An Appraisal of Modeling Dimensions for Performance Appraisal of Global Mutual Funds

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Abstract

A number of studies have been conducted to examine investment performance of mutual funds of the developed capital markets. Grinblatt and Titman (1989, 1994) found that small mutual funds perform better than large ones and that performance is negatively correlated to management fees but not to fund size or expenses. Hendricks, Patel, and Zeckhauser (1993), Goetzmann and Ibbotson (1994), and Brown and Goetzmann (1995) present evidence of persistence in mutual fund performance. Grinblatt and Titman (1992) and Elton, Gruber,

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C.-F. Lee, J. Lee (eds.), *Handbook of Financial Econometrics and Statistics*,
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and Blake (Journal of Financial Economics 42:397–421, 1996) show that past performance is a good predictor of future performance. Blake, Elton, and Grubber (1993), Detzler (1999), and Philpot, Hearth, Rimbey, and Schulman (1998) find that performance is negatively correlated to fund expense, and that past performance does not predict future performance. However, Philpot, Hearth, and Rimbey (2000) provide evidence of short-term performance persistence in high-yield bond mutual funds. In their studies of money market mutual funds, Domian and Reichenstein (1998) find that the expense ratio is the most important factor in explaining net return differences. Christoffersen (2001) shows that fee waivers matter to performance. Smith and Tito (1969) conducted a study into 38 funds for 1958–1967 and obtained similar results. Treyner (1965) advocated the use of beta coefficient instead of the total risk.

Keywords
Financial modeling • Mutual funds • Performance appraisal • Global investments • Evaluation of funds • Portfolio management • Systematic risk • Unsystematic risk • Risk-adjusted performance • Prediction of price movements

3.1 Introduction

Performance of financial instruments is basically dependent on three important models derived independently by Sharpe, Jensen, and Treynor. All three models are based on the assumptions that (1) all investors are averse to risk and are single-period expected utility of terminal wealth maximizers, (2) all investors have identical decision horizons and homogeneous expectations regarding investment opportunities, (3) all investors are able to choose among portfolios solely on the basis of expected returns and variance of returns, (4) all transactions costs and taxes are zero, and (5) all assets are infinitely divisible.

3.2 Performance Evaluation Methods

The following paragraphs indicate a brief description of the studies on "performance evaluation of mutual funds."

Friend et al. (1962) offered the first empirical analysis of mutual funds performance. Sharpe (1964), Treynor and Mazuy (1966), Jensen (1968), Fama (1972), and Grinblatt and Titman (1989, 1994) are considered to be classical studies in performance evaluation methods. Sharpe (1964) made a significant contribution in the methods of evaluating mutual funds. His measure is based on capital asset prices, market conditions with the help of risk and return probabilities. Sharpe (1966) developed a theoretical measure better known as reward to variability ratio that considers both average return and risk simultaneously in its ambit. It tested efficacy through a sample of 34 open-ended funds considering annual returns and standard deviation of annual return risk surrogate for the period for 1954–1963.

The average reward to variability ratio of 34 funds was considerably smaller than Dow Jones portfolio and considered enough to conclude that average mutual funds performance was distinctly inferior to an investment in Dow Jones Portfolio.

Treynor (1965) advocated the use of beta coefficient instead of the total risk. He argues that using only naïve diversification, the unsystematic variability of returns of the individual assets in a portfolio typically average out of zero. So he considers measuring a portfolio's return relative to its systematic risk more appropriate.

Treynor and Mazuy (1966) devised a test of ability of the investment managers to anticipate market movements. The study used the investment performance outcomes of 57 investment managers to find out evidence of market timing abilities and found no statistical evidence that the investment managers of any of the sample funds had successfully outguessed the market. The study exhibited that the investment managers had no ability to outguess the market as a whole but they could identify under priced securities.

Michael C. Jensen (1967) conducted an empirical study of mutual funds during the period 1954–1964 for 115 mutual funds. His results indicate that these funds are not able to predict security prices well enough to outperform a buy-the-market-and-hold policy. His study ignores the gross management expenses to be free. There was very little evidence that any individual fund was able to do significantly better than which investors expected from mere random chance. Jensen (1968) measured the performance as the return in excess of equilibrium return mandated by capital asset pricing model. Jensen's measure is based on the theory of the pricing of capital assets by Sharpe (1964), Linter (1965), and Treynor.

Smith and Tito (1969) conducted a study into 38 funds for 1958–1967 and published results relating to performance of mutual funds. However, Mc Donald (1974) examined 123 mutual funds for 1960–1969 measures to be closely correlated; more importantly, he found that on an average, mutual funds perform about as well as native "buy and hold" strategy.

Fama (1972) suggested alternative methods for evaluating investment performance with somewhat finer breakdowns of performance on the stock selection, market timing, diversification, and risk bearing. It devised mechanism for segregation part of an observed investment return due to managers' ability to pick up the best securities at a given level of risk from part that is due to the prediction of general market price movements.

Dunn and Theisen (1983) study is about ranking by the annual performance of 201 institutional portfolios for the period 1973 through 1982 without controlling for fund risk. They found no evidence that funds performed within the same quartile over the 10-year period. They also found that ranks of individual managers based on 5-year compound returns revealed no consistency.

Eun et al. (1991) reported similar findings. The benchmarks used in their study were the Standard and Poor's 500 Index, the Morgan Stanley Capital International World Index, and a self-constructed index of US multinational firms. For the period 1977–1986, the majority of international funds outperformed the US market.

However, they mostly failed to outperform the world index. The sample consisted of 19 US-based international funds, and the Sharpe measure was used to assess excess returns.

Barua and Varma (1993b) have examined the relationship between the NAV and the market price on Mastershares. They conclude that market prices are far more volatile than what can be justified by volatility of NAVs. The prices also show a mean reverting behavior, thus perhaps providing an opportunity for discovering a trading rule to make abnormal profits in the market. Such a rule would basically imply buying Mastershares whenever the discount from NAV was quite high and selling Mastershares whenever the discount was low.

Droms and Walker (1994) used a cross-sectional/time-series regression methodology. Four funds were examined over 20 years (1971–1990), and 30 funds were analyzed for a 6-year period (1985–1990). The funds were compared to the Standard and Poor's 500 Index, the Morgan Stanley Europe, Australia, and Far East Index (EAFE) which proxies non-US stock markets, and the World Index. Applying the Jensen, Sharpe, and Treynor indices of performance, they found that international funds have generally underperformed the US market and the international market. Additionally, their results indicated that portfolio turnover, expense ratios, asset size, load status, and fund size are unrelated to fund performance.

Bauman and Miller (1995) studied the persistence of pension and investment fund performance by type of investment organization and investment style. They employed a quartile ranking technique, because they noted that "investors pay particular attention to consultants' and financial periodicals' investment performance rankings of mutual funds and pension funds." They found that portfolios managed by investment advisors showed more consistent performance (measured by quartile rankings) over market cycles and that funds managed by banks and insurance companies showed the least consistency. They suggest that this result may be caused by a higher turnover in the decision-making structure in these less consistent funds. This study controls for the effects of turnover of key decision makers by restricting the sample to those funds with the same manager for the entire period of study.

Volkman and Wohar (1995) extend this analysis to examine factors that impact performance persistence. Their data consists of 322 funds over the period 1980–1989 and shows performance persistence is negatively related to size and negatively related to levels of management fees.

Elton et al. (1996) examined the predictability of stock mutual funds performance based on risk-adjusted future performance. It also demonstrated application of modern portfolio techniques on past data to improve selection, which permitted construction of portfolio funds that significantly outperformed a rule based on the past rank alone. The portfolio so selected was reported to have small, but statistically significant, positive risk-adjusted returns during a period when mutual funds in general had negative risk-adjusted returns.

Jayadeve (1996) paper enlightens performance evaluation based on monthly returns. His paper focuses on performance of two growth-oriented mutual funds

(Mastergain and Magnum Express) on the basis of monthly returns compared to benchmark returns. For this purpose, risk-adjusted performance measures suggested by Jensen and Treynor and Sharpe are employed.

Carhart (1997) shows that expenses and common factors in stock returns such as beta, market capitalization, 1-year return momentum, and whether the portfolio is value or growth oriented "almost completely" explain short-term persistence in risk-adjusted returns. He concludes that his evidence does not "support the existence of skilled or informed mutual fund portfolio managers."

Yuxing Yan (1999) examined performance of 67 US mutual funds and the S&P 500 Index with 10-year daily return data from 1982 to 1992. The S&P index was used as benchmark index. Daily data are transformed into weekly data for computational reasons. In the calculations, it was assumed that the S&P 500 market index is a good one, i.e., it is efficient and its variance is constant.

Redmand et al.'s (2000) study examines the risk-adjusted returns using Sharpe's Index, Treynor's Index, and Jensen's alpha for five portfolios of international mutual funds during 1985–1994. The benchmarks for competition were the US market proxied by the Vanguard Index 500 mutual fund and a portfolio of funds that invest solely in US stocks. The results show that for 1985 through 1994 the portfolio of international mutual funds outperformed the US market and the portfolio of US mutual funds.

Rahul Bhargava et al. (2001) evaluated the performance of 114 international equity managers over the January 1988 to December 1997 period. Performance tests are conducted using Sharpe and Jensen performance methodologies. Three major findings are reported. First, international equity managers, on an average, were unable to outperform the MSCI world market proxy during the sample period. Second, geographic asset allocation and equity style allocation decisions enhanced the performance of international managers during the sample period. Third, separately managed funds were outperformed mutual funds.

Sadhak's (2003) study is an attempt to evaluate the performance of Indian mutual funds with the help of data pertaining to (a) trends in income and expenses, (b) investment yield and risk-associated returns, and (c) returns of Indian mutual funds vis-à-vis returns of other emerging markets.

Bala Ramasamy and Yeung's (2003) survey focused on Malaysia where the mutual fund industry started in the 1950s but only gained importance in the 1980s with the establishment of government-initiated program. The sample size consisting of 56 financial advisors representing various life insurance and mutual fund companies resulted in 864 different profiles of mutual funds. The cojoint analysis was employed to generate the questionnaire and analyze its results. The results of this survey point to three important factors which dominate the choice of mutual funds. These are consistent past performance, size of funds, and costs of transaction.

Chang et al. (2003) identified hedging factor in the equilibrium asset pricing model and used this benchmark to construct a new performance measure. Based on this measure, they are able to evaluate mutual fund managers hedging timing ability in addition to more traditional security selectivity and timing. While security

selectivity performance involves forecasts of price movements of selected individual stock, market timing measures the forecasts of next period realizations of the market portfolio. The empirical evidence indicates that the selectivity measure is positive on average and the market timing measure is negative on average.

Obeid (2004) has suggested a new dimension called "modified approach for risk-adjusted performance of mutual funds." This method can be considered as more powerful, because it allows not only for an identification of active resources but also for identification of risk. He observed two interesting results: first, it can be shown that in some cases, a superior security selection effect is largely dependent on taking higher risks. Second, even in the small sample analyzed in the study, significant differences appear between each portfolio manager's styles of selection.

Gupta OP and Amitabh Gupta (2004) published their research on select Indian mutual funds during a 4-year period from 1999 to 2003 using weekly returns based on NAVs for 57 funds. They found that fund managers have not outperformed the relevant benchmark during the study period. The funds earned an average return of 0.041 per week against the average market return of 0.035 %. The average risk-free rate was 0.15 % per week, indicating that the sample funds have not earned even equivalent to risk-free return during the study period.

Subash Chander and Japal Singh (2004) considered selected funds during the period from November 1993 to March 2003 for the purpose of their study. It was found that the Alliance Mutual Fund and Prudential ICICI Mutual Funds have posted better performance for the period of study in that order as compared to other funds. Pioneer ITI, however, has shown average performance and Templeton India mutual fund has staged a poor show.

Amit Singh Sisodiya (2004) makes comparative analysis of performance of different mutual funds. He explains that a fund's performance when viewed on the basis of returns alone would not give a true picture about the risk the fund would have taken. Hence, a comparison of risk-adjusted return is the criteria for analysis.

Bertoni et al. (2005) analyzed the passive role that, implicitly, would place institutional investors in such a context. The study was conducted in Italy using empirical evidence from the Italian stock exchange (Comit Index). This study finds that three factors reduce the freedom of institutional investors to manage their portfolio – the market target size, the fund structure, and the benchmarking.

Sudhakar and Sasi Kumar (2005) made a case study of Franklin Templeton mutual fund. The sample consists of a total of ten growth-oriented mutual funds during the period from April 2004 to March 2005. NIFTY based on NSE Index was used as the proxy for the market index, and each scheme is evaluated with respect to the NSE index to find out whether the schemes were able to beat the market or not. It was found that most of the growth-oriented mutual funds have been able to deliver better returns than the benchmark indicators. In the sample study, all the funds have positive differential returns indicating better performance and diversification of the portfolio, except two funds with negative differential returns, viz., Franklin India Bluechip Fund and Templeton India Income Fund.

Martin Eling (2006) made a remarkable contribution to the theory of "performance evaluation measures." In this study, data envelopment analysis (DEA) is presented as an alternative method for hedge fund performance measurement. As an optimization result, DEA determines an efficiency score, which can be interpreted as a performance measure. An important result of the empirical study is that completely new rankings of hedge funds compared to classic performance measures.

George Comer (2006) examined the stock market timing ability of two samples of hybrid mutual funds. The results indicate that the inclusion of bond indices and a bond timing variable in a multifactor Treynor-Mazuy model framework leads to substantially different conclusion concerning the stock market timing performance of these funds relative to the traditional Treynor-Mazuy model find less stock timing ability over the 1981–1991 time period provide evidence of significant stock timing ability across the second fund sample during the 1999–2000 period.

Yoon K. Choi (2006) proposed an incentive-compatible portfolio performance evaluation measure. In this model, a risk-averse portfolio manager is delegated to manage a fund, and his portfolio construction (and information-gathering) effort is not directly observable to investors, in which managers are to maximize investors' gross returns net of managerial compensation. He considers the effect of organizational elements such as economics of scale on incentive and thus on performance.

Ramesh Chander (2006) study examined the investment performance of managed portfolios with regard to sustainability of such performance in relation to fund characteristics, parameter stationarity, and benchmark consistency. The study under consideration is based on the performance outcome of 80 investment schemes from public as well as private sectors for the 5-year period encompassing January 1998 through December 2002. The sample comprised 33.75 % of small, 26.75 % of medium, 21.25 % of large, and 18.75 % of the giant funds.

Ramesh Chander (2006a) study on market timing abilities enables us to understand how well the manager has been able to achieve investment targets and how well risk has been controlled in the process. The results reported were unable to generate adequate statistical evidence in support of manager's successful market timing. It persisted across measurement criteria, fund characteristics, and the benchmark indices. However, absence of performance is noted for alternative sub-periods signifying the negation of survivorship bias.

Beckmann et al. (2007) found that Italian female professionals do not only assess themselves as more risk averse than their male colleagues, they also prefer a more passive portfolio management compared to the level they are allowed to. Besides, in a competitive tournament scenario near the end of the investment period, female asset managers do not try to become the ultimate top performer when they have outperformed the peer group. However in case of underperformance, the risk of deviating from the benchmark makes female professionals more willing than their male colleagues to seize a chance of catching up.

Gajendra Sidana (2007) made an attempt to classify hundreds of mutual funds employing cluster analysis and using a host of criteria like the 1-year-old return, 2-year annualized return, 3-year annualized return, 5-year annualized return, alpha,

and beta. The data is obtained from value research. The author finds inconsistencies between investment style/objective classification and the return obtained by the fund.

Coates and Hubbard (2007) reviewed the structure, performance, and dynamics of the mutual fund industry and showed that they are consistent with competition. It was also found that concentration and barriers to entry are low, actual entry is common and continuous, pricing exhibits no dominant long-term trend, and market shares fluctuate significantly. Their study also focused on "effects of competition on fee" and "pricing anomalies." They suggested legal interventions are necessary in setting fee in mutual funds of United States.

Subha and Bharati's (2007) study is carried out for open-ended mutual fund schemes and 51 schemes are selected by convenient sampling method. NAVs are taken for a period of 1 year from 1 October 2004 to 30 September 2005. Out of the 51 funds, as many as 18 schemes earned higher returns than the market return. The remaining 33 funds however generated lower returns than the market.

Sondhi's (2007) study analyzes the financial performance of 36 diversified equity mutual funds in India, in terms of rates of return, comparison with risk-free return, benchmark comparison, and risk-adjusted returns of diversified equity funds. Fund size, ownership pattern of AMC, and type of fund are the main factors considered in this study. The study reveals that private sector is dominating public sector.

Cheng-Ru Wu et al.'s (2008) study adopts modified Delphi method and the analytical hierarchy process to design an assessment method for evaluating mutual fund performance. The most important criteria for mutual fund performance should be "mutual fund style" followed by "market investment environment." This result indicates investor's focus when they evaluate the mutual fund performance.

Eleni Thanou's (2008) study examines the risk-adjusted overall performance of 17 Greek Equity Mutual Funds between the years 1997 and 2005. The study evaluated performance of each fund based on the CAPM performance methodology, calculating the Treynor and Sharpe Indexes for the 9-year period as well as for three sub-periods displaying different market characteristics. The results indicated that the majority of the funds under examination followed closely the market, achieved overall satisfactory diversification, and some consistently outperformed the market, while the results in market timing are mixed, with most funds displaying negative market timing capabilities.

Kajshmi et al. (2008) studied a sample of schemes in the 8-year period. This study considers performance evaluation and is restricted to the schemes launched in the year 1993 when the industry was thrown open to private sector under the regulated environment by passing the SEBI (Mutual Funds) Regulations 1993. The performance of the sample schemes were in line with that of the market as evident from the positive beta values. All the sample schemes were not well diversified as depicted by the differences in the Jensen alpha and Sharpe's differential return.

Massimo Masa and Lei Zhang (2008) found the importance of organizational structure on Asset Management Company of mutual fund. Their study found that more hierarchical structures invest less in firms located close to them and deliver

lower performance. An additional layer in hierarchical structure reduces the average performance by 24 basis points per month. At the same time, more hierarchical structures leads to herd more and to hold less concentrated portfolios.

Manuel Ammann and Michael Verhofen (2008) examined the impact of prior performance on the risk-taking behavior of mutual fund managers. Their sample taken from US funds started in January 2001 and ended in December 2005. The study found that prior performance in the first half of the year has, in general, a positive impact on the choice of the risk level in the second half of the year. Successful fund managers increase the volatility and the beta and assign a higher proportion of their portfolio to value stocks, small firms, and momentum stocks in comparison to unsuccessful fund managers.

Onur et al. (2008) study evaluates the performance of 50 large US-based international equity funds using risk-adjusted returns during 1994–2003. This study provides documentation on the risk-adjusted performance of international mutual funds. The evaluation is based on objective performance measures grounded in modern portfolio theory. Using the methodology developed by Modigliani and Miller in 1997, the study reports the returns that would have accrued to these mutual funds for a 5-year holding period as well as a 10-year holding period. It is evident from the empirical results of this study that the funds with the highest average returns may lose their attractiveness to investors once the degree of risk embedded in the fund has been factored into the analysis.

Qiang Bu and Nelson Lacey (2008) examined the determinants of US mutual fund terminations and provided estimates of mutual fund hazard functions. Their study found that mutual fund termination correlates with a variety of fund-specific variables as well as with market variables such as the S&P 500 Index and the short-term interest rate. This was tested with the underlying assumptions of the semi-parametric Cox model and reject proportionality. They also found that different fund categories exhibit distinct hazard functions depending on the fund's investment objectives.

David M. Smith (2009) discussed the size and market concentration of the mutual fund industry, the market entry and exit of mutual funds, the benefits and costs of mutual fund size changes, the principal benefits and costs of ownership from fund shareholders' perspective, etc. This study is based on data from Morningstar (2009) about US mutual fund industry, which was composed of 607 fund families.

Baker et al. (2010) investigated the relation between the performance and characteristics of 118 domestic actively managed institutional equity mutual funds. The results showed that the large funds tend to perform better, which suggests the presence of significant economies of scale. The evidence indicates a positive relation between cash holding and performance. They also found evidence in a univariate analysis that expense ratio class is an important determinant of performance, and the results are significant in a multivariate setting using Miller's active alpha as a performance metric.

Khurshid et al. (2009) studied the structure of the mutual fund industry in India and analyzed the state of competition among all the mutual funds in private sector

and public sector. The levels of competition and their trends have been obtained for the periods March 2003–March 2009. This study found overall mutual fund industry is facing a high competitive environment. An increasing trend of competition was observed within bank institution, private sector foreign, and private sector joint venture mutual funds.

Mohit Gupta and Aggarwal's (2009) study focused on the portfolio creation and industry concentration of 18 ELSS schemes during April 2006 to April 2007. Mutual fund industry concentration was the variable used in classification or cluster creation. This exercise was repeated each month for the period under study. Finally portfolio performance was compared with index fund, portfolio of three randomly picked funds of the previous month, and the return and risk parameters of ELSS category as a whole.

Talat Afza and Ali Rauf's (2009) study aims to provide guidelines to the managers of open-ended Pakistani mutual funds and benefit small investors by pointing out the significant variables influencing the fund performance. An effort has been made to measure the fund performance by using Sharpe ratio with the help of pooled time-series and cross-sectional data and focusing on different fund attributes such as fund size, expenses, age, turnover, loads, and liquidity. The quarterly sample data are collected for all the open-ended mutual funds listed on Mutual Fund Association of Pakistan (MUFAP), for the years 1999–2006. The results indicate that among various funds attributes are: lagged return, liquidity and had significant impact on fund performance.

Amar Ranu and Depali Ranu (2010) critically examined the performance of equity funds and found out the top 10 best performing funds among 256 equity mutual fund schemes in this category. They considered three factors for selection: (a) mutual funds having 5 years of historical performance, (b) fund schemes having a minimum of Rs.400 crore of assets under management, and (c) funds which have average return more than 22.47. They found that HDFC TOP 200 (Growth) option was outperforming among the top 10 best performing equity funds.

Sunil Wahal and Albert Wang (2010) found impact of the entry of new mutual funds on incumbents using the overlap in their portfolio holdings as a measure of competitive intensity. Their study revealed that funds with high overlap also experience quantity competition through lower investor flows, have lower alphas, and higher attrition rates. These effects only appeared after the late 1990s, at which point there appears to be endogenous structural shift in the competitive environment. Their concluding remark is that "the mutual fund market has evolved into one that displays the hallmark features of a competitive market."

Sukhwinder Kaur Dhanda et al.'s (2012) study considered the BSE-30 as a benchmark to study the performance of mutual funds in India. The study period has been taken from 1 April 2009 to 31 March 2011. The findings of the study reveal that only three schemes have performed better than benchmark. In the year 2009, HDFC Capital Builder has the top performer. It was 69.18 returns and 26.37 SD and 0.78 beta. HDFC Capital Builder scheme has given the reward for variability and volatility. HDFC Top 200 Fund and Birla Sun Life Advantage Funds are on second and third position in terms of return. HDFC Top 200 Fund

has shown better performance than Birla Sun Life Advantage Fund in terms of SD, beta, Sharpe ratio, and Treynor ratio. Birla Sun Life Advantage Fund has more risk than the benchmark. Kotak Select Focus Fund has the poorer performer in terms of risk and return. Except two schemes all other schemes have performed better than benchmark. Except Kotak Select Focus Fund all other schemes are able to give reward for variability and volatility.

3.3 A Review on Various Models for Performance Evaluation

3.3.1 Jensen Model

Given the additional assumption that the capital market is in equilibrium, all three models yield the following expression for the expected one-period return on any security (or portfolio) *j*:

$$\mathrm{E}\left(R_j\right) = R_F + \beta_J[\mathrm{E}(R_m) - R_F] \tag{3.1}$$

R_F = the one-period risk-free interest rate.

$\beta_J = \mathrm{Cov}(j R_J, R_M)/\sigma^2 R_M$ = the measure of risk (hereafter called systematic risk) which the asset pricing model implies is crucial in determining the prices of risky assets.

$E(R_M)$ = the expected one-period return on the "market portfolio" which consists of an investment in each asset in the market in proportion to its fraction of the total value of all assets in the market. It implies that the expected return on any asset is equal to the risk-free rate plus a risk premium given by the product of the systematic risk of the asset and the risk premium on the market portfolio.

3.3.2 Fama Model

In Fama's decomposition performance evaluation measure of portfolio, overall performance can be attributed to selectivity and risk. The performance due to selectivity is decomposed into net selectivity and diversification. The difference between actual return and risk-free return indicates overall performance:

$$\mathrm{R_p} - \mathrm{R_f} \tag{3.2}$$

wherein

R_p is actually return on the portfolio, which is monthly average return of fund and

R_f is monthly average return on treasury bills 91 days.

The overall performance further can be bifurcated into performance due to selectivity and risk.

Thus,

$$\mathrm{R}_p - \mathrm{R}_f = \left[R_p - R_p\left(\beta_p + R_p\left(\beta_p - R_f\right)\right]\right. \tag{3.3}$$

In other words, overall performance = selectivity + risk

3.3.3 Treynor and Mazuy Model

Treynor and Mazuy developed a prudent and exclusive model to measure investment managers' market timing abilities. This formulation is obtained by adding squared extra return in the excess return version of the capital asset pricing model as given below:

$$\left(R_{pt} - R_{ft}\right) = \alpha + \beta_p\left(R_{mt} - R_{ft}\right) + yp\left(R_{mt} - R_{ft}\right)^{2+} e_{pt} \tag{3.4}$$

where R_{pt} is monthly return on the fund, R_{ft} is monthly return on 91 days treasury bills, R_{mt} is monthly return on market index, and E_{pt} is error term.

This model involves running a regression with excess investment return as dependent variable and the excess market return and squared excess market return as independent variables. The value of coefficient of squared excess return acts as a measure of market timing abilities that has been tested for significance of using *t*-test. Significant and positive values provide evidence in support of the investment manager's successful market timing abilities.

3.3.4 Statman Model

Statman measured mutual funds using the following equation (Statman 2000):

eSDAR (excess standard deviation and adjusted return)

$$= R_f + \left(R_p - R_f\right)\left(S_m/S_p\right) - R_m \tag{3.5}$$

In this formulae, R_f = monthly return on 3-month treasury bills, R_p = monthly return on fund portfolio, R_m = monthly return on the benchmark index, S_p = standard deviation of portfolio p's return, and S_m = standard deviation of return on the benchmark index.

This model is used for short-term investment analysis. The performance is compared with it benchmark on monthly basis.

3.3.5 Choi Model

Choi provides a theoretical foundation for an alternative portfolio performance measure that is incentive-compatible. In this model, a risk-averse portfolio manager

is delegated to manage a fund, and his portfolio construction (and information-gathering) effort is not directly observable to investors. The fund manager is paid on the basis of the portfolio return that is a function of effort, managerial skill, and organizational factors. In this model, the effect of institutional factors is described by the incentive contractual form and disutility (or cost) function of managerial efforts in fund operations. It focuses on the cost function as an organizational factor (simply, scale factor). It was assumed that the disutility function of each fund is determined by the unique nature of its operation (e.g., fund size) and is an increasing function of managerial effort at an increasing rate.

3.3.6 Elango Model

Elango's model also compares the performance of public sector funds vs private sector mutual funds in India. In order to examine the trend in performance of NAV during the study period, growth rate in NAV was computed. The growth rate was computed based on the following formula (Elango 2003):

$$\text{Growth rate: } R_g = (Y_t - Y_0/Y_0) \times 100 \tag{3.6}$$

R_g: growth rate registered during the current year
Y_t: yield in current year
Y_0: yield in previous year

In order to examine whether past is any indicator of future growth in the NAV, six regression analyses were carried out. NAV of base year was considered as the dependent variable and current year as in the independent variable.

$$\text{Equation: } Y = \mathrm{A} + \mathrm{b}\,X \tag{3.7}$$

Dependent variable: $Y =$ NAV of 1999–2000
Independent variable: $X =$ NAV of 2000–2001

In the same way, the second regression equation computed using NAVs of 2000–2001 and 2001–2002, as dependent and independent variables.

3.3.7 Chang, Hung, and Lee Model

The pricing model adopted by Jow-Ran Chang, Nao-Wei Hung, and Cheng-Few Lee is based on competitive equilibrium version of intemporal asset pricing model derived in Campbell. The dynamic asset pricing model incorporates hedging risk as well as market. This model uses a log-linear approximation to the budget constraint to substitute out consumption from a standard intertemporal asset pricing model. Therefore, asset risk premia are determined by the covariances of asset returns with the market return and with news about the discounted value of all future market returns. Formally, the pricing restrictions on asset i imported by the conditional version of the model are

$$E_t r_{i,t+1} - rf_{,t+1} = -V_{il}/2 + \gamma V_{im} + (\gamma - 1)V_{ih} \tag{3.8}$$

where
$E_t r_{i,t+1}$, log return on asset; $rf_{,t+1}$, log return on riskless asset; V_{ii} denotes $\mathrm{Var}_t(r_{i,t+1})$; γ is the agent's coefficient of relative risk aversion; V_{im} denotes $\mathrm{Cov}_t(r_{i,t+1}, r_{m,t+1})$ and $V_{ih} = \mathrm{Cov}_t(r_{i,t+1}, (E_{t+1} - E_t), \_\infty j = 1\ \rho_j\ r_{m,t+1+j})$; the parameter, $\rho = 1 - \exp(c - w)$; and $c - w$ is the mean log consumption to wealth ratio.

This states that the expected excess log return in an asset, adjusted for a Jensen's inequality effect, is a weighted average of two covariances: the covariance with the return from the market portfolio and the covariance with news about future returns on invested wealth. The intuition in this equation that assets are priced using their covariances with the return on invested wealth and future returns on invested wealth.

3.3.8 MM Approach

Leah Modigliani and Franco Modigliani are better known as M^2 in the investment literature. This measure is developed adjusting portfolio return. This adjustment is carried on the uncommitted (cash balances) part of the investment portfolio at the riskless return so as to enable all portfolio holdings to participate in the return generation process. This adjustment is needed to bring out the level playing field for portfolio risk-return and vis-à-vis market return. The effect of this adjustment is reported below (Modigliani and Modigliani 1997):

$$M^2 = {}^*\mathrm{Rp} - \mathrm{Rm} \tag{3.9}$$

$${}^*\mathrm{Rp} = (\mathrm{Rf}^*(1 - \mathrm{Sdm}/\mathrm{Sdp})) + (\mathrm{Rp}^*\mathrm{Sdm}/\mathrm{Sdp}) \tag{3.10}$$

In this formulae * Rp = expected return, Rf = risk-free return, Sdm = standard deviation of market portfolio, and Sdp = standard deviation of managed portfolio.

In case the managed portfolio has twice the standard deviation of the market, then, the portfolio would be half invested in the managed portfolio and the remaining half would be invested at the riskless rate. Likewise, in case the managed portfolio has lower standard deviation than the market portfolio, it would be levered by borrowing money and investing the money in managed portfolio. Positive M^2 value indicates superior portfolio performance, while negative indicates actively managed portfolio manager's inability to beat the benchmark portfolio performance.

3.3.9 Meijun Qian's Stage Pricing Model

Meijun Qian's (2009) study reveals about the staleness, which is measured prices imparts a positive statistical bias and a negative dilution effect on mutual fund performance. First, evaluating performance with non-synchronous data generates

Table 3.1 Overview of different measures

Measures	Description	Interpretation
Sharpe ratio	Sharpe ratio = fund return in excess of risk-free return/standard deviation of fund. Sharpe ratios are ideal for comparing funds that have a mixed asset classes	The higher the Sharpe ratio, the better the fund returns relative to the amount of risk taken
Treynor ratio	Treynor ratio = fund return in excess of risk-free return/beta of fund. Treynor ratio indicates relative measure of market risk	The higher the Treynor ratio shows higher returns and lesser market risk of the fund
Jensen measure	This shows relative ratio between alpha and beta	Jensen measure is based on systematic risk. It is also suitable for evaluating a portfolio's performance in combination with other portfolios
M^2 measure	It matches the risk of the market portfolio and then calculate appropriate return for that portfolio	A high value indicates that the portfolio has outperformed and vice versa
Jensen model	$E(R_j) = R_F + \beta_J[E(R_m) - R_F]$	The expected one-period return on the "market portfolio" which consists of an investment in each asset in the market in proportion to its fraction of the total value of all assets in the market
Fama model	$R_p–R_f = [R_p - R_p(\beta_p + R_p(\beta_p–R_f)]$	Overall performance = selectivity + risk
Treynor and Mazuy model	$(R_{pt}–R_{ft}) = \alpha + \beta_p\,(R_{mt} - R_{ft}) + yp\,(R_{mt} - R_{ft})^{2+}e_{pt}$	This model involves running a regression with excess investment return as dependent variable and the excess market return and squared excess market return as independent variables
Statman model	$\text{eSDAR} = R_f + (R_p - R_f)(S_m/S_p)–R_m$	This model used for short-term investment analysis. The performance is compared with it benchmark on monthly basis
Elango model	$R_g = (Y_t - Y_0/Y_0) \times 100$	In order to examine whether past is any indicator of future growth in the NAV, six regression analyses were carried out. NAV of base year was considered as the dependent variable and current year as in the independent variable

a spurious component of alpha. Second, stale prices create arbitrage opportunities for high-frequency traders whose trades dilute the portfolio returns and hence fund performance. This paper introduces a model that evaluates fund performance while controlling directly for these biases. Empirical tests of the model show that alpha net of these biases is on average positive although not significant and about 40 basis points higher than alpha measured without controlling for the impacts of stale pricing. The difference between the net alpha and the measured alpha consists of three components: a statistical bias, the dilution effect of long-term fund flows, and

the dilution effect of arbitrage flows. Thus, assuming that information generated in time t is not fully incorporated into prices until one period later, the observed fund return becomes a weighted average of true returns in the current and last periods:

$$r_t = \alpha + \beta r_{mt} + \varepsilon_t, \tag{3.11}$$

$$r_t^* = \eta r_{t-1} + (1 - \eta) r_t, \tag{3.12}$$

where r_t denotes the true excess return of the portfolio with mean μ and variance σ_2 and r_{mt} denotes the excess market return with mean μ_m and variance σ_m. Both r_t and r_{mt} are i.i.d, and the error term ε_t is independent of r_{mt}. R_t* is the observed excess return of the portfolio with zero flows, while η is the weight on the lagged true return. That is, the higher the η, the staler the prices. Assumedly, arbitrage traders can earn the return r_t*, by trading at the fund's reported net assets values (Table 3.1).

3.4 Conclusion

This paper is intended to examine various performance models derived by financial experts across the globe. A number of studies have been conducted to examine investment performance of mutual funds of the developed capital markets. The measure of performance of financial instruments is basically dependent on three important models derived independently by Sharpe, Jensen, and Treynor. All three models are based on the assumption that (1) all investors are averse to risk and are single-period expected utility of terminal wealth maximizers, (2) all investors have identical decision horizons and homogeneous expectations regarding investment opportunities, (3) all investors are able to choose among portfolios solely on the basis of expected returns and variance of returns, (4) all transactions costs and taxes are zero, and (5) all assets are infinitely divisible.

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