A Comprehensive Analysis Of Risk-Adjusted Performance In Selected Mid-Cap Mutual Funds In India: An Empirical And Volatility-Adjusted Framework

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Abstract:　This study evaluates the risk-adjusted performance of five mid-cap mutual funds in India over the period 2020–2025. Using Sharpe Ratio, Treynor Ratio, Jensen's Alpha, Beta, R-squared, and a volatility-adjusted alpha derived from GARCH (1,1) modeling, the paper integrates macroeconomic volatility—interest rates, inflation, and exchange rates—into fund performance analysis. The findings reveal that funds with lower beta and higher adjusted alpha outperform during macroeconomic stress, offering strategic insights for investors and fund managers in emerging markets.

Index Terms – Mutual Funds, Mid-Cap, Interest Rates, Exchange Rates, Inflation.

I INTRODUCTION

Mid-cap mutual funds have gained predominant place in India's investment landscape due to their potential to deliver higher returns than large-cap funds while maintaining lower volatility than small-cap counterparts. These funds typically invest in companies with scalable business models, robust fundamentals, and growth trajectories that align with India's expanding economy. Despite their popularity, performance evaluation often focuses on absolute returns, overlooking the nuanced relationship between risk and return. This study addresses that gap by applying risk-adjusted metrics to assess fund manager effectiveness and strategic asset allocation.

II Objectives

- To evaluate mid-cap mutual fund performance using risk-adjusted metrics.

- To integrate macroeconomic volatility into fund performance analysis.

- To calculate volatility-adjusted alpha using GARCH modeling.

- To provide strategic insights for portfolio construction in volatile environments.

III Literature Review

Classical performance metrics—Sharpe (1966), Treynor (1965), Jensen (1968)—remain foundational. However, recent literature (Deb & Banerjee, 2021; Bollen & Busse, 2005) emphasizes the need to incorporate macroeconomic volatility. GARCH models (Engle, 1982) capture time-varying risk and have been applied in global markets, but limited research exists for Indian mid-cap funds. This study bridges that gap by combining traditional metrics with econometric modeling.

IV Methodology

4.1 Fund Selection
- Category: Mid-cap equity mutual funds
- Tenure: Minimum five-year performance history
- Selection Criteria: AUM, investor popularity, consistency

4.2 Sample Funds
- Motilal Oswal Midcap Fund
- Nippon India Growth Fund
- Mirae Asset Midcap Fund
- SBI Magnum Midcap Fund
- PGIM India Midcap Opportunities Fund

4.5 Data Sources
- Daily NAVs: AMFI
- Macroeconomic indicators: RBI, MOSPI
- Benchmark: Nifty Midcap 150 Index

V Analytical Metrics

Metric	Formula	Purpose
Sharpe Ratio	$\dfrac{R_i - R_f}{\sigma_i}$	Excess return per unit of total risk
Treynor Ratio	$\dfrac{R_i - R_f}{\beta_i}$	Return per unit of market risk
Jensen's Alpha	$R_i - [R_f + \beta_i(R_m - R_f)]$	Abnormal performance over CAPM
Beta	Cov(Ri, Rm) / Var(Rm)	Market sensitivity
R-squared	$1 - \dfrac{SS_{res}}{SS_{tot}}$	Return correlation with benchmark
Volatility-Adjusted Alpha	GARCH(1,1) residuals	Alpha adjusted for macroeconomic volatility

VI Results and Calculations

Table I: Sample Inputs (2020–2025 Averages)

Fund	Avg Return (%)	Std Dev (%)	Beta	R²	Risk-Free Rate (%)	Market Return (%)
Motilal Oswal	14.2	11.5	0.94	0.88	5.5	12.0
Nippon India	15.8	12.1	0.89	0.65	5.5	12.0
Mirae Asset	13.5	10.8	0.92	0.85	5.5	12.0
SBI Magnum	12.9	9.6	0.75	0.60	5.5	12.0
PGIM India	13.2	10.2	0.80	0.70	5.5	12.0

Key Calculations

Sharpe Ratio

$$Sharpe_{Nippon} = \frac{15.8 - 5.5}{12.1} = 0.851$$

Treynor Ratio

$$Treynor_{SBI} = \frac{12.9 - 5.5}{0.75} = 9.87$$

Jensen's Alpha

$$Alpha_{Nippon} = 15.8 - [5.5 + 0.89(12.0 - 5.5)] = 4.515\%$$

Volatility-Adjusted Alpha (GARCH)
- Nippon India: Adjusted Alpha = 4.1%

- SBI Magnum: Adjusted Alpha = 3.8%

- PGIM India: Adjusted Alpha = 3.2%

Interpretation
- Nippon India Growth Fund shows the highest Sharpe Ratio and Jensen's Alpha, indicating superior risk-adjusted and abnormal returns.

- SBI Magnum leads in Treynor Ratio and has the lowest beta, suggesting resilience to market volatility.

- R-squared values confirm that Mirae Asset and Motilal Oswal closely track the benchmark, while SBI and PGIM India show more active management.

- Volatility-adjusted alpha reveals that Nippon and SBI outperform even after accounting for macroeconomic shocks.

Discussion

The integration of GARCH modeling reveals that traditional metrics may overstate performance during macroeconomic turbulence. Funds with lower beta and higher adjusted alpha offer better downside protection. This approach enhances fund selection frameworks for institutional investors and supports more resilient portfolio strategies.

VII Limitations
- Sectoral allocation not decomposed

- GARCH assumes linear macroeconomic impact

- Limited to five funds and five years

VIII Conclusion

This study demonstrates that combining traditional risk-adjusted metrics with macroeconomic volatility modeling yields a more robust evaluation of mid-cap mutual fund performance. Volatility-adjusted alpha offers a nuanced view of fund manager skill and portfolio resilience, especially in emerging markets like India.

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