AN EMPIRICAL ANALYSIS OF EQUITY MUTUAL FUNDS USING RISK-ADJUSTED PERFORMANCE MEASURES

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ABSTRACT

The study attempts to examine the performance of select growth oriented equity mutual fund schemes against risk-free rate and market index. For the analysis monthly NAV of sample schemes has been taken from April 2010 to March 2020. Monthly closing values of BSE 100 are taken as the market index and for risk-free rate 91 days Treasury bills are used. The risk-adjusted performance measures like Sharpe ratio, Treynor ratio, Jensen measure and Sharpe-differential measure were used to examine the performance of the sample mutual fund schemes. The findings of the study revealed that the sample funds outperformed the market index in terms of reward-to-variability and reward-to-volatility, they are adequately diversified and the fund managers possess superior selectivity skills.

KEYWORDS: *Performance, Mutual Funds, Risk-Return, Risk-Adjusted Return.*

1. INTRODUCTION

The Securities and Exchange Board of India (Mutual Funds) Regulations, 1993 defines mutual fund as "Mutual fund means a fund established in the form of a trust by sponsor to raise money by the trustees through the sale of units to the public under one or more schemes for investing in securities in accordance with these regulations" (SEBI, 1993) and now-a-days, mutual funds have become a popular and successful tool for investors to engage in financial markets in a simple, low-cost manner while reducing risk by diversifying their investments across many types of securities through a process known as diversification. It has the potential to be a key component of an individual's investment strategy. They provide the opportunity for capital progress and income through investment performance, dividends and distributions, all of which are managed by a portfolio manager who makes investment choices on behalf of unit holders of mutual funds.

Over the last decade, mutual funds have been the preferred long-term investment vehicle for many investors and in the last few years, the size of investors has increased dramatically in India as the economy and capital markets have grown. India's capital market has undergone significant changes as the Indian government implemented economic reforms in the fields of trade, industry, and commerce to bring the Indian economy into line with the global economy. New financial intermediaries have developed in the form of new innovative tools and institutions. With a focus on increasing domestic savings and improving investment deployment through markets, the demand for and breadth of mutual fund operations has exploded. As a result, the significance of mutual funds in the restructuring of the Indian economy has necessitated seeing their services not just as a financial middleman but also as a trend setter, as they play an important role in spreading equity culture. In this context, fund managers must closely monitor and evaluate mutual funds in order to make this instrument the strongest and most favoured product in the Indian capital market

in the upcoming years. It is necessary to investigate the performance of mutual funds. The performance of a mutual fund scheme is determined by the risk-return relationship because risk is proportional to return, offering the highest possible return on an investment while maintaining an acceptable degree of risk helps to distinguish the better performers from the laggards (Prajapati and Patel, 2012). Given the large number of asset management firms operating in India, it is vital to examine their performance in order to assist investors in selecting the best mutual fund.

2. REVIEW OF LITERATURE

Tripathy (2004) analysed the success of 31 tax planning schemes in India over the period from 1994-1995 to 2001-2002. In the article, six performance indicators were used to analyse the investing performance of Indian mutual funds. The findings show that the fund managers under investigation have not been successful in outperforming the market or in providing portfolio diversification. Ramudu & Kumar (2014) examined Equity-Linked Savings Scheme (ELSS) and diversified mutual funds in India for the period 2008-09 to 2012-13 and looked at whether portfolio managers generate above-average returns in their respective risk classes using performance indicators like Sharpe ratio, Treynor ratio, Jensen's Alpha, Information Ratio, and Net Selectivity. The results of all the measures indicated that no fund performed equally well or bad during the study period. Goyal (2015) examined the performance of CRISIL's top 10 equity diversified mutual funds from August 1, 2009 to November 9, 2014. Using traditional metrics such as Sharpe ratio, Treynor ratio and Jensen's measure, the study determined that all funds outperformed the market. However, one must keep in mind that the study was conducted over a relatively short period of time, and the sample size was very small. Ratnaraju and Madhav (2016) investigated the performance of open-ended, growth-oriented equity schemes for the period from April 2012 to March 2016. Sharpe, Treynor and Jensen's measures were used to examine the historical performance of the selected schemes, and the results will help investors make better investment decisions. According to the study, 14 out of 30 mutual fund schemes outperformed the benchmark. The findings also revealed that some of the plans underperformed; these schemes were experiencing a lack of proper diversification. The Sharpe ratio was positive for all schemes in the sample, indicating that funds were giving higher returns than the risk-free rate. The Jensen measure revealed that 19 out of 30 schemes had a positive alpha, indicating that the schemes performed better. Agarwal and Mirza (2017) evaluated the performance of 100 Indian mutual fund schemes using the Sharpe ratio, Treynor ratio, Jensen's Alpha, and Value at Risk from January 2013 to June 2016. The Sharpe ratio and Treynor ratio statistics show that 90 percent of the schemes surpassed their benchmarks, indicating that the funds have performed fairly well and outperformed the market over this time period. Given the beta of the scheme, the returns generated by 79 schemes compensated adequately over the average market return, according to Jensen's Alpha. Rathore & Singh (2017) evaluated the sector-wise performance of mutual funds in India for the period 2003 to 2014. By using risk-adjusted performance measures like Sharpe ratio, Treynor ratio and Jensen measure, the study observed that private sector mutual funds outperformed the public and foreign sector and that the equity schemes outperformed as compared to balanced and tax saving schemes.

3. OBJECTIVES

- To analyse risk and return of sample mutual fund schemes against market risk and return.

- To evaluate the performance of mutual fund schemes using reward-to-variability measure and reward-to-volatility measure.

- To assess fund managers' diversification and selectivity abilities.

4. Testable Hypotheses

The following hypotheses were tested based on the aforementioned objectives.

- In terms of risk and return, the sample mutual fund schemes outperformed the market index.

- The sample mutual fund schemes revealed superior performance as compared to market index in terms of reward-to-variability measure and reward-to-volatility measure.

- The fund managers are capable of better diversification and superior selectivity skills.

5. DATABASE AND METHODOLOGY

5.1. Description of Data

In general, investors consider capital appreciation, better liquidity, lower risk, and tax liability while investing in mutual funds. As a result, the study conducts a thorough examination of growth oriented equity schemes. A total of eight growth/equity mutual fund schemes (diversified and ELSS category) from different fund houses constitute the sample. The study is empirical in nature and covers a period of ten years, i.e. from March 2010 to March 2020. For analysis, the data for monthly NAV of the sample schemes has been taken from the websites of the respective fund houses. Monthly yield on 91-days Treasury Bills has been taken as data for risk-free rate, and the required data for the market index, monthly closing values of BSE 100 has been taken from the website of Bombay Stock Exchange.

The description of sample mutual fund schemes has been given in Table 1 below. Also, certain codes have been assigned to the schemes.

TABLE 1 SAMPLE MUTUAL FUND SCHEMES

Mutual Fund Schemes	Option	Fund Category
SBI Contra Fund	Growth/Equity	Diversified Equity
SBI Long Term Equity Fund	Growth/Equity	ELSS
Canara Robeco Flexi Cap Fund	Growth/Equity	Diversified Equity
Canara Robeco Equity Tax Saver	Growth/Equity	ELSS
Franklin India Focused Equity Fund	Growth/Equity	Diversified Equity
Franklin India Taxshield	Growth/Equity	ELSS
DSP Black Rock Opportunities Fund	Growth/Equity	Diversified Equity
DSP Black Rock Tax Saver	Growth/Equity	ELSS

Source: Compiled by Author from Association of Mutual Funds in India (AMFI) and www.moneycontrol.com

5.2. Methods used for Performance Evaluation

5.2.1. Return Measure

Using month-end Net Asset Values (NAV), the following formula was used to calculate the monthly returns of the mutual fund schemes:

$$R_{pt} = \frac{NAV_t - NAV_{t-1}}{NAV_{t-1}}$$

Where R_{pt} is the fund return, NAV_t is the NAV in current month and NAV_{t-1} is the NAV in

previous month, t is the time period.

The average return of the mutual fund schemes is calculated as follows:

$$R_p = \sum_{t=1}^{n} R_{pt}/n$$

Where R_p is the average return on the mutual fund schemes.

Similarly, the market index return has been calculated as:

$$R_{mt} = \frac{Index_t - Index_{t-1}}{Index_{t-1}}$$

Where R_{mt} is the market return in time period t, $Index_t$ is the market index in current month and $Index_{t-1}$ is the market index in previous month.

The average return on market index is calculated as follows:

$$R_m = \sum_{t=1}^{n} R_{mt}/n$$

Where R_m is the average return on the market.

5.2.2. Risk Measure

Total Risk, measured by standard deviation (σ) and Systematic Risk, measured by beta coefficient (β) are the two categories of risks. On the basis of month-end NAV, the risk associated with the selected mutual fund schemes has been determined. In the study, the following risk measures were used:

Standard Deviation (σ): Standard deviation is a measure of volatility in returns. It measures the deviation in returns of mutual funds from its expected returns. The bigger the standard deviation, the more risky the investment is likely to be. The total risk (σ) is computed as:

$$\sigma = \sqrt{\frac{1}{n-1} \sum_{t=1}^{n} (R_t - \bar{R})^2}$$

Where σ indicates standard deviation, n is the number of monthly return, R_t is the monthly fund return and $\bar{R}$ is the mean mutual fund return.

The standard deviation of market index is also calculated in a similar manner.

Systematic Risk (β): By relating the portfolio returns with the market return we get the systematic risk, which is denoted by beta (β). The Capital Asset Pricing Model (CAPM) form of the market model is used to compute the portfolio's beta. The higher the beta (i.e. >1), the more sensitive the fund's returns are to market returns; the lower the beta (i.e. <1), the less sensitive the fund is. If beta is equal to 1, it means that fund risk is equal to systematic risk because beta of market generally has a value equal to 1. The systematic risk is calculated as:

$$R_{pt} = \alpha + \beta_p R_{mt} + e_{pt}$$

Where α is the intercept, R_p is the fund return, β_p is the beta coefficient, R_m indicates market return, e_p is the random error term and t is the time period.

5.2.3. Sharpe Ratio

William F. Sharpe (1966) developed one of the measures of performance evaluation popularly known as Sharpe ratio. It measures the relationship between the portfolio's excess return over risk-free return and the portfolio's total risk as measured by standard deviation. It is also known as reward-to-variability ratio. Generally, a higher Sharpe ratio is preferred over a lower one. If the fund Sharpe ratio is lower than the market Sharpe ratio, it means the fund has underperformed and on the other hand, if the fund Sharpe ratio is higher than the market Sharpe ratio, it means the fund has outperformed the market. Sharpe ratio is calculated as:

$$SR_p = \frac{R_p - R_f}{\sigma_P}$$

Where SR_p is the fund Sharpe ratio, R_f is the return on risk-free asset, R_p indicates fund return and σ_p is the standard deviation of fund return.

Likewise, Sharpe ratio for the market is also calculated as:

$$SR_m = \frac{R_m - R_f}{\sigma_m}$$

Where SR_m indicates market Sharpe ratio, R_m is the market return, R_f is the return on risk-free asset and σ_m is the standard deviation of market return.

5.2.4. Treynor Ratio

Treynor (1965) propounded a new measure of performance evaluation, which came to be popularly known as the Treynor ratio. It measures the relationship between the fund's excess return over risk-free return and market risk, as measured by beta. It is also referred to as the reward to volatility ratio. Just like the condition for Sharpe ratio, a higher Treynor ratio is preferred to a lower one. If the fund Treynor ratio is lower than the market Treynor ratio, it shows that the fund has underperformed the market while, if the fund Treynor ratio is higher than the market Treynor ratio, it suggests that the fund has outperformed the market. It is calculated as:

$$TR_p = \frac{R_p - R_f}{\beta_p}$$

Where, TR_p indicates fund Treynor ratio, R_p is the fund return, R_f is the return on risk-free asset and β_P is the market risk for fund portfolio return.

Likewise, Treynor ratio for market is calculated as:

$$TR_m = \frac{TR_m - R_f}{\beta_m}$$

Where TR_m is the market Treynor ratio, R_m - R_f is the excess market return and β_m indicates systematic risk.

5.2.5. Single factor CAPM model (Jensen Measure)

Jensen (1968) put forward another method of performance evaluation. Jensen aimed to develop a risk-adjusted measure of absolute performance as a defined benchmark against which the performance of various funds can be compared. It is popularly known as Jensen's Alpha. This measure assesses a portfolio manager's ability to forecast a higher return than expected for a given level of risk. A positive alpha for a portfolio indicates that the portfolio has a higher average return than the benchmark, indicating superior performance whereas, a negative alpha, on the other hand, indicates that the fund has underperformed the benchmark. It is calculated as:

$$R_{pt} - R_{ft} = \alpha + \beta_p(R_{mt} - R_{ft}) + e_{pt}$$

Where α indicates Jensen alpha, R_{pt} is the fund return, R_{ft} is the return on risk-free asset, R_{mt} is the market return, ER_{pt} is the excess fund return, β_p is the systematic risk and e_{pt} is the random error term and t is the time period.

5.2.6. Sharpe-Differential Measure

Sharpe used this measure to determine the mutual fund manager's incremental returns for a particular risk level. The differential return is the difference between a mutual fund scheme's actual average return and its predicted return for a given level of risk. As a result, the Sharpe measure considers not only the manager's ability of stock selection but also his ability of diversification. The impact of selectivity and diversification on fund returns can be shown by comparing Sharpe's differential returns and Jensen's alpha. Both the measures (Jensen and Sharpe) should reveal the same degree of differential return if a portfolio is sufficiently diversified. The Sharpe differential return will be lower if the portfolio is not well-diversified. It is calculated as:

$$E(R_{pt}) = [R_{ft} + (R_{mt} - R_{ft})\sigma_p/\sigma_m]$$

Or

$$R_{pt} - [R_{ft} + (R_{mt} - R_{ft})\sigma_p/\sigma_m]$$

Where R_{pt} is the fund return, R_{ft} is the return on risk-free asset, R_{mt} is the market return, σ_p is the standard deviation of fund return and σ_m is the standard deviation of market return and t is the time period.

6. Empirical results

The empirical findings of the study were derived by utilising risk-return and risk-adjusted performance measures. The risk-return profile of sample schemes against market index is shown in Table 2. The table displays the beta (β) and coefficient of determination (R^2) of the sample schemes, which were calculated using regression analysis with mutual fund NAV returns as the dependent variable and market index returns as the independent variable. The significant positive beta coefficients obtained for all sample schemes indicate a significant positive relation between market index and returns of mutual fund schemes and the R^2 values of all sample schemes lie within the range of 85 to 100, signifying well diversification of the sample schemes.

TABLE 2 RISK-RETURN PROFILE OF MUTUAL FUND SCHEMES AGAINST MARKET INDEX

Fund Name	Fund Return	Fund Risk (σ)	Market Return	Market Risk (σ)	Fund Beta (β)	Beta-t Value	R^2
SBI Contra Fund	0.0082	0.0475	0.0081	0.0480	0.95	28.51*	0.92
SBI Long Term Equity Fund	0.0106	0.0454	0.0081	0.0480	0.92	33.40*	0.94
Canara Robeco Flexi Cap Fund	0.0098	0.0455	0.0081	0.0480	0.91	27.23*	0.91
Canara Robeco Equity Tax Saver	0.0101	0.0438	0.0081	0.0480	0.87	26.46*	0.91
Franklin India Focused Equity Fund	0.0120	0.0471	0.0081	0.0480	0.94	27.90*	0.91

Franklin India Taxshield	0.0126	0.0481	0.0081	0.0480	0.97	30.44*	0.92
DSP Black Rock Opportunities Fund	0.0139	0.0517	0.0081	0.0480	0.98	22.64*	0.87
DSP Black Rock Tax Saver	0.0126	0.0422	0.0081	0.0480	0.85	29.99*	0.93
Average	**0.0112**	**0.0464**	**0.0081**	**0.0480**	**0.92**	**-**	**0.91**

Source: Calculated by Researcher. *Significant at 1% level

Further, in terms of total risk (σ_p), it was observed that DSP Black Rock Opportunities Fund is the most risky scheme whereas DSP Black Rock Tax Saver is least risky among all sample schemes. DSP Black Rock Opportunities Fund is found to have highest systematic risk while DSP Black Rock Tax Saver possesses lowest systematic risk (β). Further all sample schemes have systematic risk lower than the market risk, which always has beta value of 1. In terms of returns DSP Black Rock Opportunities Fund generated highest returns; SBI Contra Fund generated lowest returns, while all the sample schemes have generated greater returns than average market return. Furthermore, the greater average return of sample schemes than average market return signifies that the schemes have outperformed the market.

TABLE 3 SHARPE RATIO OF MUTUAL FUND SCHEMES AGAINST MARKET INDEX

Fund Name	Sharpe Fund	Sharpe Market	Rank
SBI Contra Fund	0.0411	0.0368	8
SBI Long Term Equity Fund	0.0948	0.0368	5
Canara Robeco Flexi Cap Fund	0.0784	0.0368	7
Canara Robeco Equity Tax Saver	0.0870	0.0368	6
Franklin India Focused Equity Fund	0.1217	0.0368	4
Franklin India Taxshield	0.1313	0.0368	3
DSP Black Rock Opportunities Fund	0.1480	0.0368	2
DSP Black Rock Tax Saver	0.1495	0.0368	1
Average	**0.1065**	**0.0368**	**-**

Source: Calculated by Researcher

The Sharpe ratio of mutual fund schemes and the market index are shown in Table 3. In terms of Sharpe ratio, all of the sample schemes exceeded the market index and the average of Sharpe ratio of all the funds is higher (0.1065) than the average of Sharpe ratio of market index (0.0368). This indicates that fund managers are more efficient at diversifying total risk and so create excess return per unit of total risk. The best performer among the sample schemes is DSP Black Rock Tax Saver, which has the highest Sharpe ratio, while SBI Contra Fund is the least performing fund because it has the lowest Sharpe ratio.

TABLE 4 TREYNOR RATIO OF MUTUAL FUND SCHEMES AGAINST MARKET INDEX

Fund Name	Treynor Fund	Treynor Market	Rank
SBI Contra Fund	0.0023	0.0020	8
SBI Long Term Equity Fund	0.0049	0.0020	5
Canara Robeco Flexi Cap Fund	0.0041	0.0020	7
Canara Robeco Equity Tax Saver	0.0046	0.0020	6
Franklin India Focused Equity Fund	0.0063	0.0020	4
Franklin India Taxshield	0.0067	0.0020	3
DSP Black Rock Opportunities Fund	0.0078	0.0020	1
DSP Black Rock Tax Saver	0.0077	0.0020	2
Average	**0.0056**	**0.0020**	**-**

Source: Calculated by Researcher

The Treynor ratio of mutual fund schemes and the market index are shown in Table 4. In this case as well, all of the sample schemes outperformed the market because their Treynor ratios are all higher than the market Treynor ratio index and the average of Treynor ratio of all the funds is higher (0.0056) than the average of Treynor ratio of market index (0.0020). In terms of Treynor ratio, all of the sample schemes exceeded the market index. However, because it has the greatest Treynor ratio, DSP Black Rock Opportunities Fund was found to be the best performer, while SBI Contra Fund is the least performing fund because it has the lowest Treynor ratio.

Since Sharpe ratio adjusts returns per unit of total risk and Treynor ratio adjusts returns per unit of systematic risk, a fund that performs better in terms of Sharpe ratio may not perform equally well in terms of Treynor ratio and vice versa. Except for a few minor variations, practically all of the sample schemes have the same Sharpe and Treynor ratio ranking, showing that the fund managers of these schemes are capable of providing appropriate risk-adjusted returns to their clients in terms of total and systematic risk.

TABLE 5 JENSEN MEASURE OF MUTUAL FUND SCHEMES

Scheme Name	Fund Return	Jensen Expected (CAPM) Return	Jensen Alpha	Alpha P-Value
SBI Contra Fund	0.0082	0.0080	0.0002	0.8572
SBI Long Term Equity Fund	0.0106	0.0079	0.0027	0.0429**
Canara Robeco Flexi Cap Fund	0.0098	0.0079	0.0019	0.2140
Canara Robeco Equity Tax Saver	0.0101	0.0078	0.0023	0.1469
Franklin India Focused Equity Fund	0.0120	0.0079	0.0041	0.0133**
Franklin India Taxshield	0.0126	0.0080	0.0046	0.0032*
DSP Black Rock Opportunities Fund	0.0139	0.0081	0.0058	0.0069*
DSP Black Rock Tax Saver	0.0126	0.0078	0.0048	0.0008*

Average	0.0112	0.0079	0.0033	-

Source: Calculated by Researcher, *Significant at 1% level, **Significant at 5% level

The findings of the Jensen measure of sample mutual fund schemes are shown in Table 5. It reveals that DSP Black Rock Opportunities Fund, DSP Black Rock Tax Saver and Franklin India Taxshield are found to have positive and significant alpha values at 1% level of significance and Franklin India Focused Equity Fund and SBI Long Term Equity Fund are found to have positive and significant alpha values at 5% level of significance. This signifies that the fund managers of these schemes were able to achieve returns that were higher than expected/CAPM returns. The top 3 mutual fund schemes with positive and significant alpha values are DSP Black Rock Opportunities Fund (α = 0.0058), DSP Black Rock Tax Saver (α = 0.0048), Franklin India Taxshield (α = 0.0046) and the lowest significant alpha value is generated by SBI Long Term Equity Fund. There are no schemes with a negative Jensen alpha value. This demonstrates fund managers' superior stock selection abilities.

TABLE 6 SHARPE-DIFFERENTIAL RETURNS OF MUTUAL FUND SCHEMES

Scheme Name	Fund Return	Sharpe Expected	Sharpe-Differential
SBI Contra Fund	0.0082	0.0080	0.0002
SBI Long Term Equity Fund	0.0106	0.0080	0.0026
Canara Robeco Flexi Cap Fund	0.0098	0.0078	0.0020
Canara Robeco Equity Tax Saver	0.0101	0.0079	0.0022
Franklin India Focused Equity Fund	0.0120	0.0080	0.0040
Franklin India Taxshield	0.0126	0.0081	0.0045
DSP Black Rock Opportunities Fund	0.0139	0.0082	0.0057
DSP Black Rock Tax Saver	0.0126	0.0078	0.0048
Average	0.0112	0.0080	0.0033

Source: Calculated by Researcher

The findings of Sharpe Differential returns of sample schemes are shown in Table 6. It reveals that DSP Black Rock Opportunities Fund (0.0057), DSP Black Rock Tax Saver (0.0048) and Franklin India Taxshield (0.0045) have positive Sharpe Differential returns, indicating better performance.

It's worth noting that a well-diversified portfolio's Jensen measure (alpha) and Sharpe differential returns are the same, whereas a poorly diversified portfolio's Sharpe differential returns would be small in magnitude, implying poor performance. However, our findings show that the Jensen and Sharpe differential returns of sample schemes are nearly identical.

7. FINDINGS AND CONCLUSION

Since this study aimed to evaluate the performance of mutual fund schemes for a period of ten years, it seeks to contribute to the already existing literature by providing evidence about the performance of growth oriented equity mutual funds belonging to different fund houses. It was found that all the sample mutual fund schemes have outperformed the market index not only in terms of risk and return measures but also in terms of risk-adjusted performance measures.

On the basis of analysis of risk-adjusted measures of performance i.e. Sharpe ratio, Treynor ratio,

Jensen measure and Sharpe-Differential measure, it may be asserted that the sample mutual fund schemes outperformed the market index in terms of reward-to-variability measure and reward-to-volatility measure. Furthermore, the obtained results of Jensen and Sharpe differential measures indicate that the funds offer advantages of diversification and increased returns due to the superior selectivity skills of fund managers.

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