



# Performance evaluation of Mutual funds by using DEA Technique

<sup>1</sup>B. Kalyan Kumar, <sup>2</sup>Dr. M.Sravani

<sup>1</sup>Scholar Krishna University

<sup>2</sup>Assistant Professor Krishna University

**Abstract** – Mutual funds remain a preferred investment avenue for both retail and institutional participants, offering an effective balance between risk and potential return. Evaluating their performance is vital, as it equips investors with the insight required for sound decision-making. This research applies Data Envelopment Analysis (DEA) as an innovative non-parametric technique to measure the efficiency of selected mutual funds. By adopting this framework, the study provides a comprehensive view of how effectively these funds manage the trade-off between risk and reward, thereby offering valuable guidance to prospective investors.

**Keywords** - Mutual Funds, Investment Performance, Risk and Return, Efficiency Analysis, Data Envelopment Analysis (DEA)

## I. INTRODUCTION

A mutual fund represents a structured investment mechanism where resources are gathered from multiple investors and managed collectively by professional fund managers. The capital raised is allocated across different financial instruments such as equities, bonds, and money market securities in line with predetermined objectives. Investors, in turn, become proportionate stakeholders, benefitting from profits and bearing losses in accordance with their shareholding. Earnings may arise through periodic income (dividends or interest) and capital appreciation, and the net proceeds are distributed among unit holders. One of the key strengths of mutual funds lies in their ability to diversify holdings across industries and asset classes, thereby reducing exposure to unsystematic risk. In the Indian context, these funds operate under the regulatory framework of the Securities and Exchange Board of India (SEBI), ensuring compliance and investor protection.

The purchase of mutual fund units effectively gives investors an indirect ownership of the fund's portfolio. The value of these units, commonly known as Net Asset Value (NAV), fluctuates with market movements and the performance of underlying assets. Within the equity mutual fund category, risk levels are relatively higher owing to their dependence on stock market behaviour. Such funds are often segmented by investment focus and market capitalization.

Equity mutual funds are subject to two primary types of risk. Systematic risk stems from overall market conditions that influence all securities, while unsystematic risk is linked to firm- or industry-specific factors and can be mitigated through diversification. Returns generated by such funds are broadly categorized into two forms: current returns, arising from dividends or interest, and capital gains, resulting from asset price movements. A thorough understanding of this interplay between risk and return is crucial for investors aiming to make well-informed financial choices. Mutual funds, by design, attempt to

balance these elements to deliver sustainable and diversified investment outcomes.

## II. REVIEW OF LITERATURE

Pourzamani (2016) assessed thirty-five mutual funds in the Iranian capital market using the Omega ratio alongside real returns. The study highlighted a notable alignment between rankings obtained through both measures, underlining the reliability of return-based evaluations. Tsolas (2015) employed Data Envelopment Analysis (DEA) to evaluate the efficiency of Greek equity mutual funds over multiple annual intervals and an aggregated four-year horizon. The research revealed inefficiencies, particularly in asset utilization and load management, suggesting opportunities for improved fund performance.

Kariuki (2014) investigated how macroeconomic indicators affect the Net Asset Value (NAV) of Kenyan mutual funds. Factors such as money supply, GDP, interest rates, and inflation exhibited a positive influence, while exchange rate volatility was found to negatively impact fund performance. Ahmadi Tulamy (2013) identified meaningful relationships between fund returns, exchange rates, and inflation, emphasizing how macroeconomic dynamics shape fund outcomes. The research also observed a positive association between the size and age of funds and their overall assets.

Goh, Jiang, Tu, and Wang (2013) examined the connection between U.S. economic conditions and the Chinese stock market. Their findings indicated that American macroeconomic variables often served as leading indicators for movements in the Chinese market, particularly after the nation's entry into the WTO in 2001. Huji and Post (2011) analysed U.S.-based funds investing in emerging markets between 1993 and 2006. Their results demonstrated persistence in performance, with clear differences between consistently high- and low-performing funds.



Cheung and Ng (2011) focused on the interdependence of stock market indices and macroeconomic conditions in multiple countries. Their research confirmed a tangible connection between broad economic factors and market performance.

Singh et al. (2011) studied the influence of economic variables on stock returns across firms of varying market capitalization. They concluded that the degree of correlation differs by company size, with indicators such as unemployment, GDP, and inflation playing key roles. Jagannathan et al. (2010) explored persistence in hedge fund performance between 1996 and 2005. Their findings revealed strong persistence among top-performing funds but limited evidence of sustained outcomes among weaker funds.

Karim Zadeh and Sultani (2010) established a long-run association between stock indices of the financial intermediation sector and macroeconomic variables. Money circulation, in particular, exhibited a favourable influence on stock prices. Jiranyakul (2009) analysed Thailand's stock market, noting that GDP, money supply, and exchange rates exerted positive effects, whereas price-level fluctuations had little impact. Motwani (2008) examined the trajectory of the Indian mutual fund sector, discussing its evolution in line with investor saving patterns, evolving strategies, and future opportunities. Lehmann and Timmerman (2007) argued that relying exclusively on Sharpe ratios may be inadequate for portfolio assessment. They recommended considering additional measures such as portfolio alphas, covariances, and the efficient frontier to obtain a fuller picture of performance.

Chander, Subash, and Singh (2003) investigated the determinants influencing investors' choices of mutual fund schemes, giving weight to historical performance and growth potential. Chander (2002) analysed fund management practices in India, identifying differences in portfolio outcomes depending on strategy and execution. Yoon, Choi, and Murthi (2001) developed an alternative framework for assessing mutual funds through a return-cost efficiency index. Their findings suggested that after adjusting for scale economies, most mutual fund categories recorded comparable efficiency scores.

### Research Gap

Much of the existing research on mutual funds has primarily concentrated on assessing the effect of macroeconomic conditions and investor behaviour on fund performance. While these studies provide useful insights, relatively few have explored the application of non-parametric techniques such as Data Envelopment Analysis (DEA) to evaluate the efficiency of mutual funds. Moreover, limited attention has been directed toward the

Flexi Cap category, despite its growing significance in the Indian financial market. Given that this study spans the period from 2013 to 2023, it aims to fill this gap by measuring the input-oriented efficiency of selected Flexi Cap funds, thereby contributing to both academic literature and investor decision-making.

### Objectives of the Study

- To analyse the comparative performance of Flexi Cap funds across various fund houses.
- To conduct peer-to-peer comparisons in order to evaluate the relative positioning of funds.
- To measure the efficiency of equity mutual funds using the DEA framework.
- To generate analytical insights that can assist investors in making well-informed investment decisions.
- Hypothesis
- H1<sub>0</sub>: There is no significant difference between the returns of selected mutual funds and their benchmark index.
- H1<sub>a</sub>: There is a significant difference between the returns of selected mutual funds and their benchmark index.
- H2<sub>0</sub>: The returns of mutual funds are independent of benchmark index returns.
- H2<sub>a</sub>: The returns of mutual funds are dependent on benchmark index returns.
- METHODOLOGY
- This research adopts a quantitative approach, utilizing Data Envelopment Analysis (DEA), a linear programming-based, non-parametric technique, to evaluate fund performance. Specifically, an input-oriented DEA model is employed, focusing on minimizing input usage while achieving a given level of output.
- Inputs selected:
- Expense Ratio – represents the cost of fund management and operations as a percentage of assets under management.
- Beta Value – measures the volatility of the fund relative to the overall market.
- Outputs selected:
- Mean Returns – the arithmetic average of fund returns over the study period.
- Sharpe Ratio – a widely used indicator of risk-adjusted performance.

The dataset covers a ten-year period (2015–2025) for twenty Flexi Cap funds, subject to data availability. Analysis was carried out using DEAP software, which calculates efficiency scores for each fund. The goal is to identify high-performing funds and highlight areas where others exhibit inefficiency.



Description of variables selected for the study.

	VARIABLES	DESCRIPTION #
INPUTS		
	Expense ratio	Measure of the cost of managing and operating an investment fund, expressed as a percentage of the fund's average net assets.
	Beta Value	Metric in finance that measures the volatility of a security or investment portfolio in relation to the overall market.
OUTPUTS		
	Mean	Represents the average of a set of numerical values, calculated by summing all values and dividing by the total number of data points.
	Sharpe Ratio	Measure of risk-adjusted return, calculated by dividing the excess return of an investment over the risk-free rate by its standard deviation.

#### Data Envelopment Analysis (DEA)

Data Envelopment Analysis (DEA) utilizes linear programming as a mathematical model to derive an empirical external production frontier, representing the optimal production envelope in economic terms. This method, employing multiple inputs and outputs, yields a single efficiency indicator. In 1957, Farrell initially attempted to measure the efficiency of a production unit in a single-input and single-output scenario, focusing on technical efficiency, price, and deviation from the efficiency production function. Although successful in a single-input, single-output context, Farrell's model did not extend to cases with multiple inputs and outputs. Charnes, Cooper, and Rhodes later extended Farrell's work in 1978, successfully applying it to scenarios involving multiple inputs and outputs.

In this context, Decision Making Units (DMUs), with Microfinance Institutions (MFIs) serving as DMUs in this study, are evaluated for efficiency using DEA—a mathematical technique assessing operating efficiency relative to other units in the same industry. DEA generates a relative efficiency score, ranging from 0 to 100%, with 1 assigned to the best-performing DMUs. Inefficiency is indicated by scores below 1, prompting inefficient DMUs to improve by adopting best practices.

DEA's advantages include its comparison to the best-performing DMUs rather than the average, and it doesn't require assumptions about error terms or cost minimization. However, DEA has limitations, such as sensitivity to outliers and its tendency to overstate inefficiency when a single DMU outperforms others significantly.

Building upon Farrell's work, Charnes, Cooper, and Rhodes proposed an input-oriented measure of technical efficiency under the Constant Returns to Scale (CRS) assumption. Banker et al. extended the model for the Variable Returns to Scale (VRS) assumption. DEA, a non-parametric approach, utilizes linear programming to construct a piece wise linear envelopment frontier over data points, ensuring observed points lie on or below the production frontier. The output- oriented VRS DEA frontier is defined by linear programming solutions, and the technical efficiency measure under CRS assumption is obtained through solving linear programming problems. Input and output- oriented models estimate the same frontier surface under CRS assumption, identifying the same efficient institutions. Efficiency measures may differ between input and output orientations, but under CRS, the choice of orientation doesn't affect the estimated frontier and efficiency measure



Flexi Cap Direct Plan Descriptive Statistics										
	N	Mean	Std. Deviation	Range	Minimum	Maximum	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Kotak	10	19.8437	27.56234	97.12	-25.82	71.3	0.408	0.687	0.528	1.334
HDFC	10	19.6153	29.74755	110.94	-33.34	77.6	0.17	0.687	1.311	1.334
Parag Parikh	9	20.8137	28.27699	97.83	-15.08	82.75	1.317	0.717	2.447	1.4
UTI	10	17.5054	28.27088	96.44	-17.35	79.09	1.072	0.687	1.582	1.334
SBI	10	19.2336	27.71001	94.84	-23.2	71.63	0.622	0.687	0.395	1.334
Aditya	10	19.9947	29.26309	96.3	-24.41	71.89	0.36	0.687	-0.364	1.334
Axis	5	14.3931	24.6144	60.17	-8.59	51.58	0.827	0.913	0.205	2
Franklin India	10	19.8335	32.25999	117.53	-30.68	86.85	0.808	0.687	1.416	1.334
Canara Robeco	10	17.0684	24.382	81.22	-15.73	65.49	0.558	0.687	0.571	1.334
Motilal Oswal	8	11.5312	27.01637	85.26	-24.3	60.96	0.859	0.752	0.455	1.481
DSP	10	18.1686	27.02797	87.57	-16.34	71.22	0.834	0.687	0.34	1.334
Bandhan	10	17.1083	26.68845	82.03	-22.89	59.14	0.375	0.687	-0.492	1.334
PGIM India	8	18.1203	38.82241	128.19	-22.94	105.25	1.857	0.752	4.303	1.481
Union	10	15.3044	26.99841	94.35	-19.96	74.39	0.971	0.687	1.744	1.334
Edelweiss	8	15.5027	31.19143	105.77	-25.84	79.93	1.155	0.752	2.501	1.481
Quant	10	25.8236	40.4873	145.47	-28.3	117.16	1.203	0.687	2.188	1.334
LIC MF	10	11.9323	20.26356	63.76	-15.38	48.38	0.393	0.687	-0.273	1.334
IDBI	9	19.0899	30.37116	88.43	-19.73	68.7	0.708	0.717	-0.567	1.4
JM	10	19.8137	26.12512	80.79	-15.85	64.94	0.416	0.687	-0.691	1.334
Taurus	10	12.6452	25.74916	85.69	-29.07	56.63	0.123	0.687	-0.306	1.334
NIFTY 500 TRI	10	13.6364	15.83396	46.01	-9.86	36.15	0.085	0.687	-1.014	1.334
Valid N (list wise)	5									

Interpretation: Kotak, HDFC, and Aditya have positive skewness, indicating more occurrences of positive returns, although not extremely skewed. PGIM India has the highest

kurtosis of 4.303, indicating a more peaked distribution with potentially more extreme returns.

Regression analysis

S.No	Funds	R-Square	Sd.Coe	df	F	Sig	Alpha (α)	Beta (β)	T	Sig
1	Kotak	0.84	0.92	9	43.19	0.00	-1.96	1.60	6.57	0.70
2	HDFC	0.76	0.87	9	25.12	0.00	-2.70	1.64	5.01	0.69
3	Parag Parikh	0.69	0.83	8	15.85	0.01	2.19	1.41	3.98	0.77
4	UTI	0.82	0.91	9	37.43	0.00	-4.59	1.62	6.12	0.42
5	SBI	0.80	0.90	9	32.23	0.00	0.76	1.09	5.68	0.89



6	Aditya Birla Sun Life	0.89	0.95	9	67.77	0.00	-3.84	1.75	8.23	0.40
7	Axis	0.95	0.97	4	51.82	0.01	-1.42	1.49	7.20	0.73

8	Franklin India	0.71	0.85	8	14.85	0.01	3.19	1.51	3.89	0.92
9	Canara Robeco	0.95	0.98	9	160.50	0.00	2.74	0.84	12.67	0.23
10	Motilal Oswal	0.82	0.91	7	27.66	0.00	-5.01	1.59	5.26	0.39
11	DSP	0.92	0.97	9	99.79	0.00	-3.26	0.98	8.94	0.34
12	Bandhan	0.83	0.91	9	38.23	0.00	2.48	0.86	6.18	0.59
13	PGIM India	0.74	0.87		23.89	0.00	-4.02	1.22	8.58	0.14
14	Union	0.98	0.99	9	400.66	0.00	-0.90	0.96	20.02	0.57
15	Edelweiss	0.84	0.92	7	31.80	0.00	-3.82	1.86	5.64	0.54
16	Quant	0.73	0.86	9	21.89	0.00	-4.02	2.19	4.68	0.68
17	LIC MF	0.90	0.95	9	73.61	0.00	-4.64	1.22	8.58	0.14
18	IDBI	0.86	0.93	8	43.20	0.00	-3.19	1.68	6.57	0.56
19	JM	0.88	0.94	9	57.05	0.00	5.07	0.87	7.55	0.20
20	Taurus	0.93	0.96	9	98.79	0.00	-2.26	0.88	9.94	0.44

**Interpretation and Analysis**

- Kotak:
- R-Square: 0.84 indicates that 84% of the variability in Kotak's returns can be explained by the Nifty Index.
- Beta ( $\beta$ ): 1.60, showing a strong positive relationship with the Nifty Index.
- Alpha ( $\alpha$ ): -1.96, suggesting a slight underperformance relative to the benchmark.
- Significance: The p-value < 0.05 means the relationship is statistically significant.

**HDFC:**

- R-Square: 0.76 means 76% of the variability in returns is explained by the Nifty Index.
- Beta ( $\beta$ ): 1.64, indicating a positive relationship.
- Alpha ( $\alpha$ ): -2.70, suggesting some underperformance.
- Significance: The p-value < 0.05 signifies statistical significance.

**Parag Parikh:**

- R-Square: 0.69 shows 69% of variability is explained.

- Beta ( $\beta$ ): 1.41, indicating a positive relationship.
- Alpha ( $\alpha$ ): 2.19, suggesting outperformance.
- Significance: The p-value < 0.05 signifies statistical significance.

**UTI:**

- R-Square: 0.82 indicates 82% variability explained.
- Beta ( $\beta$ ): 1.62, indicating a strong positive relationship.
- Alpha ( $\alpha$ ): -4.59, suggesting underperformance.
- Significance: The p-value < 0.05 means the relationship is statistically significant.

**SBI:**

- R-Square: 0.80 indicates 80% variability explained.
- Beta ( $\beta$ ): 1.09, showing a positive but weaker relationship.
- Alpha ( $\alpha$ ): 0.76, indicating slight outperformance.
- Significance: The p-value < 0.05 signifies statistical significance.

**Aditya Birla Sun Life:**

- R-Square: 0.89 indicates 89% variability explained.





- Beta ( $\beta$ ): 1.75, indicating a strong positive relationship.
- Alpha ( $\alpha$ ): -3.84, suggesting underperformance.
- Significance: The p-value < 0.05 signifies statistical significance.

**Axis:**

- R-Square: 0.95 shows 95% of the variability explained.
- Beta ( $\beta$ ): 1.49, indicating a strong positive relationship.
- Alpha ( $\alpha$ ): -1.42, suggesting slight underperformance.
- Significance: The p-value < 0.05 signifies statistical significance.

**Franklin India:**

- R-Square: 0.71 indicates 71% variability explained.
- Beta ( $\beta$ ): 1.51, indicating a positive relationship.
- Alpha ( $\alpha$ ): 3.19, suggesting outperformance.
- Significance: The p-value < 0.05 signifies statistical significance.
- Canara Robeco:
  - R-Square: 0.95 indicates 95% variability explained.
  - Beta ( $\beta$ ): 0.84, indicating a weaker positive relationship.
  - Alpha ( $\alpha$ ): 2.74, suggesting outperformance.
  - Significance: The p-value < 0.05 signifies statistical significance.
- Motilal Oswal:
  - R-Square: 0.82 shows 82% variability explained.
  - Beta ( $\beta$ ): 1.59, indicating a strong positive relationship.
  - Alpha ( $\alpha$ ): -5.01, suggesting significant underperformance.
  - Significance: The p-value < 0.05 signifies statistical significance.
- DSP:
  - R-Square: 0.92 indicates 92% variability explained.
  - Beta ( $\beta$ ): 0.98, showing a moderate positive relationship.
  - Alpha ( $\alpha$ ): -3.26, suggesting underperformance.
  - Significance: The p-value < 0.05 signifies statistical significance.
- Bandhan:
  - R-Square: 0.83 shows 83% variability explained.
  - Beta ( $\beta$ ): 0.86, indicating a moderate positive relationship.
  - Alpha ( $\alpha$ ): 2.48, suggesting outperformance.
  - Significance: The p-value < 0.05 signifies statistical significance.
- PGIM India:
  - R-Square: 0.74 indicates 74% variability explained.
  - Beta ( $\beta$ ): 1.22, showing a positive relationship.
  - Alpha ( $\alpha$ ): -4.02, suggesting underperformance.
  - Significance: The p-value < 0.05 signifies statistical significance.
- Union:
  - R-Square: 0.98 shows 98% variability explained.
  - Beta ( $\beta$ ): 0.96, indicating a strong positive relationship.
  - Alpha ( $\alpha$ ): -0.90, suggesting slight underperformance.
  - Significance: The p-value < 0.05 signifies statistical significance.

- Edelweiss:
  - R-Square: 0.84 indicates 84% variability explained.
  - Beta ( $\beta$ ): 1.86, showing a strong positive relationship.
  - Alpha ( $\alpha$ ): -3.82, suggesting underperformance.
  - Significance: The p-value < 0.05 signifies statistical significance.
- Quant:
  - R-Square: 0.73 shows 73% variability explained.
  - Beta ( $\beta$ ): 2.19, indicating a strong positive relationship.
  - Alpha ( $\alpha$ ): -4.02, suggesting underperformance.
  - Significance: The p-value < 0.05 signifies statistical significance.
- LIC MF:
  - R-Square: 0.90 indicates 90% variability explained.
  - Beta ( $\beta$ ): 1.22, showing a positive relationship.
  - Alpha ( $\alpha$ ): -4.64, suggesting underperformance.
  - Significance: The p-value < 0.05 signifies statistical significance.
- IDBI:
  - R-Square: 0.86 shows 86% variability explained.
  - Beta ( $\beta$ ): 1.68, indicating a strong positive relationship.
  - Alpha ( $\alpha$ ): -3.19, suggesting underperformance.
  - Significance: The p-value < 0.05 signifies statistical significance.
- JM:
  - R-Square: 0.88 indicates 88% variability explained.
  - Beta ( $\beta$ ): 0.87, showing a moderate positive relationship.
  - Alpha ( $\alpha$ ): 5.07, suggesting significant outperformance.
  - Significance: The p-value < 0.05 signifies statistical significance.
- Taurus:
  - R-Square: 0.93 shows 93% variability explained.
  - Beta ( $\beta$ ): 0.88, indicating a moderate positive relationship.
  - Alpha ( $\alpha$ ): -2.26, suggesting slight underperformance.
  - Significance: The p-value < 0.05 signifies statistical significance.

**Summary of Regression analysis**

Regression results were used to examine the relationship between selected funds and the Nifty 500 TRI benchmark. Kotak Flexi Cap Fund: An  $R^2$  of 0.84 indicates that 84% of its return variability is explained by the index. With a beta of 1.60, it shows high market sensitivity, while the negative alpha (-1.96) signals slight underperformance. HDFC Flexi Cap Fund:  $R^2$  of 0.76 and beta of 1.64 suggest a strong benchmark relationship. The alpha of -2.70 implies consistent underperformance. Parag Parikh Flexi Cap Fund:  $R^2$  of 0.69 with a beta of demonstrates a positive correlation with the index. The positive alpha (2.19) indicates notable outperformance. UTI Flexi Cap Fund: An  $R^2$  of 0.82 and beta of 1.62 show high market linkage, though the negative alpha (-4.59) suggests lagging results. SBI Flexi Cap Fund: With an  $R^2$  of 0.80, beta of 1.09, and alpha of 0.76, the fund shows moderate volatility and slight outperformance.



Aditya Birla Sun Life Flexi Cap Fund: The highest  $R^2$  among peers (0.89) reflects strong market alignment. Its beta of 1.75 denotes high volatility, though the alpha of -3.84 indicates underperformance.

- Axis Flexi Cap Fund:  $R^2$  of 0.95 and beta of 1.49 show high dependence on the index, with alpha (- 1.42) pointing to marginal underperformance.
- Franklin India Flexi Cap Fund: A relatively modest  $R^2$  of 0.71, with a beta of 1.51 and a positive alpha (3.19), shows it exceeded benchmark returns.
- Canara Robeco Flexi Cap Fund: Exhibits the highest explanatory power ( $R^2 = 0.95$ ) with a low beta (0.84), indicating limited volatility but consistent outperformance (alpha = 2.74).
- Motilal Oswal Flexi Cap Fund: An  $R^2$  of 0.82 and beta of 1.59 reflect high volatility, while alpha (- 5.01) reveals significant underperformance.
- DSP Flexi Cap Fund: Strong  $R^2$  of 0.92, with beta (0.98) near unity, indicates moderate sensitivity. However, negative alpha (-3.26) highlights underperformance.
- Bandhan Flexi Cap Fund: An  $R^2$  of 0.83, beta of 0.86, and alpha of 2.48 demonstrate both moderate volatility and outperformance.
- PGIM India Flexi Cap Fund: With  $R^2$  of 0.74 and beta of 1.22, the fund is positively linked to the index, but its alpha (-4.02) reflects underperformance.
- Union Flexi Cap Fund: An exceptionally high  $R^2$  of 0.98 and beta of 0.96 indicate strong benchmark tracking, though alpha (-0.90) shows marginal underperformance.
- Edelweiss Flexi Cap Fund:  $R^2$  of 0.84 with a high beta (1.86) indicates volatility, with alpha (-3.82) suggesting weaker performance.
- Quant Flexi Cap Fund:  $R^2$  of 0.73 with a beta of 2.19 denotes high sensitivity. However, alpha (- 4.02) signals underperformance.
- LIC MF Flexi Cap Fund: With  $R^2$  of 0.90, beta of 1.22, and negative alpha (-4.64), it tracks the market well but underdelivers in returns.
- IDBI Flexi Cap Fund:  $R^2$  of 0.86 and beta of 1.68 show strong market sensitivity, but negative alpha (-3.19) indicates underperformance.
- JM Flexi Cap Fund:  $R^2$  of 0.88, beta of 0.87, and positive alpha (5.07) suggest moderate volatility with strong outperformance.
- Taurus Flexi Cap Fund:  $R^2$  of 0.93, beta of 0.88, and alpha (-2.26) indicate solid index tracking but slight underperformance.

### Inferences from the Regression Analysis Results

#### High Explanatory Power (R-Square)

o Most funds have a high R-Square value, indicating that the majority of the variability in the funds' returns can be explained by the Nifty Index. This suggests a strong correlation between the funds' performance and the benchmark index.

Funds like Union, Canara Robeco, and Axis have exceptionally high R-Square values ( $>0.95$ ), indicating they closely follow the index.

#### Beta ( $\beta$ ) Analysis

The Beta values are mostly above 1, indicating that the funds are generally more volatile than the Nifty Index. For instance, Quant and Aditya Birla Sun Life have high Beta values of 2.19 and 1.75 respectively, suggesting higher sensitivity to market movements.

A few funds, such as Canara Robeco and DSP, have Beta values close to or below 1, indicating less volatility compared to the index.

#### Alpha ( $\alpha$ ) Analysis

Negative Alpha values are common, indicating that many funds underperform relative to the benchmark index after adjusting for market risk. For example, Motilal Oswal and UTI have significant negative Alpha values (-5.01 and -4.59 respectively), suggesting consistent underperformance.

Positive Alpha values, seen in funds like JM (5.07) and Franklin India (3.19), indicate that these funds have outperformed the benchmark after adjusting for risk.

#### Statistical Significance

All funds have a p-value  $< 0.05$ , indicating that the regression results are statistically significant. This means the relationships observed between the fund returns and the Nifty Index are unlikely to be due to random chance.

#### Outliers and Special Cases

The Union fund stands out with an exceptionally high R-Square (0.98) and significant Beta (0.96) and T-values (20.02), suggesting a very strong and statistically significant relationship with the benchmark, but with a slightly negative Alpha (-0.90).

JM Fund has a unique profile with a high positive Alpha (5.07) and moderate Beta (0.87), indicating significant outperformance and moderate volatility.

Funds like Quant and LIC MF, despite having high Beta values, show negative Alpha, indicating that their higher risk does not translate into higher returns relative to the benchmark.

#### General Observations

Funds with higher Betas tend to have more pronounced underperformance (negative Alpha), suggesting they might be taking on additional risk without sufficient returns.

The variability in Alpha values suggests that fund managers' ability to generate excess returns varies significantly across different funds.

Funds with Beta values closer to 1, such as DSP and Canara Robeco, might be more suitable for investors seeking returns that closely mirror the index but with some potential for excess returns (positive Alpha).



### Overall Insights from Regression:

Most funds show high  $R^2$  values, meaning their performance is closely tied to the Nifty Index.

Beta values above 1 (e.g., Quant, Aditya Birla, and HDFC) reveal higher volatility.

Positive alpha values in Franklin India, JM, and Bandhan indicate superior fund management, while large negative alphas (Motilal Oswal, UTI, LIC MF) reflect underperformance.

### Results of DEA analysis

#### Slacks calculated using multi-stage method

#### Efficiency Summary:

Name of the Fund	CRSTE	VRSTE	Scale	Returns to scale
1.Kotak Flexi cap Fund Direct Plan	0.885	0.984	0.900	IRS
2. HDFC Flexi cap Fund Direct Plan	0.619	0.884	0.700	IRS
3.Prag Parikh Flexi cap Fund Direct Plan	0.847	1.000	0.847	IRS
4.UTI Flexi cap Fund Direct Plan	0.604	0.783	0.772	IRS
5.SBI Flexi cap Fund Direct Plan	0.891	1.000	0.891	IRS
6.Aditya Birla Sun Life Flexi cap Fund Direct Plan	0.682	0.923	0.739	IRS
7.Axis Flexi cap Fund Direct Plan	0.593	0.666	0.891	IRS
8.Franklin India Flexi cap Fund Direct Plan	0.569	0.833	0.683	IRS
9.Canara Robeco Flexi cap Fund Direct Plan	1.000	1.000	1.000 -	CRS
10.Motilal Oswal Flexicap Fund Direct Plan	0.378	0.502	0.752	IRS
11.DSP Flexi cap Fund Direct Plan	0.712	0.859	0.829	IRS
12.Bandhan Flexi cap Fund Direct Plan	0.912	0.913	0.999	IRS
13.PGIM Flexi cap Fund Direct Plan	0.947	1.000	0.947	IRS
14.Union Flexi cap Fund Direct Plan	0.739	0.777	0.951	IRS
15.Edelweiss Flexi cap Fund Direct Plan	0.662	0.673	0.983	IRS
16. Quant Flexi cap Fund Direct Plan	1.000	1.000	1.000 -	IRS
17.LIC MF Flexi cap Fund Direct Plan	0.447	0.557	0.802	IRS
18.IDBI Flexi cap Fund Direct Plan	0.557	0.827	0.673	IRS
19. JM Flexi cap Fund Direct Plan	1.000	1.000	1.000 -	





20.Taurus Flexi cap Fund Direct Plan	0.631	0.637	0.991	IRS
Mean	0.734	0.841	0.867	IRS

Note: CRSTE=technical efficiency from CRS DEA Note also that all subsequent tables refer to VRS result  
VRSTE=technical efficiency from VRS DEA Scale =scale  
efficiency =CRSTE/VRSTE

#### Summary of Peers

Name of the Fund	Peers	Peer weights					
1.Kotak Flexi cap Fund Direct Plan	16	3	9		0.308	0.604	0.088
2. HDFC Flexi cap Fund Direct Plan	16	3	19		0.349	0.296	0.355
3.Prag Parikh Flexi cap Fund Direct Plan	3				1.000		
4.UTI Flexi cap Fund Direct Plan	16	19	3		0.352	0.218	0.430
5.SBI Flexi cap Fund Direct Plan	5				1.000		
6.Aditya Birla Sun Life Flexi cap Fund Direct Plan	16	19	3		0.203	0.166	0.631
7.Axis Flexi cap Fund Direct Plan	3	16	5	9	0.338	0.293	0.245
8.Franklin India Flexi cap Fund Direct Plan	19	16			0.336	0.664	
9.Canara Robeco Flexi cap Fund Direct Plan	9				1.000		
10.Motilal Oswal Flexi cap Fund Direct Plan	5	16	19		0.155	0.520	0.325
11.DSP Flexi cap Fund Direct Plan	16	19	3		0.072	0.026	0.902
12.Bandhan Flexi cap Fund Direct Plan	5	19	9		0.007	0.605	0.387
13.PGIM Flexi cap Fund Direct Plan	13				1.000		
14.Union Flexi cap Fund Direct Plan	5	19	9		0.419	0.509	0.072
15.Edelweiss Flexi cap Fund Direct Plan	9	16	13		0.246	0.670	0.084
16. Quant Flexi cap Fund Direct Plan	16				1.000		
17.LIC MF Flexi cap Fund Direct Plan	19	16			0.735	0.265	
18.IDBI Flexi cap Fund Direct Plan	19	16			0.455	0.545	
19. JM Flexi cap Fund Direct Plan	19				1.000		
20.Taurus Flexi cap	19	16			0.992	0.008	



Fund Direct Plan							
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### Interpretation

The peers and their weights for various Flexi cap mutual funds indicates the influence of different peer funds on each fund's performance. Some funds, like Prag Parikh Flexi cap Fund and SBI Flexi cap Fund rely entirely on a single peer, while others, such as UTI Flexi cap Fund and Axis Flexi cap Fund, diversify their peer influence among multiple funds. This distribution of peer weights reflects

how fund managers consider various factors and performances from their peers to shape their investment strategies. The high weights given to specific peers suggest significant reliance or benchmarking against those particular funds.

### Result as per CRS and VRS model:

#### As per Constant Returns to Scale

S.No	Name of the Fund	te	Rank
1	Canara Robeco Flexi Cap Fund Direct Plan	1.000	1
2	JM Flexi Cap Fund Direct Plan	1.000	1
3	Quant Flexi Cap Fund Direct Plan	1.000	1
4	PGIM India Flexi Cap Fund Direct Plan	0.947	2
5	Bandhan Flexi Cap Fund Direct Plan	0.912	3
6	SBI Flexi Cap Fund Direct Plan	0.891	4
7	Kotak Flexi Cap Fund Direct Plan	0.885	5
8	Parag Parikh Flexi Cap Fund Direct Plan	0.847	6
9	Union Flexi Cap Fund Direct Plan	0.739	7
10	DSP Flexi Cap Fund Direct Plan	0.712	8
11	Aditya Birla Sun Life Flexi Cap Fund Direct Plan	0.682	9
12	Edelweiss Flexi Cap Fund Direct Plan	0.662	10
13	Taurus Flexi Cap Fund Direct Plan	0.631	11
14	HDFC Flexi Cap Fund Direct Plan	0.619	12
15	UTI Flexi Cap Fund Direct Plan	0.604	13
16	Axis Flexi Cap Fund Direct Plan	0.593	14
17	Franklin India Flexi Cap Fund Direct Plan	0.569	15
18	IDBI Flexi Cap Fund Direct Plan	0.557	16
19	LIC MF Flexi Cap Fund Direct Plan	0.447	17



20	Motilal Oswal Flexi Cap Fund Direct Plan	0.378	18
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**Interpretation:**

According to the table, the top rank is secured by three flexi cap funds: Canara Robeco, JM, and Quant Flexi Cap Funds, as they have demonstrated good performance.

Conversely, the Motilal Oswal flexi cap fund ranks last due to its lower performance based on the CRS model in DEA technique.

**As per Variable Returns to Scale**

S.No	Name of the Fund	te	Rank
1	Parag Parikh Flexi Cap Fund Direct Plan	1.000	1
2	SBI Flexi Cap Fund Direct Plan	1.000	1
3	Canara Robeco Flexi Cap Fund Direct Plan	1.000	1
4	PGIM India Flexi Cap Fund Direct Plan	1.000	1
5	Quant Flexi Cap Fund Direct Plan	1.000	1
6	JM Flexi Cap Fund Direct Plan	1.000	1
7	Kotak Flexi Cap Fund Direct Plan	0.984	2
8	Aditya Birla Sun Life Flexi Cap Fund Direct Plan	0.923	3
9	Bandhan Flexi Cap Fund Direct Plan	0.913	4
10	HDFC Flexi Cap Fund Direct Plan	0.884	5
11	DSP Flexi Cap Fund Direct Plan	0.859	6
12	Franklin India Flexi Cap Fund Direct Plan	0.833	7
13	IDBI Flexi Cap Fund Direct Plan	0.827	8
14	UTI Flexi Cap Fund Direct Plan	0.783	9
15	Union Flexi Cap Fund Direct Plan	0.777	10
16	Edelweiss Flexi Cap Fund Direct Plan	0.673	11
17	Axis Flexi Cap Fund Direct Plan	0.666	12
18	Taurus Flexi Cap Fund Direct Plan	0.637	13
19	LIC MF Flexi Cap Fund Direct Plan	0.557	14



20	MotilalFlexi Cap Fund Direct Plan	0.502	15
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**Interpretation:**

According to the VRS model in DEA technique, the top rank is achieved by six flexi cap funds: Parag Parikh, SBI, Canara Robeco, PGIM, Quant, and JM, as they have

demonstrated strong performance. On the other hand, Motilal Oswal receives the last rank as it performs poorly compared to other companies' flexi cap funds.

**Final Result:**

S.No	Name of the Fund	Averages	Rank
1	Canara Robeco Flexi Cap Fund Direct Plan	1	1
2	JM Flexi Cap Fund Direct Plan	1	1
3	Quant Flexi Cap Fund Direct Plan	1	1
4	PGIM India Flexi Cap Fund Direct Plan	1.5	2
5	SBI Flexi Cap Fund Direct Plan	2.5	3
6	Bandhan Flexi Cap Fund Direct Plan	3.5	4
7	Kotak Flexi Cap Fund Direct Plan	3.5	4
8	Parag Parikh Flexi Cap Fund Direct Plan	3.5	4
9	Aditya Birla Sun Life Flexi Cap Fund Direct Plan	6	5
10	DSP Flexi Cap Fund Direct Plan	7	6
11	Union Flexi Cap Fund Direct Plan	8.5	7
12	HDFC Flexi Cap Fund Direct Plan	8.5	7
13	Edelweiss Flexi Cap Fund Direct Plan	10.5	8
14	Franklin India Flexi Cap Fund Direct Plan	11	9
15	UTI Flexi Cap Fund Direct Plan	11	9
16	IDBI Flexi Cap Fund Direct Plan	12	10
17	Taurus Flexi Cap Fund Direct Plan	12	10
18	Axis Flexi Cap Fund Direct Plan	13	11
19	LIC MF Flexi Cap Fund Direct Plan	15.5	12
20	Motilal Oswal Flexi Cap Fund Direct Plan	16.5	13

**Interpretation:**

Overall, based on both the CRS and VRS ranking averages, Canara Robeco, JM, and Quant flexi cap funds exhibit strong performance, securing the first rank, while

Motilal Oswal receives the last rank due to its under performance.



### DEA Analysis

The DEA results provide efficiency scores under Constant Returns to Scale (CRS) and Variable Returns to Scale (VRS) frameworks:

- Under CRS, Canara Robeco, JM, and Quant achieved a perfect efficiency score of 1.00, ranking at the top. Conversely, Motilal Oswal recorded the lowest efficiency score (0.378), placing it last.
- Under VRS, multiple funds — Parag Parikh, SBI, Canara Robeco, PGIM, Quant, and JM — attained full efficiency (1.00), while Motilal Oswal again occupied the lowest rank (0.502).
- The average efficiency across funds stood at 0.734 (CRS) and 0.841 (VRS), with scale efficiency averaging 0.867, indicating that many funds operate under increasing returns to scale.

### Peer Comparisons:

Some funds, like Parag Parikh and SBI, showed reliance on single peers for efficiency benchmarking. Others, such as UTI and Axis, drew on a more diversified peer set. This reflects different approaches to fund strategy and adaptation.

### Final Rankings:

By averaging CRS and VRS results, Canara Robeco, JM, and Quant consistently emerged as the most efficient funds, while Motilal Oswal ranked the weakest.

### Findings

- Among Kotak, HDFC, Parag Parikh, UTI, and SBI Flexi Cap Funds, the Parag Parikh fund demonstrated superior returns, while UTI delivered comparatively weaker performance.
- Within the group of ABSL, Axis, Motilal Oswal, Canara Robeco, and Franklin India, ABSL achieved higher returns, whereas Axis trailed behind.
- In the set comprising DSP, Bandhan, PGIM, Union, and Edelweiss, DSP performed strongest, while Union registered lower returns.
- For Quant, LIC MF, IDBI, JM, and Taurus funds, Quant delivered the highest returns, and Taurus produced the least favourable outcomes.
- Taurus carried the highest expense ratio across the sample, while PGIM maintained the lowest, highlighting differences in cost efficiency.
- DEA analysis indicated that Canara Robeco, JM, and Quant consistently operated at peak efficiency, whereas Motilal Oswal persistently underperformed.
- Canara Robeco's sustained performance and stability contrast with Motilal Oswal's inefficiency,
- which can be linked to its emphasis on large-cap allocations and recent managerial transitions.

### Suggestions

- Portfolio Diversification: Investors may strengthen their portfolios by incorporating consistently strong

performers such as Parag Parikh, ABSL, DSP, and Quant.

- Expense Optimization: Since higher expense ratios erode returns, funds like PGIM with relatively low costs can be considered attractive options.
- Holistic Assessment: Evaluations should move beyond returns alone and consider fund strategy, management style, and risk levels. For instance, Motilal Oswal's underperformance highlights the need to examine structural and managerial factors.
- Risk Management: Investors with low risk tolerance may prefer funds such as Canara Robeco, which combines stability with steady returns.
- Long-Term Consistency: Funds with stable performance over extended periods, such as Canara Robeco, should be prioritized over those with only short-term gains.
- Fund Strategy Analysis: Examining the underlying approach of funds e.g., Taurus's higher costs can
- provide clarity on the trade-off between risk and reward.
- Managerial Oversight: Monitoring leadership changes and fund management practices is crucial, as these directly influence fund outcomes and investor confidence.

## III. CONCLUSION

The comparative evaluation of Flexi Cap mutual funds reveals significant disparities in both performance and efficiency. Parag Parikh demonstrated leadership among its peer group, while UTI underperformed. Similarly, ABSL and DSP emerged as stronger options compared to Axis and Union, respectively. Quant consistently produced superior returns, while Taurus trailed with weaker outcomes and higher costs. DEA results further confirmed that Canara Robeco, JM, and Quant were consistently efficient, achieving top ranks across both CRS and VRS models. Conversely, Motilal Oswal was identified as the least efficient, largely due to its high exposure to large-cap holdings and recent managerial instability.

For investors, the implications are twofold: (1) funds such as Parag Parikh, ABSL, DSP, Quant, and Canara Robeco may serve as strong candidates for inclusion in diversified portfolios, and (2) underperforming funds such as Motilal Oswal and Taurus should be approached with caution. Ultimately, the findings reinforce the need for a balanced evaluation framework that considers returns, costs, strategies, and management quality in order to make well-informed investment decisions.

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