An Empirical Analysis of Risk-Adjusted Performance: A Comparative Study of Selected Mutual Funds

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Abstract
The study provides a detailed examination of performance of selected mutual funds because the mutual fund sector has grown at an exponential rate over the previous two decades; the research examines the performance of specific mutual funds in depth. With the increased mobilization of funds in the industry it becomes empirical to analyze the performance of such mutual funds which can help the investors to take rational decision that has actually motivated researchers to undertake the current research. The researchers have tried to examine the performance of selected equity mutual funds with varying market capitalization. This was analyzed using risk adjusted ratios like Sharpe ratio, treynor's ratio and Jensen's Alpha ratio, M2 measures, Information ratio, Sortino ratio and Appraisal ratio. The researchers have tried to examine the wide spectrum of three different categories of mutual funds using risk adjusted ratios which have not been covered in the previous studies which can actually help the investors to take intelligent decisions. The results of these selected ratios were verified across categories using statistical technique ANOVA in MS-Excel. Researchers found out JM Large Cap Fund outperform other selected mutual funds in the Large Cap category. HDFC Mid-Cap Opportunities Fund outperforms other selected mutual funds in the Mid Cap category. HDFC Small Cap Fund outperforms other selected mutual funds in the Small Cap category. ANOVA results indicates that investors or portfolio managers can allocate more of their funds to small cap mutual funds to earn better risk adjusted returns.

Keywords: Mutual Funds, Performance Evaluation, Market Capitalization, Sharpe ratio, treynor's ratio and Jensen's Alpha ratio, M2 measures, Information ratio, Sortino ratio and Appraisal ratio, ANOVA.

Introduction

A mutual fund is an investment vehicle that is professionally managed which collects funds from multiple investors and invests it in a diverse portfolio of stocks, bonds, and other assets. A qualified fund manager is responsible for managing the fund, making informed investment decisions on behalf of investors with aligned financial goals. Mutual funds allow the investors to diversify their risk handling the portfolio development and management job to experts. The investors buy the units of the mutual funds and are called the unit holders. So in the case of mutual funds, investors never get the voting rights but it is the mutual fund companies who are making investments in the equities of other companies, get the voting rights. The investors get returns in the form of dividend as distributed by the mutual fund companies along with capital appreciation. These experts referred to as fund managers create a portfolio according to investor's expectations for returns and willingness to undertake risk.
Benefits of evaluating the performance of mutual funds as a financial assets are as follows:

- Assessing the risk of investment portfolios, thereby minimizing the losses.
- Identifying any unusual patterns in financial transactions, thereby detecting fraudulent activities
- Analyzing the financial data and developing the market trends from the same, thereby supports the decision making based on market trends.
- Assessing the creditworthiness of various mutual fund companies.

With the exponential growth in mutual funds over a period of time have attracted several investors who actually want to know about the performance of those funds. The current study attempts to examine the performance of chosen Mutual Funds based on market capitalization in relation to the Indian Stock Market Indices. To better understand the performance of mutual funds based on risk adjusted ratios, data of twenty mutual funds each from large cap, mid cap and small cap was taken. The market indices of each category of mutual funds were taken as a benchmark to evaluate

the performance of selected mutual funds with respect to their market portfolio. S&P BSE LARGE CAP was selected as a benchmark for analyzing the performance of selected top 20 large cap mutual funds. S&P BSE MID CAP was selected as a benchmark for analyzing the performance of selected top 20 mid cap mutual funds. S&P BSE SMALL CAP was selected as a benchmark for analyzing the performance of selected top 20 small cap mutual funds.

To assess the performance of mutual funds risk adjusted ratios like Sharpe ratio, Treynor's ratio and Jensen's Alpha ratio, M Squared measures, Information ratio, Sortino ratio and Appraisal ratio were calculated for a period from January 01, 2019 to December 31, 2023.

Literature Review

William F Sharpe (1963) proposed an approach to portfolio selection. The research is an extension of Markowitz's three-stage portfolio analysis. In the paper, researcher suggested a simplified model of portfolio analysis and its evidence on cost as well. Jack L. Treynor(1965) in his research paper attempts to derive new ways to rate the performance of investment funds. In his 1967 study on mutual fund performance, Michael C Jensen developed a risk-adjusted metric for portfolio performance. This metric measures the contribution of the manager's predicting ability to the fund's results. For the objective of research, 115 mutual funds were analyzed from 1945 to 1964. The study indicated that mutual funds were not able to foresee asset prices well enough to outperform the market; and the emphasize was made on not taking diversification into account.

Another research by Ray (2011) looked at the performance of open-ended balanced mutual funds introduced by Unit Trust of India, also known as US 64. The performance was measured in terms of profitability, savings mobilization, income, dividend distribution and investible funds, expenditure patterns, redemption and net inflow of funds. The article also attempted to investigate the problems and challenges encountered by UTIs over time. The NAV base sector was determined to be the best metric for measuring the performance of UTI mutual funds. Dr.R.Narayanasamy, V. Rathnamani,(2013) examined the performance of selected equity large cap funds using statistical parameters like standard deviation, beta coefficient, R Squared Sharpe Ratio, Jensen Alpha Ratio. For the purpose of study data of mutual funds were collected from 1st Jan, 2010 to Dec 2012.It was discovered that the benchmark index CNX had an influence on the performance of all the selected funds. Furthermore, all funds except Reliance Vision did well throughout the very erratic market movement. Rizwan Ali, Mohammad Akram Naseem, and Ramiz Ur Rehman (2014) seek to determine the investing patterns of mutual funds in Pakistan, both conventional and Islamic. The Sharpe Ratio and Treynor Ratio were used to examine data from five conventional and five Islamic funds for research purposes. It was discovered that the performance of Islamic funds is superior than that of conventional funds.

(N. Bhagyasree, 2016) inspected the performance of mutual funds of Indian Securities Market. Qualitative Research by reviewing the literature was conducted. It was thus established that mutual funds, as an investing tool, are a safe and trustworthy choice for investors. Pandow (2017) conducted qualitative study on the evolution and emergence of India's mutual fund sector. The mutual funds sector's expansion was driven by an increase in the number of funds, schemes, total funds mobilized in the industry, assets managed by mutual funds, and household savings mobilized by mutual funds. It was discovered that the mutual fund business has experienced considerable development in all of the reasons listed above. However, the sector has yet to realize its full potential, owing mostly to a low penetration ratio, a lack of product uniqueness, a lack of investor knowledge, and other factors. Dr. J K Raju, Mr. Manjunath B R, Ms. Nithya S(2018) conducted an empirical research to evaluate the performance of chosen large cap equity mutual funds created by various private sector fund houses. The study was carried out over a period of five years, from January 2013 to December 2017.The researchers analyzed the performance using Sharpe, Treynor and Jensen alpha performance index. They also tried to identify the correlation between the selected mutual funds. The study determined that mutual funds are a safe investing instrument since they diversify the risk for investors.

(Mayank Malviya, 2020) examined several mutual fund schemes based on their historical Net Asset Value (NAV). The research also tried to identify the risk and returns associated with the investment in mutual funds. The performance was evaluated by undertaking three types of funds namely large cap, mid cap and small cap funds. The statistical tool adopted was annualized returns, standard deviation, beta coefficient and Sharpe ratio. It was concluded that the investors

of large cap funds will be benefited only in the initial stage. Thus the investors should hold mutual funds only for 3 years or less. However, investors can hold up to 5 years in case of mid cap mutual funds because returns are maximized during the middle stage. (Rokade, 2021) evaluated the remarkable growth of mutual funds in Indian Financial Markets by measuring the performance of five large cap funds using standard deviation, beta coefficient, Sharpe ratio, treynor's ratio and Jensen's alpha ratio. It was seen that 64% of the investors prefer to invest in mutual fund schemes by evaluating their past performance using the risk adjusted ratios.
(Rui Chen, 2021) investigated the performance of AI powered Mutual funds by comparing them with those mutual funds that are managed by humans. For analysis, mutual funds data from January, 2009 to December 2019 was observed and analyzed using t-test, wilcoxon signed rank test, Jensen's alpha ratio, standard deviation and beta coefficient. It was found that the AI powered mutual funds outperformed their human managed funds because of lower transaction cost and superior stockpiling techniques.

The recent study on gold ETF by (Harmeet Kaur Makkar, 2022) analyzed the performance of gold ETF as an investment instrument in the Indian Securities Market. The analysis is done by comparing the performance of five gold ETFs using standard deviation, beta coefficient, Sharpe ratio, treynor's ratio and Jensen's ratio. The researchers concluded that the above ratios were able to provide the investors with appropriate details about performance of gold ETFs which helps them to make an informed decision about investment in ETFs.

Dr. J. Murthy, et.al.(2022) assessed the performance of chosen equities mutual funds in India. The daily closing NAVs of several schemes were gathered for research purposes between April 2019 and March 2022. NSE- Nifty was used to manage the market portfolios of several schemes. The statistical methods employed in the investigation were risk-return analysis, standard deviation, Sharpe ratio, Treynor ratio, and ANOVA. The analysis found that the majority of mutual funds had positive returns over the study period.

Mr. Chintamani Panda (2022) investigated the performance of chosen mutual funds utilizing models and metrics for evaluating the risk- return relationship. The researcher studied three public sector and six private sector mutual funds from a period of April 1996 to March 2009. The performance was evaluated using Sharpe Ratio, Treynor ratio, Jensen Alpha Ratio, Beta Coefficient and mean returns. The analysis found that Franklin Templeton and UTI were the top performing mutual funds, whereas Birla SunLife, HDFC, and LIC fared below average.

Bharathi Karanth, Prakash Pinto(2024) conducted a detailed examination of equities mutual funds over a five-year period, from 2017 to 2021. To analyze mutual fund performance against the market index Nifty 50, a variety of statistical approaches were used, including standard deviation, beta coefficient, Sharpe Ratio, Treynor Ratio, Jensen Alpha Ratio, Fama Index, and M2 measure. Several mutual funds, including Axis Blue Chip Fund Direct Plan Growth and UTI Flexi Cap, beat the market index and provided investors with a favorable risk-return profile.

Based on the review of literature, it was found out that there is no comprehensive study that has integrated various other risk adjusted metrics, which the researchers have tried to do in the current research. Researchers have tried to provide a more holistic view of the selected mutual fund performance.

Research Methodology

The current study attempts to examine the performance of chosen Mutual Funds based on market capitalization in relation to the Indian Stock Market Indices. To better understand the performance of mutual funds based on risk adjusted ratios, data of twenty mutual funds each from large cap, mid cap and small cap was taken. The market indices of each category of mutual funds were taken as a benchmark to evaluate the performance of selected mutual funds with respect to their market portfolio. S&P BSE LARGE CAP was selected as a benchmark for analyzing the performance of selected top 20 large cap mutual funds. S&P BSE MID CAP was selected as a benchmark for analyzing the performance of selected top 20 mid cap mutual funds. S&P BSE SMALL CAP was selected as a benchmark for analyzing the performance of selected top 20 small cap mutual funds. In order to assess the performance of mutual funds risk adjusted ratios like Sharpe ratio, treynor's ratio and Jensen's Alpha ratio, M2 measures, Information ratio, Sortino ratio and Appraisal ratio were calculated on the NAV of the selected mutual funds for a period from January 01, 2019 to December 31, 2023.

Research Objectives:

- To analyze mutual fund performance for using risk adjusted ratios like Sharpe Ratio, Treynor ratio, Jensen Alpha Ratio, M squared Ratio, Information Ratio, Sortino Ratio and Appraisal Ratio.
- To examine the difference in the performance across all three categories mutual fund types.

Data Collection:

The selected mutual funds' daily net asset value (NAV) was gathered throughout a five-year period from January 1, 2019, to December 31, 2023.

Performance Evaluation Metrics:

The performance of the selected mutual funds was assessed through the application of seven widely recognized performance evaluation metrics:

Sharpe Ratio:-

- This ratio measures a fund's riskadjusted return and allows for a comparative evaluation of funds based on their adjusted performance.

Sharpe ratio = $\frac{R_p - R_f}{\sigma}$

- The ratio evaluates the risk adjustment performance of a mutual fund. The higher the ratio, the better the mutual fund performs.

Treynor's Ratio:

• Like the Sharpe ratio, the Treynor ratio also measures the risk-adjusted performance of mutual funds. However, it is considered systematic risk as measured by Beta(b). Beta measures the change in returns due to changes in market returns.

Treynor ratio = $\frac{R_p - R_f}{\beta_p}$

- A higher Treynor Ratio means the mutual fund is performing much better if compared with similar mutual fund.

Jensen Ratio

- Also called alpha, this measure provides insight into a fund manager's ability to generate higher than expected r eturns based on its level of systematic risk(b)

Jensen ratio Alpha $(\alpha) = R(i) - (R(f) + B * (R(m) - R(f)))$

- The positive alpha value means that the portfolio is earning excess returns. The excess returns shows fund manager's ability to generate higher returns.

Sortino Ratio

- It is the variation of Sharpe ratio where it has considered the standard deviation of only negative returns. It gives a better insight on risk adjusted performance of mutual funds as positive volatility is a benefit.

Sortino ratio = $\frac{R_p - R_f}{\sigma_d}$

- Just like Sharpe Ratio, the higher the ratio, mutual fund is performing much better if compared with similar mutual fund.

Information Ratio

- Information ratio quantifies the mutual fund returns with that of benchmark returns with respect to volatility of those returns. The volatility is measured by tracking error. The standard deviation of the difference between portfolio returns and benchmark returns is used to define tracking error.

Information ratio = $\frac{R_p - R_m}{T.E}$, where T.E. is Tracking Error

• The greater the Information ratio, the more likely the fund manager is to outperform the benchmark.

M Squared Ratio

- It is a metric that assesses how well mutual funds perform when risk is managed in relation to benchmark return and risk-free rate of return.
- It is an extension of Sharpe ratio.

M squared Ratio $=$ Sharpe Ratio $* \sigma_m + R_f$

- Just like Sharpe Ratio, the higher the ratio, mutual fund is performing much better if compared with similar mutual fund.

Appraisal Ratio

- Appraisal Ratio measures the fund manager's quality on generating revenues from investment. However, it takes into consideration the unsystematic risk of the portfolio.

Appraisal Ratio $= \frac{\text{Jensen Alpha}}{\text{Unsystematic Risk}}$

- The positive ratio means that the portfolio is earning excess returns. The surplus returns demonstrate the fund manager's capacity to generate higher returns.

These metrics were selected due to their well-established relevance in the assessment of mutual fund performance and their ability to provide comprehensive insights into risk-adjusted returns.

Data Analysis & Interpretation:

The researchers did a rigorous examination of the selected mutual funds based on seven risk adjusted ratios namely, Sharpe ratio, Treynor ratio, Jensen Ratio, M-squared ratio, Information ratio, Sortino ratio, Appraisal ratio. This analysis will help the investors or portfolio manager to choose the mutual funds wisely, based on risk adjusted returns.

Out of the selected 20 mutual funds in each category- large cap, mid cap and small cap, following are the top five ranking based on **Sharpe ratio:**

Ranking	Large Cap	Sharpe Ratio	Mid Cap	Sharpe Ratio	Small Cap	Sharpe Ratio
1	JM Large Cap Fund	0.721	HDFC Mid-Cap Opportunities Fund	1.039	Axis Small Cap Fund Direct-Growth	1.187
2	Edelweiss Large Cap Fund	0.619	Kotak Emerging Equity Fund	0.989	Tata Small Cap Fund Direct - Growth	1.176
3	ICICI Prudential Bluechip Fund	0.609	Axis Midcap Fund	0.950	Quant Small Cap Fund Direct Plan-Growth	1.164

4	Nippon India Large Cap Fund	0.583	Nippon India Growth Fund	0.939	Kotak Small Cap Fund Direct-Growth	1.161
5	UTI Large Cap Fund	0.534	SBI Magnum Midcap Fund	0.921	Edelweiss Small Cap Fund Direct - Growth	1.160

Out of the selected 20 mutual funds in each category- large cap, mid cap and small cap, following are the bottom five ranking based on **Sharpe ratio:**

Ranking	**Large Cap**	**Sharpe Ratio**	**Mid Cap**	**Sharpe Ratio**	**Small Cap**	**Sharpe Ratio**
20	Franklin India Bluechip Fund	-0.086	Mahindra Manulife Mid Cap Fund	0.390	Aditya Birla Sun Life Small Cap Fund Direct-Growth	0.572
19	DSP Top 100 Equity Fund	-0.085	Tata Midcap Growth Fund	0.448	Mahindra Manulife Small Cap Fund Direct - Growth	0.624
18	HDFC Top 100 Fund	-0.011	Invesco India Mid Cap Fund	0.510	HDFC Small Cap Fund	0.632
17	Bandhan Large Cap Fund	0.027	Aditya Birla Sun Life Mid Cap Fund	0.588	UTI Small Cap Fund Direct - Growth	0.783
16	Baroda BNP Paribas Large Cap Fund	0.182	Edelweiss Mid Cap Fund	0.594	Sundaram Small Cap Fund Direct-Growth	0.795

Based on the Sharpe ratio, it is evident that Small Cap Funds has performed better followed by Mid Cap Funds and Large Cap Funds.

Out of the selected 20 mutual funds in each category - large cap, mid cap and small cap, following are the top five ranking based on **Treynor ratio:**

Ranking	**Large Cap**	**Treynor Ratio**	**Mid Cap**	**Treynor Ratio**	**Small Cap**	**Treynor Ratio**
1	JM Large Cap Fund	97.469	HDFC Mid-Cap Opportunities Fund	10.072	HDFC Small Cap Fund	14.545
2	Invesco India Largecap Fund	3.487	Kotak Emerging Equity Fund	8.009	Mahindra Manulife Small Cap Fund Direct - Growth	8.856
3	Edelweiss Large Cap Fund	3.358	Axis Midcap Fund	5.577	Invesco India Smallcap Fund Direct - Growth	3.718

4	Nippon India Large Cap Fund	3.272	Nippon India Growth Fund	5.057	Edelweiss Small Cap Fund Direct - Growth	3.665
5	UTI Large Cap Fund	3.088	SBI Magnum Midcap Fund	4.445	Axis Small Cap Fund Direct-Growth	2.733

Out of the selected 20 mutual funds in each category - large cap, mid cap and small cap, following are the bottom five ranking based on **Treynor ratio:**

Ranking	**Large Cap**	**Treynor Ratio**	**Mid Cap**	**Treynor Ratio**	**Small Cap**	**Treynor Ratio**
20	Franklin India Bluechip Fund	-0.442	Mahindra Manulife Mid Cap Fund	0.641	Bandhan Small Cap Fund Direct - Growth	0.261
19	DSP Top 100 Equity Fund	-0.263	Tata Midcap Growth Fund	0.947	Aditya Birla Sun Life Small Cap Fund Direct-Growth	0.579
18	HDFC Top 100 Fund	-0.092	Invesco India Mid Cap Fund	0.979	UTI Small Cap Fund Direct - Growth	0.767
17	Bandhan Large Cap Fund	0.125	Aditya Birla Sun Life Mid Cap Fund	1.948	Sundaram Small Cap Fund Direct-Growth	0.770
16	Mahindra Manulife Large Cap Fund	0.583	Edelweiss Mid Cap Fund	2.446	Franklin India Smaller Companies Direct Fund-Growth	0.872

Out of the selected 20 mutual funds in each category - large cap, mid cap and small cap, following are the top five ranking based on **Jensen Alpha ratio:**

Ranking	**Large Cap**	**Jensen Ratio**	**Mid Cap**	**Jensen Ratio**	**Small Cap**	**Jensen Ratio**
1	Nippon India Large Cap Fund	0.109	ICICI Prudential Midcap Fund	19.924	HDFC Small Cap Fund	38.818
2	Edelweiss Large Cap Fund	0.104	Quant Mid Cap Fund	0.199	Quant Small Cap Fund Direct Plan-Growth	0.231
3	ICICI Prudential	0.104	Mirae Asset Midcap Fund	0.170	Edelweiss Small Cap Fund Direct	0.195

	Bluechip Fund				- Growth	
4	UTI Large Cap Fund	0.091	Edelweiss Mid Cap Fund	0.165	Nippon India Small Cap Fund	0.193
5	SBI Bluechip Fund	0.090	Mahindra Manulife Mid Cap Fund	0.160	Tata Small Cap Fund Direct - Growth	0.178

Out of the selected 20 mutual funds in each category - large cap, mid cap and small cap, following are the bottom five ranking based on **Jensen Alpha ratio:**

Ranking	**Large Cap**	**Jensen Ratio**	**Mid Cap**	**Jensen Ratio**	**Small Cap**	**Jensen Ratio**
20	DSP Top 100 Equity Fund	-0.024	Franklin India Prima Fund	0.076	Mahindra Manulife Small Cap Fund Direct - Growth	0.036
19	Franklin India Bluechip Fund	-0.021	Motilal Oswal Midcap Fund	0.081	UTI Small Cap Fund Direct - Growth	0.070
18	HDFC Top 100 Fund	-0.005	Sundaram Mid Cap Fund	0.084	Bandhan Small Cap Fund Direct - Growth	0.079
17	Bandhan Large Cap Fund	0.002	Aditya Birla Sun Life Mid Cap Fund	0.096	Aditya Birla Sun Life Small Cap Fund Direct-Growth	0.082
16	Baroda BNP Paribas Large Cap Fund	0.033	HSBC Midcap Fund	0.105	Sundaram Small Cap Fund Direct-Growth	0.119

Based on the Jensen ratio, it is evident that Small Cap Funds has performed better followed by Mid Cap Funds and Large Cap Funds.

Out of the selected 20 mutual funds in each category - large cap, mid cap and small cap, following are the top five ranking based on **M-Square ratio**:

Ranking	**Large Cap**	**M-Squared Ratio**	**Mid Cap**	**M-Squared Ratio**	**Small Cap**	**M-Squared Ratio**
1	JM Large Cap Fund	0.056	HDFC Mid-Cap Opportunities Fund	0.057	Axis Small Cap Fund Direct-Growth	0.097

2	Edelweiss Large Cap Fund	0.038	Kotak Emerging Equity Fund	0.047	Tata Small Cap Fund Direct - Growth	0.094
3	ICICI Prudential Bluechip Fund	0.036	Axis Midcap Fund	0.040	Quant Small Cap Fund Direct Plan-Growth	0.092
4	Nippon India Large Cap Fund	0.031	Nippon India Growth Fund	0.038	Kotak Small Cap Fund Direct-Growth	0.092
5	UTI Large Cap Fund	0.021	SBI Magnum Midcap Fund	0.035	Edelweiss Small Cap Fund Direct - Growth	0.091

Out of the selected 20 mutual funds in each category - large cap, mid cap and small cap, following are the bottom five ranking based on **M-Square ratio**:

Ranking	**Large Cap**	**M-Squared Ratio**	**Mid Cap**	**M-Squared Ratio**	**Small Cap**	**M-Squared Ratio**
20	Franklin India Bluechip Fund	-0.094	Mahindra Manulife Mid Cap Fund	-0.065	Aditya Birla Sun Life Small Cap Fund Direct-Growth	-0.024
19	DSP Top 100 Equity Fund	-0.094	Tata Midcap Growth Fund	-0.054	Mahindra Manulife Small Cap Fund Direct - Growth	-0.014
18	HDFC Top 100 Fund	-0.080	Invesco India Mid Cap Fund	-0.042	HDFC Small Cap Fund	-0.012
17	Bandhan Large Cap Fund	-0.073	Aditya Birla Sun Life Mid Cap Fund	-0.028	UTI Small Cap Fund Direct - Growth	0.018
16	Baroda BNP Paribas Large Cap Fund	-0.044	Edelweiss Mid Cap Fund	-0.026	Sundaram Small Cap Fund Direct-Growth	0.020

Out of the selected 20 mutual funds in each category - large cap, mid cap and small cap, following are the top five ranking based on **Sortino ratio**:

Ranking	**Large Cap**	**Sortino Ratio**	**Mid Cap**	**Sortino Ratio**	**Small Cap**	**Sortino Ratio**
1	JM Large Cap Fund	14.274	HDFC Mid-Cap Opportunities Fund	452.099	HDFC Small Cap Fund	615.337
2	Edelweiss Large Cap Fund	11.015	Kotak Emerging Equity Fund	19.549	Quant Small Cap Fund Direct Plan-Growth	21.593

3	ICICI Prudential Bluechip Fund	10.889	Axis Midcap Fund	16.336	Kotak Small Cap Fund Direct-Growth	19.683
4	Nippon India Large Cap Fund	10.424	Nippon India Growth Fund	16.175	Tata Small Cap Fund Direct - Growth	19.568
5	UTI Large Cap Fund	9.509	SBI Magnum Midcap Fund	15.989	Axis Small Cap Fund Direct-Growth	19.297

Out of the selected 20 mutual funds in each category - large cap, mid cap and small cap, following are the bottom five ranking based on **Sortino ratio**:

Ranking	**Large Cap**	**Sortino Ratio**	**Mid Cap**	**Sortino Ratio**	**Small Cap**	**Sortino Ratio**
20	Franklin India Bluechip Fund	-1.394	Mahindra Manulife Mid Cap Fund	5.937	Mahindra Manulife Small Cap Fund Direct - Growth	5.231
19	DSP Top 100 Equity Fund	-1.326	Tata Midcap Growth Fund	8.926	Aditya Birla Sun Life Small Cap Fund Direct-Growth	9.954
18	HDFC Top 100 Fund	-0.171	Invesco India Mid Cap Fund	10.204	UTI Small Cap Fund Direct - Growth	11.355
17	Bandhan Large Cap Fund	0.440	Aditya Birla Sun Life Mid Cap Fund	10.238	Sundaram Small Cap Fund Direct-Growth	13.580
16	Baroda BNP Paribas Large Cap Fund	3.029	Edelweiss Mid Cap Fund	11.779	Motilal Oswal Nifty Small Cap 250 Index Reg	13.596

Out of the selected 20 mutual funds in each category - large cap, mid cap and small cap, following are the top five ranking based on **Information ratio**:

Ranking	**Large Cap**	**Information Ratio**	**Mid Cap**	**Information Ratio**	**Small Cap**	**Information Ratio**
1	JM Large Cap Fund	11.319	HDFC Mid-Cap Opportunities Fund	16.479	Bandhan Small Cap Fund Direct - Growth	32.686
2	Edelweiss Large Cap Fund	11.280	Kotak Emerging Equity Fund	16.031	Tata Small Cap Fund Direct - Growth	21.234

3	Nippon India Large Cap Fund	11.005	Axis Midcap Fund	15.551	ICICI Prudential Smallcap Fund Direct Plan-Growth	21.220
4	UTI Large Cap Fund	10.346	Nippon India Growth Fund	15.086	Canara Robeco Small Cap Fund Direct - Growth	20.978
5	SBI Bluechip Fund	10.190	SBI Magnum Midcap Fund	14.977	Quant Small Cap Fund Direct Plan-Growth	18.492

Out of the selected 20 mutual funds in each category - large cap, mid cap and small cap, following are the bottom five ranking based on **Information ratio**:

Ranking	**Large Cap**	**Information Ratio**	**Mid Cap**	**Information Ratio**	**Small Cap**	**Information Ratio**
20	ICICI Prudential Bluechip Fund	1.796	Mahindra Manulife Mid Cap Fund	1.155	Nippon India Small Cap Fund	4.396
19	DSP Top 100 Equity Fund	3.117	Tata Midcap Growth Fund	7.118	Mahindra Manulife Small Cap Fund Direct - Growth	8.531
18	Franklin India Bluechip Fund	3.151	Invesco India Mid Cap Fund	8.824	HDFC Small Cap Fund	10.006
17	HDFC Top 100 Fund	3.903	Aditya Birla Sun Life Mid Cap Fund	10.570	Aditya Birla Sun Life Small Cap Fund Direct-Growth	11.713
16	Bandhan Large Cap Fund	4.704	Edelweiss Mid Cap Fund	11.224	UTI Small Cap Fund Direct - Growth	12.284

Out of the selected 20 mutual funds in each category - large cap, mid cap and small cap, following are the top five ranking based on **Appraisal ratio**:

Ranking	**Large Cap**	**Appraisal Ratio**	**Mid Cap**	**Appraisal Ratio**	**Small Cap**	**Appraisal Ratio**
1	JM Large Cap Fund	11.261	HDFC Mid-Cap Opportunities Fund	16.031	HDFC Small Cap Fund	17.894

2	Edelweiss Large Cap Fund	9.478	Kotak Emerging Equity Fund	15.207	Quant Small Cap Fund Direct Plan-Growth	17.686
3	ICICI Prudential Bluechip Fund	9.292	Axis Midcap Fund	14.569	Kotak Small Cap Fund Direct-Growth	17.605
4	Nippon India Large Cap Fund	8.915	Nippon India Growth Fund	14.099	Tata Small Cap Fund Direct - Growth	17.370
5	UTI Large Cap Fund	8.136	SBI Magnum Midcap Fund	13.674	Axis Small Cap Fund Direct-Growth	16.619

Out of the selected 20 mutual funds in each category - large cap, mid cap and small cap, following are the bottom five ranking based on **Appraisal ratio**:

Ranking	**Large Cap**	**Appraisal Ratio**	**Mid Cap**	**Appraisal Ratio**	**Small Cap**	**Appraisal Ratio**
20	Franklin India Bluechip Fund	-1.748	Mahindra Manulife Mid Cap Fund	5.920	Mahindra Manulife Small Cap Fund Direct - Growth	7.049
19	DSP Top 100 Equity Fund	-1.595	Tata Midcap Growth Fund	6.962	Aditya Birla Sun Life Small Cap Fund Direct-Growth	9.714
18	HDFC Top 100 Fund	-0.327	Invesco India Mid Cap Fund	6.990	UTI Small Cap Fund Direct - Growth	9.891
17	Bandhan Large Cap Fund	0.158	Aditya Birla Sun Life Mid Cap Fund	7.497	Sundaram Small Cap Fund Direct-Growth	10.399
16	Baroda BNP Paribas Large Cap Fund	2.757	Edelweiss Mid Cap Fund	8.652	Motilal Oswal Nifty Small Cap 250 Index Reg	10.569

Based on the research, JM Large Cap Fund outperforms other selected mutual funds in the Large Cap category. HDFC Mid-Cap Opportunities Fund outperforms other selected mutual funds in the Mid Cap category. HDFC Small Cap Fund outperforms other selected mutual funds in the Small Cap category

Comparative Analysis of Mutual Fund Performance

In order to analyze the significant difference in the ratios across large cap, mid and small cap category chosen, researchers have tried to test the results using ANOVA

H_0 : There is no significant difference in the mean of all the three categories with respect to ratio.

H_1 : There is significant difference in the mean of all the three categories with respect to ratio.

Comparative Summary of Performance- Mean

Performance Ratios	**Large Cap**	**Mid Cap**	**Small Cap**	**Interpretation**
Sharpe Ratio	0.348	0.766	0.966	Small Cap funds have the highest risk-adjusted return, followed by Mid Cap and then Large Cap funds.
Treynor Ratio	6.664	3.591	2.662	Large Cap funds have the highest risk-adjusted return per unit of market risk, compared to Mid and Small Cap funds.
Jensen Ratio	0.058	3.591	2.133	Mid Cap funds exhibit the highest alpha, indicating they outperform the expected return by the largest margin, followed by Small Cap and then Large Cap funds.
M-Square Ratio	-0.013	0.006	0.052	Small Cap funds have the highest risk-adjusted performance when scaled to the market's risk, while Large Cap funds show a slightly negative performance.
Sortino Ratio	6.276	35.408	45.932	Small Cap funds have the highest risk-adjusted return when considering only downside risk, indicating they perform well with less downside volatility.
Information Ratio	7.741	12.423	16.184	Small Cap funds have the highest excess return relative to a benchmark per unit of tracking error, suggesting they are better at delivering consistent excess returns.
Appraisal Ratio	5.168	11.458	13.842	Small Cap funds are the best performers relative to their unsystematic risk, followed by Mid Cap and Large Cap funds.

Comparative Summary of ANOVA statistics

Performance Ratios	**ANOVA Statistics**		**Interpretation**
Sharpe Ratio	p value	2.40955E-12	p-value is less than 0.05 and the calculated value of F-statistics is much larger than F critical value (3.158843), so null hypothesis stands rejected
	F statistics	44.361	
	Size Effect	0.609	
Treynor Ratio	p value	0.585	p-value is more than 0.05 and the calculated value of F-statistics is much smaller than F critical value (3.158843), so null hypothesis stands accepted
	F statistics	0.541	
	Size Effect	0.019	
Jensen Ratio	p value	0.109	p-value is more than and 0.05 and calculated value of F-statistics is smaller than F critical value (3.158843), so null hypothesis stands accepted.
	F statistics	2.305	
	Size Effect	0.075	
M-Square Ratio	p value	9E-06	p-value is less than 0.05 and the calculated value of F-statistics is much larger than F critical value (3.158843),so null hypothesis stands rejected.
	F statistics	14.344	
	Size Effect	0.335	

Sortino Ratio	p value	0.406	p-value is more than 0.05 and the calculated value of F-statistics is smaller than F critical value (3.158843), so null hypothesis stands accepted.
	F statistics	0.917	
	Size Effect	0.031	
Information Ratio	p value	3.79E-07	p-value is less than 0.05 and the calculated value of F-statistics is much larger than F critical value (3.158843), so null hypothesis stands rejected
	F statistics	19.380	
	Size Effect	0.405	
Appraisal Ratio	p value	8.4E-11	p-value is less than 0.05 and the calculated value of F-statistics is much larger than F critical value (3.158843), so null hypothesis stands rejected.
	F statistics	35.824	
	Size Effect	0.557	

Size effect have been calculated by dividing the between sum of square with the total sum of square.

For **Sharpe ratio**, from the above output, it is evident that there is a significant difference among the means of three categories viz. large cap, mid cap and small cap based on Sharpe Ratio. Small cap has better performed and is more volatile in generating excess returns for each unit of risk taken. Investors / portfolio managers may consider allocating more resources to small cap as it provides better risk adjusted returns.

For **Treynor ratio**, from the above output, it is evident that there is no significant difference among the means of three categories viz. large cap, mid cap and small cap based on Treynor Ratio. This indicates that the portfolios in these categories exhibit similar levels of excess return per unit of market risk. This can help investors/ portfolio managers to make judgments based on criteria's other than systematic risk like personal risk tolerance, sector allocation or investment horizon which may be able to predict excess returns when deciding between selected categories.

For **Jensen ratio**, from the above output, it is evident that there is no significant difference among the means of three categories viz. large cap, mid cap and small cap based on Jensen Ratio. For investor or portfolio managers, this indicates, none of the three categories of mutual funds outperforms the others in a statistically significant manner in terms of generating returns over and above what is expected given their risk levels. This can help investors/ portfolio managers to make judgments based on other criteria's like personal risk tolerance or investment horizon which may be able to predict excess returns when deciding between selected categories.

For **M-Square ratio,** from the above output, it is evident there is a significant difference among the means of three categories viz. large cap, mid cap and small cap based on M-squared Ratio. Small cap has outperforms as compared to mid-cap and large cap based on M-square ratio. Investors / portfolio managers may consider allocating more resources to small cap as it provides better risk adjusted returns.

For **Sortino ratio**, from the above output, it is evident that there is no significant difference in the downside risk-adjusted returns among the means of three categories viz. large cap, mid cap and small cap based on Sortino Ratio. This actually means that the portfolios across different categories have similar performance when considering downside returns. This also suggest that investors/ portfolio managers may consider other factors like growth prospects, liquidity or market conditions for allocating funds across the selected category of mutual funds.

For **Information ratio**, from the above output, it is evident that there is a significant difference among the means of three categories viz. large cap, mid cap and small cap based on Information Ratio. Small cap has outperforms as compared to mid-cap and large cap based on Information ratio. Investors / portfolio managers may consider allocating more resources to small cap as it provides better risk adjusted returns relative to their benchmarks.

For **Appraisal ratio**, from the above output, it is evident that there is a significant difference among the means of three categories viz. large cap, mid cap and small cap based on Appraisal Ratio. This indicates that the portfolios in these categories exhibit different levels of excess return relative to unsystematic risk. Investors/ portfolio manager should consider focusing on Small Cap having higher Appraisal Ratios to achieve better performance relative to the unsystematic risk taken.

Conclusion:

This research concentrated on a diversified range of mutual funds, stratified by market capitalization, enabling a rigorous examination of their performance. Employing risk adjusted such as Sharpe ratio, Treynor ratio, and Jensen's alpha ratio, M-squared ratio, Information Ratio, Sortino Ratio and Appraisal Ratio, we gleaned profound insights into the risk-adjusted returns and efficacy of these funds. Based on the research, JM Large Cap Fund outperforms other selected mutual funds in the Large Cap category. HDFC Mid-Cap Opportunities Fund outperforms other selected mutual funds in the Mid Cap category. HDFC Small Cap Fund outperforms other selected mutual funds in the Small Cap category. And Franklin India Bluechip Fund was the worst performer in the Large Cap category. Mahindra Manulife Mid Cap Fund was the worst performer in the Mid Cap category. Mahindra Manulife Small Cap Fund Direct - Growth was the worst performer in the Small Cap category.

In order to evaluate the mean performance of mutual funds across categories, researchers have applied ANOVA technique on the risk adjusted ratios. Based on the analysis, Small cap funds outperformed the other categories for Sharpe, M-squared, Information and Appraisal ratios. This implies that investors or portfolio managers can allocate more of their funds to small cap mutual funds to earn better risk adjusted returns. However, in Treynor, Jensen Alpha and Sortino ratios, there is no significant difference, implying similar level of systematic and downside risk-adjusted returns across the categories. This implies that investors or portfolio manager remains indifferent while allocating funds among the categories of mutual funds.

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