund	G	0.00	9/81
Steinroe Special Fund	G	0.00	9/81
Trustees Comm Eq-US Port	G	0.00	9/81
Twentieth Cent Select	G	0.00	9/81
Unified Growth Fund	G	4.50	9/81
United Income Fund	G	8.50	9/81
United Science & Energy	G	8.50	9/81
United Vanguard Fund	G	8.50	9/81
US All American Equity	G	0.00	9/81
USAA Mutual Fd Growth	G	0.00	9/81
U.S. Trend Fund, Inc.	G	4.75	9/81
Value Line Fund	G	0.00	9/81
Value Line Leverage Gr	G	0.00	9/81
Vanguard World-US Gr	G	0.00	9/81

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Fund Name	IO	Load	Data From
Vanguard Index 500 Fund	G	0.00	9/81
Vanguard Morgan Growth	G	0.00	9/81
Wm Blair Growth Shares	G	0.00	9/81

APPENDIX M

This appendix contains a list of all growth and income mutual funds (GI) covered by CDA Investment Technologies in operation as of September 1981. In total, 72 mutual funds were contained in this data base.

Fund Name	IO	Load		Data From
ABT Growth & Income Tr	GI	4.75	9/81	
ABT Utility Income Fund	GI	4.75	9/81	
Aegon USA Growth Portf	GI	4.75	9/81	
Affiliated Fund	GI	6.75	9/81	
Alliance Growth & Inc A	GI	5.50	9/81	
American Investors Incm	GI	5.00	9/81	
American Mutual Fund	GI	5.75	9/81	
American Natl Inc Fund	GI	8.50	9/81	
American Growth Fund	GI	8.50	9/81	
Analytic Optioned Equity	GI	0.00	9/81	
Anchor Cap Accumulation	GI	0.00	9/81	
Armstrong Associates	GI	0.00	9/81	
Bascom Hill Investors	GI	0.00	9/81	
Bull & Bear Equity Inc.	GI	0.00	9/81	
Cardinal Fund	GI	8.50	9/81	
CGM Mutual Fund	GI	0.00	9/81	
Colonial Fund	GI	5.75	9/81	
Composite Growth Fund	GI	4.00	9/81	
Country Capital Growth	GI	3.00	9/81	
Dean Witter Dividend Gro	GI	0.00	9/81	
Delaware Grp-Decatur I	GI	8.50	9/81	
Dreyfus Leverage	GI	4.50	9/81	
Dreyfus Convertible Secs	GI	0.00	9/81	
Dreyfus Third Century	GI	0.00	9/81	
Eaton Vance Stock Fund	GI	4.75	9/81	
Evergreen Total Return	GI	0.00	9/81	
FBL-Growth Common Stock	GI	0.00	9/81	
Fidelity Qualified Divd	GI	0.00	9/81	
Fidelity Fund	GI	0.00	9/81	

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Fund Name	IO	Load	Data From
Fidelity Equity Income	GI	2.00	9/81
Financial Indust. Income	GI	0.00	9/81
FPA Paramount Fd Inc	GI	6.50	9/81
Franklin Utilities	GI	4.00	9/81
Franklin Premier Return	GI	4.00	9/81
Gateway Index Plus Fund	GI	0.00	9/81
General Securities	GI	5.00	9/81
General Elec S&S Program	GI	0.00	9/81
IDS Progressive Fund	GI	5.00	9/81
IDS Stock Fund	GI	5.00	9/81
Invest Co of America	GI	5.75	9/81
Kemper Total Return Fund	GI	5.75	9/81
Lexington Corp Leaders	GI	0.00	9/81
Lindner Fund	GI	0.00	9/81
Merrill L Basic Value A	GI	6.50	9/81
Mutual Beacon Fund	GI	0.00	9/81
Natl Secs Total Return	GI	5.75	9/81
Neuberger B. Partners	GI	0.00	9/81
Old Dominion Invts Tr	GI	5.75	9/81
Oppenheimer Total Return	GI	5.75	9/81
Penn Square Mutual Fund	GI	4.75	9/81
Philadelphia Fund	GI	0.00	9/81
Phoenix Convertible Fund	GI	4.75	9/81
Phoenix Growth Fund Ser	GI	4.75	9/81
Pine Street Fund	GI	0.00	9/81
Putnam Convert Inc-Gr Tr	GI	5.75	9/81
Putnam Fd for Growth/Inc	GI	5.75	9/81
Safeco Income Fund	GI	0.00	9/81
Scudder Growth & Income	GI	0.00	9/81
Sentinel Common Stock Fd	GI	8.50	9/81
Sequoia Fund	GI	0.00	9/81
Smith, Barney Inc. & Gr.	GI	4.50	9/81
Sovereign Investors	GI	5.00	9/81
State Bond Diversified	GI	4.75	9/81
Stratton Growth Fund	GI	0.00	9/81
Transamerica Gr & Inc A	GI	4.75	9/81

Fund Name	IO	Load	Data From
Unified Mutual Shares	GI	4.50	9/81
United Accumulative Fund	GI	8.50	9/81
United Contl. Income Fd.	GI	8.50	9/81
Valley Forge Fund	GI	0.00	9/81
Wash. Mutual Investors	GI	5.75	9/81
Windsor Fund	GI	0.00	9/81
WPG Growth & Income Fund	GI	0.00	9/81

APPENDIX N

This appendix contains a list of all balanced mutual funds (B) covered by CDA Investment Technologies in operation as of September 1981. In total, 47 mutual funds were contained in this data base.

Fund Name	IO	Load	Data From
Alliance Balanced Shrs A	B	5.50	9/81
American Capital Harbor	B	5.75	9/81
American Cap Equity Inc	B	5.75	9/81
American Balanced Fund	B	5.75	9/81
Axe-Houghton Fund B	B	5.75	9/81
Burnham Fund	B	5.00	9/81
Colonial Corp Cash I	B	2.00	9/81
Colonial Strategic Inc	B	4.75	9/81
Commonwealth Inv Tr-Bal	B	7.50	9/81
Composite Bond & Stock	B	4.00	9/81
Delaware Grp-Delaware Fd	B	6.75	9/81
Dodge & Cox Balanced	B	0.00	9/81
Dreyfus Fund	B	0.00	9/81
Eaton Vance Investors Fd	B	4.75	9/81
Federated Stock & Bond	B	0.00	9/81
Fidelity Puritan Fund	B	2.00	9/81
Founders Equity Income	B	0.00	9/81
Franklin Income	B	4.00	9/81
IDS Mutual Fund	B	5.00	9/81
Income Fund of America	B	5.75	9/81
Keystone K-1	B	0.00	9/81
Lepercq-Istel Fund	B	0.00	9/81
Lindner Dividend Fund	B	0.00	9/81
Mass. Finl Total Return	B	4.75	9/81
Mathers Fund	B	0.00	9/81
Merrill L Capital Fd A	B	6.50	9/81
Mutual of Omaha Income	B	4.75	9/81

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Fund Name	IO	Load	Data From
Mutual Qualified Income	B	0.00	9/81
Mutual Shares Corp.	B	0.00	9/81
Natl Secs Total Income	B	5.75	9/81
New England Balanced Fd	B	6.50	9/81
Oppenheimer Equity Inc.	B	5.75	9/81
Pax World Fund	B	0.00	9/81
Phoenix Total Return Fd	B	4.75	9/81
Phoenix Balanced Fd Ser	B	4.75	9/81
Providentmutual Totl Ret	B	6.00	9/81
Putnam George Fund	B	5.75	9/81
Security Investment Fund	B	5.75	9/81
Seligman Income Fund	B	4.75	9/81
Sentinel Balanced Fund	B	8.50	9/81
State Farm Balanced	B	0.00	9/81
Steinroe Total Return Fd	B	0.00	9/81
Stratton Monthly Div Shs	B	0.00	9/81
United Retirement Shares	B	8.50	9/81
Value Line Income	B	0.00	9/81
Wellesley Income Fund	B	0.00	9/81
Wellington Fund	B	0.00	9/81

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APPENDIX O

This appendix contains a list of all international mutual funds (IN) covered by CDA Investment Technologies in operation as of September 1981. In total, 20 mutual funds were contained in this data base.

Fund Name	IO	Load	Data from
Alliance International A	IN	5.50	9/81
Alliance Global-Canadian	IN	5.50	9/81
G. T. Pacific Growth Fd	IN	4.75	9/81
Kemper Intl Fund	IN	5.75	9/81
Keystone Intl Fund	IN	0.00	9/81
Kleinwort Benson Intl Eq	IN	0.00	9/81
Lexington World Emerging	IN	0.00	9/81
Merrill L Pacific Fund A	IN	6.50	9/81
Natl Secs World Opporty	IN	5.75	9/81
New Perspective Fund	IN	5.75	9/81
Oppenheimer Global Fund	IN	5.75	9/81
Price Rowe Intl Stock	IN	0.00	9/81
Putnam Global Growth	IN	5.75	9/81
Scudder International Fd	IN	0.00	9/81
Sogen International Fund	IN	3.75	9/81
Templeton Growth Fund	IN	8.50	9/81
Templeton Smaller Co Grw	IN	8.50	9/81
Templeton World Fund	IN	8.50	9/81
United Intl. Growth Fund	IN	8.50	9/81
Vanguard World-Intl Gr	IN	0.00	9/81

APPENDIX P

This appendix contains a list of all precious metals mutual funds (ME) covered by

CDA Investment Technologies in operation as of September 1981. In total, 8 mutual funds

were contained in this data base.

Fund Name	IO	Load	Data From
Bull & Bear Gold Invs	ME	0.00	9/81
Fidelity Sel Prec Met&Mn	ME	3.00	9/81
Franklin Gold Fund	ME	4.00	9/81
Keystone Precious Metals	ME	0.00	9/81
Lexington Goldfund	ME	0.00	9/81
Strategic Investments	ME	8.50	9/81
US Gold Shares Fund	ME	0.00	9/81
Van Eck Intl Investors	ME	8.50	9/81

APPENDIX Q

This appendix contains a list of all bond (non-municipal) mutual funds (BP) covered by CDA Investment Technologies in operation as of September 1981. In total, 82 mutual funds were contained in this data base.

Fund Name	IO	Load	Data From
AGE High Income Fund	BP	4.00	9/81
AIM High Yld Securities	BP	4.75	9/81
Alliance Bd-Mthly Income	BP	4.75	9/81
AMA USG Income Plus	BP	4.75	9/81
American Cap Corp Bond	BP	4.75	9/81
American Capital Hiyld	BP	4.75	9/81
Amev US Gov Securities	BP	4.50	9/81
Axe-Houghton Income Fund	BP	4.75	9/81
Babson Bond Tr-Long	BP	0.00	9/81
Bond Fund of America	BP	4.75	9/81
Capstone Govt Income Tr	BP	0.00	9/81
Cigna High Yield	BP	5.00	9/81
Cigna Income Fund	BP	5.00	9/81
Colonial High Yield Secs	BP	4.75	9/81
Colonial Income	BP	4.75	9/81
Composite Income Fund	BP	4.00	9/81
Dean Witter High Yield	BP	5.50	9/81
Delaware Grp-Delchstr I	BP	6.75	9/81
Donoghue Money Mkt Avg	BP	0.00	9/81
Dreyfus A Bonds Plus	BP	0.00	9/81
Eaton Vance Inc Fd/Bost	BP	4.75	9/81
Fidelity Flexible Bond	BP	0.00	9/81
Fidelity Captl & Income	BP	0.00	9/81
Fidelity Intermediate Bd	BP	0.00	9/81
Fidelity Govt Secs	BP	0.00	9/81
First Invest. Fd. Income	BP	6.90	9/81
FPA New Income	BP	4.50	9/81

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Fund Name	IO	Load	Data From
Franklin U.S. Govt. Sec.	BP	4.00	9/81
Fund for U.S. Govt. Sec.	BP	4.50	9/81
General Elec S&S Lt Bond	BP	0.00	9/81
Hancock J. US Govt Trust	BP	4.50	9/81
Hancock J. Bond Fund	BP	4.50	9/81
IAI Bond Fund	BP	0.00	9/81
IDS Bond Fund	BP	5.00	9/81
IDS Selective	BP	5.00	9/81
JP Income	BP	5.50	9/81
Kemper Diversified Inc	BP	4.50	9/81
Kemper High Yield Fund	BP	4.50	9/81
Kemper Inc & Cap Preserv	BP	4.50	9/81
Kemper US Govt Secs	BP	4.50	9/81
Keystone B-1	BP	0.00	9/81
Keystone B-4	BP	0.00	9/81
Keystone B-2	BP	0.00	9/81
Lexington GNMA New Inc	BP	0.00	9/81
Liberty High Income Bond	BP	4.50	9/81
Lord Abbett Bond-Deben.	BP	4.75	9/81
Lord Abbett US Gov Secs	BP	4.75	9/81
Lutheran Brother. Income	BP	5.00	9/81
Mass. Finl Bond	BP	4.75	9/81
Mass. Finl Hi Income	BP	4.75	9/81
Merrill L Hi Inc Bond A	BP	4.00	9/81
Merrill L Bond-Interm Fd	BP	2.00	9/81
Merrill L Hi Qual Bond A	BP	4.00	9/81
MFS Worldwide Govts Tr	BP	4.75	9/81
Midwest Interm Term Govt	BP	1.00	9/81
Mutual of Omaha America	BP	4.75	9/81
Nationwide Bond Fund	BP	7.50	9/81
Natl Secs Bond	BP	4.75	9/81
New England Bond Income	BP	4.50	9/81
Newton Income Fund	BP	0.00	9/81
Nicholas Income Fund	BP	0.00	9/81
Northeast Inv Trust	BP	0.00	9/81
Oppenheimer High Yield	BP	4.75	9/81

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Fund Name	IO	Load	Data From
Phoenix High Yield	BP	4.75	9/81
Pilgrim High Yield Fund	BP	4.75	9/81
Pioneer Bond Fund	BP	4.50	9/81
Price Rowe New Income	BP	0.00	9/81
Prudential High Yield B	BP	0.00	9/81
Putnam High Yield	BP	6.75	9/81
Putnam Income Fund	BP	4.75	9/81
Scudder Income Fund	BP	0.00	9/81
Security Inc Fd-Corp Bd	BP	4.75	9/81
Sentinel Bond	BP	5.25	9/81
Shearson High Yield Fund	BP	5.00	9/81
Transamerica Inv Qual A	BP	4.75	9/81
United Bond Fund	BP	8.50	9/81
United High Income Fund	BP	8.50	9/81
USAA Mutual Fd Income	BP	0.00	9/81
Vanguard Fi Inc GNMA	BP	0.00	9/81
Vanguard Preferred Stock	BP	0.00	9/81
Vanguard Fi Inc Inv Grad	BP	0.00	9/81
Vanguard Fi Inc Hi Yield	BP	0.00	9/81

APPENDIX R

This appendix contains a list of all municipal bond mutual funds (MB) covered by

CDA Investment Technologies in operation as of September 1981. In total, 39 mutual

funds were contained in this data base.

Fund Name	IO	Load	Data From
American Capital Muni Bd	MB	4.75	9/81
Calvert Txfr Reserve-Ltd	MB	2.00	9/81
Cigna Municipal Bond	MB	5.00	9/81
Composite Tax Exempt Bd	MB	4.00	9/81
Dean Witter Tx ex Secs	MB	4.00	9/81
DMC Tax Free-PA	MB	4.75	9/81
Dreyfus Tax Exempt Bond	MB	0.00	9/81
Dupree Kentucky Txfr Inc	MB	0.00	9/81
Eaton Vance Municipal Bd	MB	4.75	9/81
Federated Sh-Interm Muni	MB	0.00	9/81
Federated Tax Fr Income	MB	4.50	9/81
Fidelity Muni Bond Fund	MB	0.00	9/81
Fidelity Ltd Term Muns	MB	0.00	9/81
Fidelity High Yield Muni	MB	0.00	9/81
First Invest. Insd Txe	MB	6.90	9/81
Hancock J. Tax Ex Income	MB	4.50	9/81
IDS High Yield Tax Ex	MB	5.00	9/81
IDS Tax Exempt Bond	MB	5.00	9/81
Kemper Muni Bond Fund	MB	4.50	9/81
Lutheran Brother. Mun Bd	MB	5.00	9/81
Merrill L Muni-Ltd Mat	MB	0.75	9/81
Merrill L Muni-Bd Insd A	MB	4.00	9/81
Merrill L Muni-Bd Hyld A	MB	4.00	9/81
MFS Mgd Muni-Bd Trust	MB	4.75	9/81
Mutual of Omaha Tax Free	MB	4.75	9/81
Natl Secs Tax Exempt Bd	MB	4.75	9/81
New England Txex Income	MB	4.50	9/81

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APPENDIX R   (Continued)

Fund Name	IO	Load	Data From
Nuveen Municipal Bond	MB	4.75	9/81
Price Rowe Tax Free Inc	MB	0.00	9/81
Putnam Tax Exempt Inc	MB	4.75	9/81
Scudder Managed Muni Bd	MB	0.00	9/81
Shearson Managed Muni	MB	5.00	9/81
Steinroe Managed Muni Fd	MB	0.00	9/81
Tax Exempt Bd Fd/America	MB	4.75	9/81
United Municipal Bond Fd	MB	4.25	9/81
Vanguard Muni Short-Term	MB	0.00	9/81
Vanguard Muni Interm-Trm	MB	0.00	9/81
Vanguard Muni High Yield	MB	0.00	9/81
Vanguard Muni Long-Term	MB	0.00	9/81

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APPENDIX S

This appendix contains a list of all mutual funds covered by CDA Investment Technologies in operation as of September 1994. In total, 377 mutual funds were contained in this data base.

Fund Name	IO	Load	Data From
ABT Growth & Income Tr	GI	4.75	9/81
ABT Utility Income Fund	GI	4.75	9/81
Acorn Fund	G	0.00	9/81
Affiliated Fund	GI	6.75	9/81
AGE High Income Fund	BP	4.00	9/81
AIM Charter Fund	G	5.50	9/81
AIM Constellation Fund	AG	5.50	9/81
AIM High Yld Securities	BP	4.75	9/81
AIM Weingarten Fund	G	5.50	9/81
Alliance Globl Sm Cap A	AG	5.50	9/81
Alliance Bd-Mthly Income	BP	4.75	9/81
Alliance Balanced Shrs A	B	5.50	9/81
Alliance Fund A	AG	5.50	9/81
Alliance Quasar A	AG	5.50	9/81
Alliance International A	IN	5.50	9/81
Alliance Growth & Inc A	GI	5.50	9/81
Amcap Fund	G	5.75	9/81
American Capital Hiyld	BP	4.75	9/81
American Capital Muni Bd	MB	4.75	9/81
American Capital Pace Fd	G	5.75	9/81
American Cap Corp Bond	BP	4.75	9/81
American Growth Fund	GI	8.50	9/81
American Cap Emerging Gr	AG	5.75	9/81
American Heritage Fund	AG	0.00	9/81
American Cap Enterprise	G	5.75	9/81
American Cap Gr & Income	G	5.75	9/81
American Natl Inc Fund	GI	8.50	9/81
American Leaders Fund	G	4.50	9/81
American Balanced Fund	B	5.75	9/81

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Fund Name	IO	Load	Data From
American Mutual Fund	GI	5.75	9/81
American Capital Harbor	B	5.75	9/81
American Cap Equity Inc	B	5.75	9/81
American Cap Comstock	G	8.50	9/81
American National Growth	G	8.50	9/81
Analytic Optioned Equity	GI	0.00	9/81
Anchor Cap Accumulation	GI	0.00	9/81
Armstrong Associates	GI	0.00	9/81
Babson Bond Tr-Long	BP	0.00	9/81
Babson Growth Fund	G	0.00	9/81
Bascom Hill Investors	GI	0.00	9/81
Beacon Hill Mutual Fund	G	0.00	9/81
Berger 100 Fund	AG	0.00	9/81
Berger 101 Fund	G	0.00	9/81
Bond Fund of America	BP	4.75	9/81
Bruce Fund	G	0.00	9/81
Bull & Bear Gold Invs	ME	0.00	9/81
Burnham Fund	B	5.00	9/81
Calvert Txfr Reserve-Ltd	MB	2.00	9/81
Capstone Govt Income Tr	BP	0.00	9/81
Cardinal Fund	GI	8.50	9/81
Century Shares Trust	G	0.00	9/81
CGM Capital Development	AG	0.00	9/81
CGM Mutual Fund	GI	0.00	9/81
Colonial High Yield Secs	BP	4.75	9/81
Colonial Income	BP	4.75	9/81
Colonial Growth Shares	G	5.75	9/81
Colonial Strategic Inc	B	4.75	9/81
Colonial Fund	GI	5.75	9/81
Columbia Growth Fund	G	0.00	9/81
Composite Growth Fund	GI	4.00	9/81
Composite Bond & Stock	B	4.00	9/81
Composite Income Fund	BP	4.00	9/81
Composite Tax Exempt Bd	MB	4.00	9/81
Copley Fund	G	0.00	9/81
Dean Witter Dividend Gro	GI	0.00	9/81
Dean Witter High Yield	BP	5.50	9/81
Dean Witter American Val	G	0.00	9/81

Fund Name	IO	Load	Data From
Dean Witter Tx Ex Secs	MB	4.00	9/81
Dean Witter Nat Resource	G	0.00	9/81
Delaware Grp-Delchstr I	BP	6.75	9/81
Delaware Grp-Decatur I	GI	8.50	9/81
Delaware Grp-Delaware Fd	B	6.75	9/81
Delaware Grp-Delta Trend	AG	4.75	9/81
Depositors Fund/Boston	G	0.00	9/81
Diversification Fund	G	0.00	9/81
Dodge & Cox Balanced	B	0.00	9/81
Dodge & Cox Stock	G	0.00	9/81
Donoghue Money Mkt Avg	BP	0.00	9/81
Dreyfus A Bonds Plus	BP	0.00	9/81
Dreyfus Gr Opportunity	G	0.00	9/81
Dreyfus Third Century	GI	0.00	9/81
Dreyfus Fund	B	0.00	9/81
Dupree Kentucky Txfr Inc	MB	0.00	9/81
Eagle Growth Shares	AG	8.50	9/81
Eaton Vance Inc Fd/Bost	BP	4.75	9/81
Eaton Vance Growth Fund	G	4.75	9/81
Eaton Vance Stock Fund	GI	4.75	9/81
Eaton Vance Investors Fd	B	4.75	9/81
Eaton Vance Municipal Bd	MB	4.75	9/81
Eaton Vance Spl Equities	AG	4.75	9/81
Elfun Trusts	G	0.00	9/81
Enterprise Growth Fund	G	4.75	9/81
Evergreen Total Return	GI	0.00	9/81
Evergreen Fund	G	0.00	9/81
Fairmont Fund	AG	0.00	9/81
FBL-Growth Common Stock	GI	0.00	9/81
Fidelity Sel Energy	G	3.00	9/81
Fidelity Exchange Fund	G	0.00	9/81
Fidelity Intermediate Bd	BP	0.00	9/81
Fidelity Sel Technology	AG	3.00	9/81
Fidelity Fund	GI	0.00	9/81
Fidelity Ltd Term Muns	MB	0.00	9/81
Fidelity Trend	AG	0.00	9/81
Fidelity Captl & Income	BP	0.00	9/81
Fidelity Muni Bond Fund	MB	0.00	9/81

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Fund Name	IO	Load	Data From
Fidelity Value Fund	G	0.00	9/81
Fidelity Equity Income	GI	2.00	9/81
Fidelity Puritan Fund	B	2.00	9/81
Fidelity Govt Secs	BP	0.00	9/81
Fidelity High Yield Muni	MB	0.00	9/81
Fidelity Contrafund	AG	3.00	9/81
Fidelity Sel Prec Met&Mn	ME	3.00	9/81
Fidelity Congress Street	G	0.00	9/81
Fidelity Destiny-Plan 1	G	8.50	9/81
Fidelity Magellan Fund	G	3.00	9/81
Fidelity Sel Health	AG	3.00	9/81
Financial Dynamics Fund	AG	0.00	9/81
Financial Indust. Income	GI	0.00	9/81
First Invest. Insd Txe	MB	6.90	9/81
First Invest. Fd. Income	BP	6.90	9/81
Founders Special Fund	AG	0.00	9/81
Founders Blue Chip Fund	G	0.00	9/81
Founders Growth Fund	G	0.00	9/81
Founders Equity Income	B	0.00	9/81
FPA Capital Fund	AG	6.50	9/81
FPA New Income	BP	4.50	9/81
FPA Paramount Fd Inc	GI	6.50	9/81
Franklin Growth	G	4.00	9/81
Franklin Gold Fund	ME	4.00	9/81
Franklin Premier Return	GI	4.00	9/81
Franklin U.S. Govt. Sec.	BP	4.00	9/81
Franklin Utilities	GI	4.00	9/81
Franklin Income	B	4.00	9/81
Franklin Dynatech	G	4.00	9/81
Franklin Equity Fund	G	4.00	9/81
Fund for U.S. Govt. Sec.	BP	4.50	9/81
Fundamental Investors	G	5.75	9/81
Gateway Index Plus Fund	GI	0.00	9/81
General Elec S&S Program	GI	0.00	9/81
General Elec S&S Lt Bond	BP	0.00	9/81
General Securities	GI	5.00	9/81
Gintel Fund	G	0.00	9/81
Growth Fund of America	G	5.75	9/81

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Fund Name	IO	Load	Data From
Guardian Park Ave Fund	G	4.50	9/81
Hancock J. Growth Fund	G	4.50	9/81
Hancock J. Bond Fund	BP	4.50	9/81
Hancock J. Tax Ex Income	MB	4.50	9/81
Hartwell Emerging Growth	AG	4.75	9/81
IAI Bond Fund	BP	0.00	9/81
IAI Regional Fund	G	0.00	9/81
IDS Bond Fund	BP	5.00	9/81
IDS Equity Plus Fd Inc.	G	5.00	9/81
IDS Growth Fund	G	5.00	9/81
IDS High Yield Tax Ex	MB	5.00	9/81
IDS Mutual Fund	B	5.00	9/81
IDS New Dimensions Fund	G	5.00	9/81
IDS Progressive Fund	GI	5.00	9/81
IDS Selective	BP	5.00	9/81
IDS Stock Fund	GI	5.00	9/81
IDS Tax Exempt Bond	MB	5.00	9/81
Income Fund of America	B	5.75	9/81
Invest Co of America	GI	5.75	9/81
Investors Research	G	6.75	9/81
Ivy Growth Fund	G	0.00	9/81
Janus Fund	G	0.00	9/81
Kemper Diversified Inc	BP	4.50	9/81
Kemper Growth Fund	G	5.75	9/81
Kemper High Yield Fund	BP	4.50	9/81
Kemper Intl Fund	IN	5.75	9/81
Kemper Inc & Cap Preserv	BP	4.50	9/81
Kemper Muni Bond Fund	MB	4.50	9/81
Kemper Technology Fund	G	5.75	9/81
Kemper Total Return Fund	GI	5.75	9/81
Kemper US Govt Secs	BP	4.50	9/81
Keystone B-1	BP	0.00	9/81
Keystone K-1	B	0.00	9/81
Keystone B-2	BP	0.00	9/81
Keystone S-4	AG	0.00	9/81
Keystone S-3	G	0.00	9/81
Keystone Precious Metals	ME	0.00	9/81
Keystone Amer Omega	G	4.75	9/81

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Fund Name	IO	Load	Data From
Keystone K-2	G	0.00	9/81
Keystone S-1	G	0.00	9/81
Keystone Intl Fund	IN	0.00	9/81
Keystone B-4	BP	0.00	9/81
Lepercq-Istel Fund	B	0.00	9/81
Lexington Corp Leaders	GI	0.00	9/81
Lexington GMNA New Inc	BP	0.00	9/81
Lexington World Emerging	IN	0.00	9/81
Lexington Goldfund	ME	0.00	9/81
Lexington Growth & Inc.	G	0.00	9/81
Liberty High Income Bond	BP	4.50	9/81
Lindner Dividend Fund	B	0.00	9/81
Lindner Fund	GI	0.00	9/81
Lord Abbett Dev Growth	AG	6.75	9/81
Lord Abbett Bond-Deben.	BP	4.75	9/81
Lord Abbett US Gov Secs	BP	4.75	9/81
Lutheran Brother. Fund	G	5.00	9/81
Lutheran Brother. Income	BP	5.00	9/81
Lutheran Brother. Mun Bd	MB	5.00	9/81
Mass. Inv. Trust	G	5.75	9/81
Mass. Inv. Growth Stock	AG	5.75	9/81
Mathers Fund	B	0.00	9/81
Merrill L Basic Value A	GI	6.50	9/81
Merrill L Specl Value A	AG	6.50	9/81
Merrill L Bond-Interm Fd	BP	2.00	9/81
Merrill L Muni-Bd Insd A	MB	4.00	9/81
Merrill L Capital Fd A	B	6.50	9/81
Merrill L Hi Qual Bond A	BP	4.00	9/81
Merrill L Hi Inc Bond A	BP	4.00	9/81
Merrill L Muni-Ltd Mat	MB	0.75	9/81
MFS Mgd Muni-Bd Trust	MB	4.75	9/81
MFS Worldwide Govts Tr	BP	4.75	9/81
Midwest Interm Term Govt	BP	1.00	9/81
Mutual Beacon Fund	GI	0.00	9/81
Mutual Benefit Fund	G	4.75	9/81
Mutual Qualified Income	B	0.00	9/81
Mutual Shares Corp.	B	0.00	9/81
M.S.B. Fund	G	0.00	9/81

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Fund Name	IO	Load	Data From
National Industries Fund	G	0.00	9/81
Nationwide Growth Fund	G	7.50	9/81
Nationwide Fund	G	7.50	9/81
Nationwide Bond Fund	BP	7.50	9/81
Neuberger B. Partners	GI	0.00	9/81
Neuberger B. Sel Sectors	G	0.00	9/81
Neuberger B. Manhattan	G	0.00	9/81
Neuberger B. Guardian	G	0.00	9/81
New England Growth Fund	AG	6.50	9/81
New England Balanced Fd	B	6.50	9/81
New England Txex Income	MB	4.50	9/81
New England Bond Income	BP	4.50	9/81
New Perspective Fund	IN	5.75	9/81
New York Venture Fund	G	4.75	9/81
Nicholas Income Fund	BP	0.00	9/81
Nicholas Fund	G	0.00	9/81
Northeast Inv Trust	BP	0.00	9/81
Northeast Inv Growth	G	0.00	9/81
Nuveen Municipal Bond	MB	4.75	9/81
Old Dominion Invts Tr	GI	5.75	9/81
Oppenheimer Global Fund	IN	5.75	9/81
Oppenheimer Total Return	GI	5.75	9/81
Oppenheimer Target Fund	G	5.75	9/81
Oppenheimer Equity Inc.	B	5.75	9/81
Oppenheimer High Yield	BP	4.75	9/81
Oppenheimer Special Fund	G	5.75	9/81
Oppenheimer Time Fund	G	5.75	9/81
Oppenheimer Fund	G	5.75	9/81
Pax World Fund	B	0.00	9/81
Penn Square Mutual Fund	GI	4.75	9/81
Pennsylvania Mutual Fund	G	0.00	9/81
Philadelphia Fund	GI	0.00	9/81
Phoenix Growth Fund Ser	GI	4.75	9/81
Phoenix Convertible Fund	GI	4.75	9/81
Phoenix Stock Fund	G	4.75	9/81
Phoenix High Yield	BP	4.75	9/81
Phoenix Balanced Fd Ser	B	4.75	9/81
Phoenix Total Return Fd	B	4.75	9/81

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Fund Name	IO	Load	Data From
Pilgrim Magnacap Fund	G	4.75	9/81
Pilgrim High Yield Fund	BP	4.75	9/81
Pioneer Fund	G	5.75	9/81
Pioneer Bond Fund	BP	4.50	9/81
Pioneer II	G	5.75	9/81
Price Rowe Intl Stock	IN	0.00	9/81
Price Rowe Growth Stock	G	0.00	9/81
Price Rowe Tax Free Inc	MB	0.00	9/81
Price Rowe New Era	G	0.00	9/81
Price Rowe New Horizon	AG	0.00	9/81
Price Rowe New Income	BP	0.00	9/81
Princor Growth Fd, Inc.	AG	5.00	9/81
Princor Cap Accumulation	G	5.00	9/81
Prudential Grwth Oppty B	AG	0.00	9/81
Prudential High Yield B	BP	0.00	9/81
Putnam Convert Inc-Gr Tr	GI	5.75	9/81
Putnam Fd for Growth/Inc	GI	5.75	9/81
Putnam George Fund	B	5.75	9/81
Putnam Global Growth	IN	5.75	9/81
Putnam High Yield	BP	6.75	9/81
Putnam Investors Fund	G	5.75	9/81
Putnam Income Fund	BP	4.75	9/81
Putnam Tax Exempt Inc	MB	4.75	9/81
Putnam Vista Fund	G	5.75	9/81
Putnam Voyager Fund	AG	5.75	9/81
Quest for Value Fund	G	5.50	9/81
Rainbow Fund	G	0.00	9/81
Safeco Equity Fund	G	0.00	9/81
Safeco Growth Fund	AG	0.00	9/81
Safeco Income Fund	GI	0.00	9/81
Salomon Investors Fund	G	5.00	9/81
Salomon Capital Fund	AG	5.00	9/81
Salomon Opportunity Fund	G	0.00	9/81
Schroder U.S. Equity Fd	G	0.00	9/81
Scudder Income Fund	BP	0.00	9/81
Scudder International Fd	IN	0.00	9/81
Scudder Growth & Income	GI	0.00	9/81
Scudder Development Fund	AG	0.00	9/81

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Fund Name	IO	Load	Data From
Scudder Managed Muni Bd	MB	0.00	9/81
Scudder Capital Growth	AG	0.00	9/81
Security Equity Fund	G	5.75	9/81
Security Ultra Fund	AG	5.75	9/81
Security Inc Fd-Corp Bd	BP	4.75	9/81
Security Investment Fund	B	5.75	9/81
Selected American Shares	G	0.00	9/81
Selected Special Shares	G	0.00	9/81
Seligman Growth Fund	G	4.75	9/81
Seligman Common Stock Fd	G	4.75	9/81
Seligman Capital Fund	AG	4.75	9/81
Seligman Income Fund	B	4.75	9/81
Sentinel Common Stock Fd	GI	8.50	9/81
Sentinel Bond	BP	5.25	9/81
Sentinel Growth Fund	G	5.25	9/81
Sentinel Balanced Fund	B	8.50	9/81
Sentry Fund	G	0.00	9/81
Sequoia Fund	GI	0.00	9/81
Smith, Barney Inc. & Gr.	GI	4.50	9/81
Sogen International Fund	IN	3.75	9/81
State Bond Common Stock	G	4.75	9/81
State Bond Diversified	GI	4.75	9/81
State Farm Growth Fund	G	0.00	9/81
State Farm Balanced	B	0.00	9/81
State Street Inv. Corp.	G	4.50	9/81
Steadman Associated	AG	0.00	9/81
Steadman American Indus.	AG	0.00	9/81
Steadman Investment	AG	0.00	9/81
Steinroe Total Return Fd	B	0.00	9/81
Steinroe Special Fund	G	0.00	9/81
Steinroe Stock Fund	G	0.00	9/81
Steinroe Managed Muni Fd	MB	0.00	9/81
Steinroe Cap Opportunity	AG	0.00	9/81
Strategic Investments	ME	8.50	9/81
Stratton Growth Fund	GI	0.00	9/81
Stratton Monthly Div Shs	B	0.00	9/81
Tax Exempt Bd Fd/America	MB	4.75	9/81
Templeton Smaller Co Grw	IN	8.50	9/81

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Fund Name	IO	Load	Data From
Templeton Growth Fund	IN	8.50	9/81
Templeton World Fund	IN	8.50	9/81
Transamerica Inv Qual A	BP	4.75	9/81
Transamerica Gr & Inc A	GI	4.75	9/81
Trustees Comm Eq-US Port	G	0.00	9/81
Twentieth Cent Select	G	0.00	9/81
Twentieth Cent Growth	AG	0.00	9/81
United Accumulative Fund	GI	8.50	9/81
United Bond Fund	BP	8.50	9/81
United Contl. Income Fd.	GI	8.50	9/81
United High Income Fund	BP	8.50	9/81
United Income Fund	G	8.50	9/81
United Intl. Growth Fund	IN	8.50	9/81
United Municipal Bond Fd	MB	4.25	9/81
United Retirement Shares	B	8.50	9/81
United Science & Energy	G	8.50	9/81
United Vanguard Fund	G	8.50	9/81
US All American Equity	G	0.00	9/81
US Gold Shares Fund	ME	0.00	9/81
USAA Mutual Fd Growth	G	0.00	9/81
Valley Forge Fund	GI	0.00	9/81
Value Line Spl Situation	AG	0.00	9/81
Value Line Fund	G	0.00	9/81
Value Line Leverage Gr	G	0.00	9/81
Value Line Income	B	0.00	9/81
Van Eck Intl Investors	ME	8.50	9/81
Vanguard Explorer Fund	AG	0.00	9/81
Vanguard Preferred Stock	BP	0.00	9/81
Vanguard Fi Inc GNMA	BP	0.00	9/81
Vanguard Fi Inc Hi Yield	BP	0.00	9/81
Vanguard Index 500 Fund	G	0.00	9/81
Vanguard Morgan Growth	G	0.00	9/81
Vanguard Muni High Yield	MB	0.00	9/81
Vanguard Muni Interm-Trm	MB	0.00	9/81
Vanguard Muni Long-Term	MB	0.00	9/81
Vanguard World-Intl Gr	IN	0.00	9/81
Vanguard Muni Short-Term	MB	0.00	9/81
Wall Street Fund	AG	4.00	9/81

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Fund Name	IO	Load	Data From
Wash. Mutual Investors	GI	5.75	9/81
Wellesley Income Fund	B	0.00	9/81
Wellington Fund	B	0.00	9/81
Windsor Fund	GI	0.00	9/81
Wm Blair Growth Shares	G	0.00	9/81
WPG Growth & Income Fund	GI	0.00	9/81
WPG Tudor Fund	AG	0.00	9/81

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APPENDIX T

This appendix contains a list of all aggressive growth mutual funds (AG) covered by

CDA Investment Technologies in operation as of September 1994. In total, 43 mutual funds

were contained in this data base.

Fund Name	IO	Load	Data From
AIM Constellation Fund	AG	5.50	9/81
Alliance Quasar A	AG	5.50	9/81
Alliance Globl Sm Cap A	AG	5.50	9/81
Alliance Fund A	AG	5.50	9/81
American Cap Emerging Gr	AG	5.75	9/81
American Heritage Fund	AG	0.00	9/81
Berger 100 Fund	AG	0.00	9/81
CGM Capital Development	AG	0.00	9/81
Delaware Grp-Delta Trend	AG	4.75	9/81
Eagle Growth Shares	AG	8.50	9/81
Eaton Vance Spl Equities	AG	4.75	9/81
Fairmont Fund	AG	0.00	9/81
Fidelity Sel Technology	AG	3.00	9/81
Fidelity Trend	AG	0.00	9/81
Fidelity Contrafund	AG	3.00	9/81
Fidelity Sel Health	AG	3.00	9/81
Financial Dynamics Fund	AG	0.00	9/81
Founders Special Fund	AG	0.00	9/81
FPA Capital Fund	AG	6.50	9/81
Keystone S-4	AG	0.00	9/81
Lord Abbett Dev Growth	AG	6.75	9/81
Mass. Inv. Growth Stock	AG	5.75	9/81
Merrill L Specl Value A	AG	6.50	9/81
New England Growth Fund	AG	6.50	9/81
Price Rowe New Horizon	AG	0.00	9/81
Princor Growth Fd, Inc.	AG	5.00	9/81
Prudential Grwth Oppty B	AG	0.00	9/81
Putnam Voyager Fund	AG	5.75	9/81
Safeco Growth Fund	AG	0.00	9/81

Fund Name	IO	Load	Data From
Salomon Capital Fund	AG	5.00	9/81
Scudder Capital Growth	AG	0.00	9/81
Scudder Development Fund	AG	0.00	9/81
Security Ultra Fund	AG	5.75	9/81
Seligman Capital Fund	AG	4.75	9/81
Steadman Investment	AG	0.00	9/81
Steadman American Indus.	AG	0.00	9/81
Steadman Associated	AG	0.00	9/81
Steinroe Cap Opportunity	AG	0.00	9/81
Twentieth Cent Growth	AG	0.00	9/81
Value Line Spl Situation	AG	0.00	9/81
Vanguard Explorer Fund	AG	0.00	9/81
Wall Street Fund	AG	4.00	9/81
WPG Tudor Fund	AG	0.00	9/81

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APPENDIX U

This appendix contains a list of all growth mutual funds (G) covered by CDA Investment Technologies in operation as of September 1994. In total, 115 mutual funds were contained in this data base.

Fund Name	IO	Load	Data From
Acorn Fund	G	0.00	9/81
AIM Charter Fund	G	5.50	9/81
AIM Weingarten Fund	G	5.50	9/81
Amcap Fund	G	5.75	9/81
American National Growth	G	8.50	9/81
American Cap Enterprise	G	5.75	9/81
American Cap Gr & Income	G	5.75	9/81
American Cap Comstock	G	8.50	9/81
American Leaders Fund	G	4.50	9/81
American Capital Pace Fd	G	5.75	9/81
Babson Growth Fund	G	0.00	9/81
Beacon Hill Mutual Fund	G	0.00	9/81
Berger 101 Fund	G	0.00	9/81
Bruce Fund	G	0.00	9/81
Century Shares Trust	G	0.00	9/81
Colonial Growth Shares	G	5.75	9/81
Columbia Growth Fund	G	0.00	9/81
Copley Fund	G	0.00	9/81
Dean Witter Nat Resource	G	0.00	9/81
Dean Witter American Val	G	0.00	9/81
Depositors Fund/Boston	G	0.00	9/81
Diversification Fund	G	0.00	9/81
Dodge & Cox Stock	G	0.00	9/81
Dreyfus Gr Opportunity	G	0.00	9/81
Eaton Vance Growth Fund	G	4.75	9/81
Elfun Trusts	G	0.00	9/81
Enterprise Growth Fund	G	4.75	9/81
Evergreen Fund	G	0.00	9/81
Fidelity Congress Street	G	0.00	9/81

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Fund Name	IO	Load	Data From
Fidelity Magellan Fund	G	3.00	9/81
Fidelity Value Fund	G	0.00	9/81
Fidelity Exchange Fund	G	0.00	9/81
Fidelity Sel Energy	G	3.00	9/81
Fidelity Destiny-Plan 1	G	8.50	9/81
Founders Blue Chip Fund	G	0.00	9/81
Founders Growth Fund	G	0.00	9/81
Franklin Growth	G	4.00	9/81
Franklin Equity Fund	G	4.00	9/81
Franklin Dynatech	G	4.00	9/81
Fundamental Investors	G	5.75	9/81
Gintel Fund	G	0.00	9/81
Growth Fund of America	G	5.75	9/81
Guardian Park Ave Fund	G	4.50	9/81
Hancock J. Growth Fund	G	4.50	9/81
IAI Regional Fund	G	0.00	9/81
IDS Equity Plus Fd Inc.	G	5.00	9/81
IDS Growth Fund	G	5.00	9/81
IDS New Dimensions Fund	G	5.00	9/81
Investors Research	G	6.75	9/81
Ivy Growth Fund	G	0.00	9/81
Janus Fund	G	0.00	9/81
Kemper Growth Fund	G	5.75	9/81
Kemper Technology Fund	G	5.75	9/81
Keystone Amer Omega	G	4.75	9/81
Keystone K-2	G	0.00	9/81
Keystone S-1	G	0.00	9/81
Keystone S-3	G	0.00	9/81
Lexington Growth & Inc.	G	0.00	9/81
Lutheran Brother. Fund	G	5.00	9/81
Mass. Inv. Trust	G	5.75	9/81
Mutual Benefit Fund	G	4.75	9/81
M.S.B. Fund	G	0.00	9/81
National Industries Fund	G	0.00	9/81
Nationwide Fund	G	7.50	9/81
Nationwide Growth Fund	G	7.50	9/81
Neuberger B. Sel Sectors	G	0.00	9/81
Neuberger B. Manhattan	G	0.00	9/81

Fund Name	IO	Load	Data From
Neuberger B. Guardian	G	0.00	9/81
New York Venture Fund	G	4.75	9/81
Nicholas Fund	G	0.00	9/81
Northeast Inv Growth	G	0.00	9/81
Oppenheimer Time Fund	G	5.75	9/81
Oppenheimer Fund	G	5.75	9/81
Oppenheimer Special Fund	G	5.75	9/81
Oppenheimer Target Fund	G	5.75	9/81
Pennsylvania Mutual Fund	G	0.00	9/81
Phoenix Stock Fund	G	4.75	9/81
Pilgrim Magnacap Fund	G	4.75	9/81
Pioneer II	G	5.75	9/81
Pioneer Fund	G	5.75	9/81
Price Rowe Growth Stock	G	0.00	9/81
Price Rowe New Era	G	0.00	9/81
Princor Cap Accumulation	G	5.00	9/81
Putnam Investors Fund	G	5.75	9/81
Putnam Vista Fund	G	5.75	9/81
Quest for Value Fund	G	5.50	9/81
Rainbow Fund	G	0.00	9/81
Safeco Equity Fund	G	0.00	9/81
Salomon Investors Fund	G	5.00	9/81
Salomon Opportunity Fund	G	0.00	9/81
Schroder U.S. Equity Fd	G	0.00	9/81
Security Equity Fund	G	5.75	9/81
Selected Special Shares	G	0.00	9/81
Selected American Shares	G	0.00	9/81
Seligman Common Stock Fd	G	4.75	9/81
Seligman Growth Fund	G	4.75	9/81
Sentinel Growth Fund	G	5.25	9/81
Sentry Fund	G	0.00	9/81
State Bond Common Stock	G	4.75	9/81
State Farm Growth Fund	G	0.00	9/81
State Street Inv. Corp.	G	4.50	9/81
Steinroe Stock Fund	G	0.00	9/81
Steinroe Special Fund	G	0.00	9/81
Trustees Comm Eq-US Port	G	0.00	9/81
Twentieth Cent Select	G	0.00	9/81

Fund Name	IO	Load	Data From
United Income Fund	G	8.50	9/81
United Science & Energy	G	8.50	9/81
United Vanguard Fund	G	8.50	9/81
US All American Equity	G	0.00	9/81
USAA Mutual Fd Growth	G	0.00	9/81
Value Line Fund	G	0.00	9/81
Value Line Leverage Gr	G	0.00	9/81
Vanguard Index 500 Fund	G	0.00	9/81
Vanguard Morgan Growth	G	0.00	9/81
Wm Blair Growth Shares	G	0.00	9/81

APPENDIX V

This appendix contains a list of all growth and income mutual funds (GI) covered by

CDA Investment Technologies in operation as of September 1994. In total, 61 mutual funds

were contained in this data base.

Fund Name	IO	Load		Data From
ABT Growth & Income Tr	GI	4.75	9/81	
ABT Utility Income Fund	GI	4.75	9/81	
Affiliated Fund	GI	6.75	9/81	
Alliance Growth & Inc A	GI	5.50	9/81	
American Mutual Fund	GI	5.75	9/81	
American Natl Inc Fund	GI	8.50	9/81	
American Growth Fund	GI	8.50	9/81	
Analytic Optioned Equity	GI	0.00	9/81	
Anchor Cap Accumulation	GI	0.00	9/81	
Armstrong Associates	GI	0.00	9/81	
Bascom Hill Investors	GI	0.00	9/81	
Cardinal Fund	GI	8.50	9/81	
CGM Mutual Fund	GI	0.00	9/81	
Colonial Fund	GI	5.75	9/81	
Composite Growth Fund	GI	4.00	9/81	
Dean Witter Dividend Gro	GI	0.00	9/81	
Delaware Grp-Decatur I	GI	8.50	9/81	
Dreyfus Third Century	GI	0.00	9/81	
Eaton Vance Stock Fund	GI	4.75	9/81	
Evergreen Total Return	GI	0.00	9/81	
FBL-Growth Common Stock	GI	0.00	9/81	
Fidelity Fund	GI	0.00	9/81	
Fidelity Equity Income	GI	2.00	9/81	
Financial Indust. Income	GI	0.00	9/81	
FPA Paramount Fd Inc	GI	6.50	9/81	
Franklin Utilities	GI	4.00	9/81	
Franklin Premier Return	GI	4.00	9/81	
Gateway Index Plus Fund	GI	0.00	9/81	
General Securities	GI	5.00	9/81	

Fund Name	IO	Load	Data From
General Elec S&S Program	GI	0.00	9/81
IDS Progressive Fund	GI	5.00	9/81
IDS Stock Fund	GI	5.00	9/81
Invest Co of America	GI	5.75	9/81
Kemper Total Return Fund	GI	5.75	9/81
Lexington Corp Leaders	GI	0.00	9/81
Lindner Fund	GI	0.00	9/81
Merrill L Basic Value A	GI	6.50	9/81
Mutual Beacon Fund	GI	0.00	9/81
Neuberger B. Partners	GI	0.00	9/81
Old Dominion Invts Tr	GI	5.75	9/81
Oppenheimer Total Return	GI	5.75	9/81
Penn Square Mutual Fund	GI	4.75	9/81
Philadelphia Fund	GI	0.00	9/81
Phoenix Convertible Fund	GI	4.75	9/81
Phoenix Growth Fund Ser	GI	4.75	9/81
Putnam Convert Inc-Gr Tr	GI	5.75	9/81
Putnam Fd for Growth/Inc	GI	5.75	9/81
Safeco Income Fund	GI	0.00	9/81
Scudder Growth & Income	GI	0.00	9/81
Sentinel Common Stock Fd	GI	8.50	9/81
Sequoia Fund	GI	0.00	9/81
Smith, Barney Inc. & Gr.	GI	4.50	9/81
State Bond Diversified	GI	4.75	9/81
Stratton Growth Fund	GI	0.00	9/81
Transamerica Gr & Inc A	GI	4.75	9/81
United Accumulative Fund	GI	8.50	9/81
United Contl. Income Fd.	GI	8.50	9/81
Valley Forge Fund	GI	0.00	9/81
Wash. Mutual Investors	GI	5.75	9/81
Windsor Fund	GI	0.00	9/81
WPG Growth & Income Fund	GI	0.00	9/81

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APPENDIX W

This appendix contains a list of all balanced mutual funds (B) covered by CDA
Investment Technologies in operation as of September 1994. In total, 39 mutual funds were
contained in this data base.

Fund Name	IO	Load	Data From
Alliance Balanced Shrs A	B	5.50	9/81
American Capital Harbor	B	5.75	9/81
American Cap Equity Inc	B	5.75	9/81
American Balanced Fund	B	5.75	9/81
Burnham Fund	B	5.00	9/81
Colonial Strategic Inc	B	4.75	9/81
Composite Bond & Stock	B	4.00	9/81
Delaware Grp-Delaware Fd	B	6.75	9/81
Dodge & Cox Balanced	B	0.00	9/81
Dreyfus Fund	B	0.00	9/81
Eaton Vance Investors Fd	B	4.75	9/81
Fidelity Puritan Fund	B	2.00	9/81
Founders Equity Income	B	0.00	9/81
Franklin Income	B	4.00	9/81
IDS Mutual Fund	B	5.00	9/81
Income Fund of America	B	5.75	9/81
Keystone K-1	B	0.00	9/81
Lepercq-Istel Fund	B	0.00	9/81
Lindner Dividend Fund	B	0.00	9/81
Mathers Fund	B	0.00	9/81
Merrill L Capital Fd A	B	6.50	9/81
Mutual Qualified Income	B	0.00	9/81
Mutual Shares Corp.	B	0.00	9/81
New England Balanced Fd	B	6.50	9/81
Oppenheimer Equity Inc.	B	5.75	9/81
Pax World Fund	B	0.00	9/81
Phoenix Total Return Fd	B	4.75	9/81
Phoenix Balanced Fd Ser	B	4.75	9/81

Fund Name	IO	Load	Data From
Putnam George Fund	B	5.75	9/81
Security Investment Fund	B	5.75	9/81
Seligman Income Fund	B	4.75	9/81
Sentinel Balanced Fund	B	8.50	9/81
State Farm Balanced	B	0.00	9/81
Steinroe Total Return Fd	B	0.00	9/81
Stratton Monthly Div Shs	B	0.00	9/81
United Retirement Shares	B	8.50	9/81
Value Line Income	B	0.00	9/81
Wellesley Income Fund	B	0.00	9/81
Wellington Fund	B	0.00	9/81

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APPENDIX X

This appendix contains a list of all international mutual funds (IN) covered by CDA

Investment Technologies in operation as of September 1994. In total, 15 mutual funds were

contained in this data base.

Fund Name	IO	Load	Data from
Alliance International A	IN	5.50	9/81
Kemper Intl Fund	IN	5.75	9/81
Keystone Intl Fund	IN	0.00	9/81
Lexington World Emerging	IN	0.00	9/81
New Perspective Fund	IN	5.75	9/81
Oppenheimer Global Fund	IN	5.75	9/81
Price Rowe Intl Stock	IN	0.00	9/81
Putnam Global Growth	IN	5.75	9/81
Scudder International Fd	IN	0.00	9/81
Sogen International Fund	IN	3.75	9/81
Templeton Growth Fund	IN	8.50	9/81
Templeton Smaller Co Grw	IN	8.50	9/81
Templeton World Fund	IN	8.50	9/81
United Intl. Growth Fund	IN	8.50	9/81
Vanguard World-Intl Gr	IN	0.00	9/81

APPENDIX Y

This appendix contains a list of all precious metals mutual funds (ME) covered by

CDA Investment Technologies in operation as of September 1994. In total, 8 mutual funds

were contained in this data base.

Fund Name	IO	Load	Data From
Bull & Bear Gold Invs	ME	0.00	9/81
Fidelity Sel Prec Met&Mn	ME	3.00	9/81
Franklin Gold Fund	ME	4.00	9/81
Keystone Precious Metals	ME	0.00	9/81
Lexington Goldfund	ME	0.00	9/81
Strategic Investments	ME	8.50	9/81
US Gold Shares Fund	ME	0.00	9/81
Van Eck Intl Investors	ME	8.50	9/81

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APPENDIX Z

This appendix contains a list of all bond (non-municipal) mutual funds (BP) covered by CDA Investment Technologies in operation as of September 1994. In total, 66 mutual funds were contained in this data base.

Fund Name	IO	Load	Data From
AGE High Income Fund	BP	4.00	9/81
AIM High Yld Securities	BP	4.75	9/81
Alliance Bd-Mthly Income	BP	4.75	9/81
American Cap Corp Bond	BP	4.75	9/81
American Capital Hiyld	BP	4.75	9/81
Babson Bond Tr-Long	BP	0.00	9/81
Bond Fund of America	BP	4.75	9/81
Capstone Govt Income Tr	BP	0.00	9/81
Colonial High Yield Secs	BP	4.75	9/81
Colonial Income	BP	4.75	9/81
Composite Income Fund	BP	4.00	9/81
Dean Witter High Yield	BP	5.50	9/81
Delaware Grp-Delchstr I	BP	6.75	9/81
Donoghue Money Mkt Avg	BP	0.00	9/81
Dreyfus A Bonds Plus	BP	0.00	9/81
Eaton Vance Inc Fd/Bost	BP	4.75	9/81
Fidelity Captl & Income	BP	0.00	9/81
Fidelity Intermediate Bd	BP	0.00	9/81
Fidelity Govt Secs	BP	0.00	9/81
First Invest. Fd. Income	BP	6.90	9/81
FPA New Income	BP	4.50	9/81
Franklin U.S. Govt. Sec.	BP	4.00	9/81
Fund for U.S. Govt. Sec.	BP	4.50	9/81
General Elec S&S Lt Bond	BP	0.00	9/81
Hancock J. Bond Fund	BP	4.50	9/81
IAI Bond Fund	BP	0.00	9/81
IDS Bond Fund	BP	5.00	9/81
IDS Selective	BP	5.00	9/81
Kemper Diversified Inc	BP	4.50	9/81

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Fund Name	IO	Load	Data From
Kemper High Yield Fund	BP	4.50	9/81
Kemper Inc & Cap Preserv	BP	4.50	9/81
Kemper US Govt Secs	BP	4.50	9/81
Keystone B-1	BP	0.00	9/81
Keystone B-4	BP	0.00	9/81
Keystone B-2	BP	0.00	9/81
Lexington GNMA New Inc	BP	0.00	9/81
Liberty High Income Bond	BP	4.50	9/81
Lord Abbett Bond-Deben.	BP	4.75	9/81
Lord Abbett US Gov Secs	BP	4.75	9/81
Lutheran Brother. Income	BP	5.00	9/81
Merrill L Hi Inc Bond A	BP	4.00	9/81
Merrill L Bond-Interm Fd	BP	2.00	9/81
Merrill L Hi Qual Bond A	BP	4.00	9/81
MFS Worldwide Govts Tr	BP	4.75	9/81
Midwest Interm Term Govt	BP	1.00	9/81
Nationwide Bond Fund	BP	7.50	9/81
New England Bond Income	BP	4.50	9/81
Nicholas Income Fund	BP	0.00	9/81
Northeast Inv Trust	BP	0.00	9/81
Oppenheimer High Yield	BP	4.75	9/81
Phoenix High Yield	BP	4.75	9/81
Pilgrim High Yield Fund	BP	4.75	9/81
Pioneer Bond Fund	BP	4.50	9/81
Price Rowe New Income	BP	0.00	9/81
Prudential High Yield B	BP	0.00	9/81
Putnam High Yield	BP	6.75	9/81
Putnam Income Fund	BP	4.75	9/81
Scudder Income Fund	BP	0.00	9/81
Security Inc Fd-Corp Bd	BP	4.75	9/81
Sentinel Bond	BP	5.25	9/81
Transamerica Inv Qual A	BP	4.75	9/81
United Bond Fund	BP	8.50	9/81
United High Income Fund	BP	8.50	9/81
Vanguard Fi Inc GNMA	BP	0.00	9/81
Vanguard Preferred Stock	BP	0.00	9/81
Vanguard Fi Inc Hi Yield	BP	0.00	9/81

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APPENDIX AA

This appendix contains a list of all municipal bond mutual funds (MB) covered by

CDA Investment Technologies in operation as of September 1994. In total, 30 mutual

funds were contained in this data base.

Fund Name	IO	Load	Data From
American Capital Muni Bd	MB	4.75	9/81
Calvert Txfr Reserve-Ltd	MB	2.00	9/81
Composite Tax Exempt Bd	MB	4.00	9/81
Dean Witter Tx ex Secs	MB	4.00	9/81
Dupree Kentucky Txfr Inc	MB	0.00	9/81
Eaton Vance Municipal Bd	MB	4.75	9/81
Fidelity Muni Bond Fund	MB	0.00	9/81
Fidelity Ltd Term Muns	MB	0.00	9/81
Fidelity High Yield Muni	MB	0.00	9/81
First Invest. Insd Txe	MB	6.90	9/81
Hancock J. Tax Ex Income	MB	4.50	9/81
IDS High Yield Tax Ex	MB	5.00	9/81
IDS Tax Exempt Bond	MB	5.00	9/81
Kemper Muni Bond Fund	MB	4.50	9/81
Lutheran Brother. Mun Bd	MB	5.00	9/81
Merrill L Muni-Ltd Mat	MB	0.75	9/81
Merrill L Muni-Bd Insd A	MB	4.00	9/81
MFS Mgd Muni-Bd Trust	MB	4.75	9/81
New England Txex Income	MB	4.50	9/81
Nuveen Municipal Bond	MB	4.75	9/81
Price Rowe Tax Free Inc	MB	0.00	9/81
Putnam Tax Exempt Inc	MB	4.75	9/81
Scudder Managed Muni Bd	MB	0.00	9/81
Steinroe Managed Muni Fd	MB	0.00	9/81
Tax Exempt Bd Fd/America	MB	4.75	9/81
United Municipal Bond Fd	MB	4.25	9/81
Vanguard Muni Short-Term	MB	0.00	9/81

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Fund Name	IO	Load	Data From
Vanguard Muni Interm-Trm	MB	0.00	9/81
Vanguard Muni High Yield	MB	0.00	9/81
Vanguard Muni Long-Term	MB	0.00	9/81

VITA

Larry Joseph Prather was born to Herbert and Evelyn Prather on the 20th of April, 1952, in Dayton, Ohio, and is an American citizen. He graduated from John H. Patterson High School, Dayton, Ohio, in 1971. He joined the United States Navy soon thereafter and married his high school sweetheart, Linda Jackowski, in 1972. During his military career, he served as an instructor, curriculum developer, technical school director, training program coordinator, and technical manager in the electronics field for twenty years. In 1988, he received a Bachelor of Science in General Business from the State University of New York, Albany, New York and commenced graduate study in business the same year. He retired from the United States Navy in 1991 to pursue his studies' full time. In May 1992, he received a Master of Business Administration from Old Dominion University, Norfolk, Virginia, and remained there to work on a doctorate. In December 1994, he received a Master of Economics from Old Dominion University. He was selected as the Outstanding Doctoral Level Student for the 1994-95 academic year and completed his doctorate in June 1995.

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