

Assessment of Efficiency of Mutual Funds

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Abstract

The present study employs Data Envelopment Analysis (DEA) to benchmark selected 32 top mutual fund schemes on their efficiency. DEA is a nonparametric method which measures the relationship of inputs utilized and output produced with an efficiency score. The study has been conducted by employing six inputs and two outputs. Inputs include minimum investment, expense ratio, exit-load, age of the mutual fund, asset size and beta. Outputs include Sharpe's value and Treynor's index value. The efficiencies with respect to Variable Returns to Scale, Constant Returns to Scale, and Scale Efficiency were calculated. The efficiency score from DEA analysis compares mutual fund schemes to the schemes which are performing best. The study helps to identify efficient schemes so that investor can choose efficient fund to get good returns. Further, this paper generates efficient peers with corresponding weights and target values for all the selected mutual funds for their improvement.

Keywords: Efficiency, Data Envelopment Analysis, Mutual Funds.

I. INTRODUCTION

The Mutual fund industry in India is one of the fast growing sectors in the financial markets. Mutual funds are preferred by the investors because of safety, low transaction costs, diversification of risk and the professional expertise in investments. It offers a wide variety of combination of product options and plans, options for investing and tax efficiency. In the recent years, investments such as Gold and real estate have become unattractive and has failed to yield fair returns in the last 2–3 years in long-term. The awareness programme on mutual funds as an investment option has increased drastically leading to increased investments. Small investors are also choosing to invest in SIPs to build long-term portfolio to reduce risk, related to volatility in the equity markets. The cost of investing in mutual funds is reducing due to expanded markets with improved and sophisticated technology, playing a prominent role. This provides wide scope, lot of opportunities for the industry to leverage¹.

Mutual Funds performance depends upon number of inputs and many outputs simultaneously and because of this Operations research is an effective decision making discipline for handling these kinds of activities. It will facilitate multipurpose task dealings with optimality objectives.

Data Envelopment Analysis (DEA)

The most significant, appropriate and efficient tool applied in linear programming problems was Data envelopment analysis (DEA). DEA is a non parametric tool used to assess the performance in terms of cost efficiency, productive efficiency, scale efficiency etc., by considering a set of decision making units (DMU's) which contains numerous inputs and outputs [2]. DEA method will be assuming a set of decision making units with their related amount of multiple inputs and outputs. DEA analysis will give results in the form of an efficiency score. The efficiency score is the ratio of weighted outputs to the weighted inputs. Efficiency score lies between 0 to 1, as output can never be more than the input [3].

DEA tool identifies all the efficient DMU's which lie on the efficiency frontier. A DMU can be called as efficient, as it lies on the efficient frontier which means it produces maximum output with the given level of inputs. In order to estimate the efficiency frontier it is assumed in the process that production yields constant returns to scale such that if there is any increase in the level of inputs the level of output also increases which was given by Charnes, Cooper and Rhodes (CCR) [4]. Banker, Charnes and Cooper (BCC) proposed another model in which, the model assumes that production yields variable returns to scale (VRS) such that if there is any increase in the input the output may increase or decrease such that a decision making unit results in either increasing returns to scale (IRS) or decreasing returns to scale (DRS)[5]. It is said to be increasing returns to scale when small increase in inputs brings a large change that is increase in the output. Similarly decreasing returns to scale is visible when the input is increased and the effect on output is very

small. Technical efficiency will be of two types namely CRS technical efficiency which will be measured by taking the base of CCR model and VRS technical efficiency by relying on the basis of BCC model[6,7]. Scale efficiency can also be evaluated as it is the ratio of CRS efficiency score and VRS efficiency score given by Coelli et al (2005)[8].

An input-oriented DEA model is used for analysis as the study focuses on decreasing the level of usage of inputs so as to maintain the output level constant.. DMUs considered in the study are 32 top performing Mutual fund schemes from the top Asset Management Companies whose assets under management constitutes more than seventy percent as on November 2019. The study considered six inputs and two outputs which were mostly used in the research process from the literature review.

INPUT ORIENTED MODEL

The input-oriented model adopted for the study is as follows,

$$\text{Efficiency} = \text{Max} \sum a_r y_{rj} / \sum b_i x_{ij} \quad \text{Eff} = \text{Max} \sum a_r y_{rj} / \sum b_i x_{ij}$$

subject to

$$\sum a_r y_{rj} - \sum b_i x_{ij} + a_0 \leq 0; \forall j \quad \sum a_r y_{rj} - \sum b_i x_{ij} + a_0 \leq 0; \forall j$$

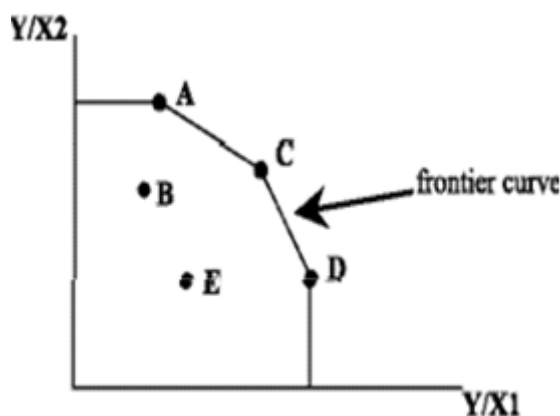
$$\sum b_i x_{ij} = 1;$$

$$a_r, b_i \geq 0; \forall r, \forall i \quad a_r, b_i \geq 0; \forall r, \forall i$$

In the above equation y_{rj} is the amount of output that should be produced by Mutual fund j ; let x_{ij} be the amount of input 'i' used by Mutual fund 'j'; let a_r be the amount of the weight given to the output 'r'; b_i be the amount of weight given to the input 'i'; and 'n' be the total number of sample mutual funds, and j_0 is the name of the selected mutual funds in the study. MF; \forall for all.

The efficiency score lies between 0 and 1. The DMU whose score is exactly one means it is 100 % efficient and lies on the efficient frontier and be called as efficient fund otherwise called as inefficient fund if the score is less than 1 or 100%.

Consider there are five DMU's (A,B,C,D,E), each of them used two inputs X1, & X2 to produce Y of outputs. The data of inputs and outputs related to these units determined the levels of their efficiencies as shown in the figure below. The DMUs A, C, & D forms together frontier curve are efficient, while B & E are inefficient because they do not lie on the efficient curve.



DEA also provides the information of inefficient DMU's and directions to improve their efficiency, by submitting peer DMU's for each inefficient DMU's (Khalid & Hussein Buttall, 2006)

III. SIGNIFICANCE OF THE STUDY

Data envelopment analysis helps the fund managers to determine the efficiency score of the funds they manage, who is playing a prominent role in selection of a portfolio. DEA analysis gives the information to fund managers regarding the changes to be made in the inputs in order to bring the scheme near to efficiency score i.e., unity. Further, with a basic knowledge of DEA tool and its efficiency score, an individual investor can opt or choose the efficient scheme for the investment.

LITERATURE REVIEW

DEA as an efficiency measure

Data Envelopment Analysis (DEA) was employed for the first time in the year 1997 to measure the performance of mutual funds. The conventional strategies for fund performance assessment consider risk – return factors in relation to a bench market index or market returns. They do not consider the efficiency of management as much they consider profitability. The conventional techniques don't consider the operation expenses of the store, which is an essential factor in performance assessment.

Murthi et al. (1997) was the first person who has applied DEA methodology and found an index to measure the efficiency score called as DEPI index. This measure considered only the risk measure and transaction costs and concluded that mutual funds are mean-variance efficient. Galgadera and Silvapulle (2002) conducted efficiency analysis for 257 Australian mutual fund and also applied logistic regression analysis and gave result that positive net flows will have negative effect on efficiency. Rao et al. (2004), the study measured the efficiency of 21 equity funds using Sharpe, Treynor, Jensen, Semi-Standard Deviation and Negative Potential Measure and concluded that no scheme was constantly among the top 5 in the study period. Margaritis, Otten and Tourani Rad (2007) analysed New Zealand MF's by considering inputs as the expense ratio, load and volatility and 5-year return as output and resulted that size of the fund will have positive effect on the efficiency score. Nikhat Afsham (2013) measured the efficiency of dividend and growth funds from 2009 to 2012 and the inputs considered are Value at risk and Conditional value at risk standard deviation, residual return, annual return and costs as outputs. The results being the efficiency score being constant for some of the funds and efficiency score gradually increased year by year for remaining funds. Balachandran and Laxman (2014) examined 8 mutual funds using linear programming model and correlation coefficient analysis. They found that there was no strong positive correlation between Sharpe measure, Fama measure, Treynor's and Jensen measure and found that there was no strong positive or negative correlation between DEA and all other Uni-variate financial tools. Mahendra Raj and Md Hamid Uddin (2016) studied the comparative efficiency of the five star and three star mutual funds rated by Morning star rating agency. A total of 420 funds were selected and analysed using DEA assuming constant returns to scale. They used the exponential distribution model of Banker's test for finding differences in the efficiency for the said growth funds. The funds which are rated as five star are more efficient than the 3 star rated funds. Siva Rama Prasad and Kanaka Durga (2017) studied the efficiency of selected Equity Mid-Cap Mutual Fund Schemes. Inputs considered in the study are Minimum investment, Expense ratio, beta and total assets; outputs are Sharpe, turnover of the fund and Jensen's Alpha values. The results revealed that except two funds the remaining are efficient for constant returns to scale and variable returns to scale.

OBJECTIVES:

The study aims

- 1.To identify the efficiency scores of mutual fund schemes as per variable returns scale (VRS), Constant return Scale (CRS), Scale Efficiency (SE) among 32 schemes.
- 2.To identify the most efficient and inefficient mutual fund schemes
- 3.To identify the peers and their weights of inefficient schemes, so as to improve the efficiency score.

METHODOLOGY ADAPTED FOR THE STUDY

This research paper is categorized as diagnostic and exploratory in nature and makes use of secondary data. The data of risk adjusted Net asset values of selected schemes has been collected through different websites like Yahoo Finance and Money control.com. The data regarding the inputs like load, expense ratio, fund size, minimum investment of fund, and age of the fund were collected from the websites valueresearchonline.com and beta the systematic risk is calculated from the monthly closing net asset values. Outputs considered in the study are calculated values of Sharpe, Treynor which shows the performance of the selected schemes. After arranging all these input and output values in text format i.e., formatted data was run on DEAP software by writing the program code. The performance evaluation of the selected mutual fund schemes has been done on two models, the first is with Charne's Cooper Rhodes (CCR) model, where the technical efficiency is calculated with variable returns to scale (VRS); the second is with Banker Charne's Cooper (BCC) model where the efficiency is calculated with constant returns to scale (CRS). We have applied Data Envelopment Analysis technique for calculating the efficiency of thirty two mutual fund schemes by considering six input variables namely (1) minimum investment (2) Expense ratio (3) Load (4) Asset size (5) Age of the fund from

its inception (6) Beta value, the market risk. The study considered two output variables namely (1) Sharpe Value and (2) Treynor's value which considers both types of risk the standard deviation and the beta. The conceptual background of Linear programming problem has been used to formulate the programming problems with the objective of input minimization and output maximization. The input slackness, output slackness, peers of each DMU or scheme, peer weights, peer count, etc. results are extracted from the data set.

METHODOLOGY FOR DATA PROCESSING AND REPORT MAKING:

The data processing has been conducted with the following steps.

1. Raw data of inputs was collected from the mentioned source in text format and Beta the systematic risk was calculated for the selected schemes of the study. The output values are calculated values.
2. Some of the calculated sharpe values which are used as one of the output variable resulted in negative values. By employing the translation invariance property (Charnes et al., 1983; Lovell and Pastor, 1995; Seiford and Zhu, 2002). of the DEA technology they have been converted into positive values.
3. Final data set was obtained with 6 input variables and 2 output variables for 32 schemes depicted in Table 1.
4. Converted the data in to text format to suit the data set for processing with the software by name DEAP 2.1; and prepared the input file, Instruction file, Output files by developing the DOS command in DEAP
5. Obtained the outputs on the items of Technical efficiency, Input & output variable targets, Achieved Input & Output variables, Input & Output slacks, Identification of peers, Peer counts, Peer weights, etc with DEAP.

DATA ANALYSIS AND INTERPRETATION:

1. Technical Analysis According to VRS

Table 1: Efficiency Score As Per Variable Returns to scale

Company	Scheme	2017-18	2018-19	Average	Freq.of Full TE-1
HDFC	Balanced Advantage Mutual Fund	0.962	0.974	0.968	0
	Equity	0.985	0.978	0.9815	0
	Hybrid Equity Fund	1.000	0.956	0.978	1
	Liquid Fund -DP Growth	0.888	0.992	0.94	0
ICICI Prudential	Equity & Debt(G)	0.980	0.974	0.977	0
	Liquid Fund (Direct (G)	1.000	1.000	1	2
	Balanced Advantage(G)	1.000	1.000	1	2
	Blue chip Fund (G)	0.977	0.982	0.9795	0
SBI	Liquid Direct And Growth	0.996	1.000	0.998	1
	Equity Hybrid (G) Fund	0.991	0.948	0.9695	0
	ETF Sensex	1.000	0.977	0.9885	1
	Blue chip Fund Growth	1.000	0.977	0.9885	1
Franklin India	Credit Risk fund (G)	1.000	1.000	1	2
	Ultra SBF Direct Growth	1.000	1.000	1	2
	Short term Income Plan Retail Growth	1.000	1.000	1	2
	Equity Fund growth	1.000	1.000	1	2
Kotak	Short Term Plan -D(G)	1.000	1.000	1	2
	Liquid Direct Plan Fund	1.000	1.000	1	2
	Standard Multi(D)	1.000	0.996	0.998	1
Aditya Birla Sun life	Liquid Fund (D)(G)	1.000	0.997	0.9985	1
	Frontline Equity(G)	1.000	0.990	0.995	1
	Corporate Bond (D)(G) Fund	1.000	0.984	0.992	1
	Equity Hybrid 95 Fund(G)	1.000	0.994	0.997	1
Nippon India	CPSE	1.000	1.000	1	2
	Liquid Mutual fund DP Growth	1.000	1.000	1	2

	Large Capital Fund Growth	1.000	0.985	0.9925	1
	Multi Cap Fund Growth	0.995	0.992	0.9935	0
UTI	Equity Mutual Fund Growth	1.000	1.000	1	2
	Hybrid Equity Fund Growth	1.000	1.000	1	2
	Liquid Cash Plan Growth	1.000	0.997	0.9985	1
	Money Market DP Growth	1.000	1.000	1	2
	ULIP Direct Fund	1.000	1.000	1	2
Average		0.992938	0.990406	0.991672	

***DP Direct plan**

INTERPRETATION

From the table it is found that the average technical efficiency of selected mutual fund schemes for the years 2017-2019 was 99.1% under VRS approach. Selected mutual fund schemes can maximize their output by only 0.9% at the given level of inputs. Among the 32 mutual fund schemes selected for the study almost all the schemes has got the efficiency score more than 97 % except SBI Equity Hybrid Fund growth has recorded average technical efficiency score of 96.9%. The fund can maximize their output by 3.1%.

2. Technical Efficiency According to CRS

Table 2: Technical Efficiency according to CRS

Company	Scheme	2017-18	2018-19	Average	Freq.of Full TE-1
HDFC	Balanced Advantage Mutual Fund	0.865	0.852	0.8585	0
	Equity	0.957	0.907	0.932	0
	Hybrid Equity Fund	1.000	0.947	0.9735	1
	Liquid Fund -DP Growth	0.448	0.445	0.4465	0
ICICI Prudential	Equity & Debt(G)	0.956	0.916	0.936	0
	Liquid Fund (Direct (G)	0.136	0.135	0.1355	0
	Balanced Advantage(G)	1.000	1.000	1	2
	Blue chip Fund (G)	0.922	0.912	0.917	0
SBI	Liquid Direct And Growth	0.449	0.446	0.4475	0
	Equity Hybrid (G) Fund	0.957	0.877	0.917	0
	ETF Sensex	0.375	0.438	0.4065	0
	Blue chip Fund Growth	1.000	0.919	0.9595	1
Franklin India	Credit Risk fund (G)	1.000	1.000	1	2
	Ultra SBF Direct Growth	0.883	1.000	0.9415	1
	Short term Income Plan Retail Growth	0.938	0.963	0.9505	0
	Equity Fund growth	1.000	1.000	1	2
Kotak	Short Term Plan -D(G)	0.460	0.464	0.462	0
	Liquid Direct Plan Fund	0.136	0.156	0.146	0
	Standard Multi(D)	1.000	0.995	0.9975	1
Aditya Birla sunlife	Liquid Fund (D)(G)	1.000	0.129	0.5645	1
	Frontline Equity(G)	0.966	0.953	0.9595	0
	Corporate Bond (D)(G) Fund	0.159	0.164	0.1615	0
	Equity Hybrid 95 Fund(G)	0.987	0.970	0.9785	0
Nippon India	CPSE	0.640	0.672	0.656	0
	Liquid Mutual fund DP Growth	1.000	1.000	1	2
	Large Capital Fund Growth	1.000	0.906	0.953	1
	Multi Cap Fund Growth	0.972	0.961	0.9665	0
UTI	Equity Mutual Fund Growth	1.000	1.000	1	2
	Hybrid Equity Fund Growth	1.000	1.000	1	2

	Liquid Cash Plan Growth	0.080	0.061	0.0705	0
	Money Market DP Growth	0.892	0.899	0.8955	0
	ULIP Direct Fund	1.000	1.000	1	2
Average		0.786813	0.752719	0.769766	

Interpretation

From the above table that the average technical efficiency of the mutual funds considered for the study period 2017-2019 resulted to be 76.9% as per CRS approach, which indicates further the mutual fund schemes can be able to maximize the output by 23.1% at the given level of inputs. From the selected 32 mutual fund schemes in the study, ICICI Prudential Balanced Advantage fund, Franklin India Credit Risk fund, Franklin India Equity fund (G), Nippon India Liquid Direct plan (G), UTI Equity Fund (G), UTI Hybrid Equity Fund (G), UTI ULIP Direct Fund have proved a scale efficiency of 100%, 3 schemes efficiency scores was more than 97%. This indicates that further these schemes can increase the output by 3%. According to Constant Returns to Scale most of the schemes have not performed well.

3. SCALE EFFICIENCY

Table 3 : Scale Efficiency

Company	Scheme	2017-18	2018-19	Average	Freq.of Full TE-1
HDFC	Balanced Advantage Mutual Fund	0.900	0.876	0.888	0
	Equity	0.972	0.927	0.9495	0
	Hybrid Equity Fund	1.000	0.990	0.995	1
	Liquid Fund -DP Growth	0.504	0.449	0.4765	0
ICICI Prudential	Equity & Debt(G)	0.976	0.941	0.9585	0
	Liquid Fund (Direct (G)	0.136	0.335	0.2355	0
	Balanced Advantage(G)	1.000	1.000	1	2
	Blue chip Fund (G)	0.944	0.929	0.9365	0
SBI	Liquid Direct And Growth	0.451	0.446	0.4485	0
	Equity Hybrid (G) Fund	0.966	0.925	0.9455	0
	ETF Sensex	0.375	0.448	0.4115	0
	Blue chip Fund Growth	1.000	0.941	0.9705	1
Franklin India	Credit Risk fund (G)	1.000	1.000	1	2
	Ultra SBF Direct Growth	0.883	1.000	0.9415	1
	Short term Income Plan Retail Growth	0.938	0.963	0.9505	0
	Equity Fund growth	1.0000	1.000	1	2
Kotak	Short Term Plan -D(G)	0.460	0.464	0.462	0
	Liquid Direct Plan Fund	0.136	0.156	0.146	0
	Standard Multi(D)	1.000	0.998	0.999	1
Aditya Birla sunlife	Liquid Fund (D)(G)	1.000	0.129	0.5645	1
	Frontline Equity(G)	0.966	0.962	0.964	0
	Corporate Bond (D)(G) Fund	0.159	0.167	0.163	0
	Equity Hybrid 95 Fund(G)	0.987	0.976	0.9815	0
Nippon India	CPSE	0.640	0.672	0.656	0
	Liquid Mutual fund DP Growth	1.000	1.000	1	2
	Large Capital Fund Growth	1.000	0.920	0.96	1
	Multi Cap Fund Growth	0.977	0.968	0.9725	0
UTI	Equity Mutual Fund Growth	1.000	1.000	1	2
	Hybrid Equity Fund Growth	1.000	1.000	1	2
	Liquid Cash Plan Growth	0.080	0.061	0.0705	0
	Money Market DP Growth	0.892	0.899	0.8955	0
	ULIP Direct Fund	1.000	1.000	1	2
Average		0.791938	0.766938	0.779438	

Interpretation

From the above table efficiency of Mutual Funds for the years 2017-2019 was 77.9%. Further the mutual fund schemes can improve the efficiency by 12.1%. Among the 32 Mutual Fund schemes, ICICI Prudential Balanced Advantage(G), Franklin India Credit Risk fund, Franklin India Equity Fund, Nippon India Liquid Fund Direct Plan Growth, UTI Equity Fund Growth, UTI ULIP Direct Fund have proved a scale efficiency of 100%, 8 mutual fund schemes have attained scale efficiency of more than 95%. The average scale efficiency of selected mutual funds for the year 2017-18 resulted in 79.1% and 76.9% in the year 2018-19.

4. RANKING OF TECHNICAL EFFICIENCY UNDER DIFFERENT APPROACHES

Table 4 Ranking of efficiency under Different Approaches

Ranking of Selected Mutual Funds under different approaches(2017-19)							
S.No	Name of the bank	VRSTE-AVG	Rank	CRSTE-AVG	Rank	SE-AVG	Rank
1	HDFC Bal Advantage fund.	0.968	14	0.8585	14	0.888	16
2	HDFC Equity Mutual Fund	0.9815	9	0.932	11	0.9495	11
3	HDFC Hybrid Equity Fund	0.978	11	0.9735	4	0.995	3
4	HDFC Liquid Direct- Growth	0.94	15	0.4465	19	0.4765	19
5	ICICI Prudential Equity & Debt(G)	0.977	12	0.936	10	0.9585	9
6	ICICI Prudential Liquid Fund D (G)	1	1	0.1355	23	0.2355	23
7	ICICI Pru Balanced Advantage	1	1	1	1	1	1
8	ICICI Pru Blue chip Fund	0.9795	10	0.917	12	0.9365	14
9	SBI Liquid Direct And Growth	0.998	2	0.4475	18	0.4485	21
10	SBI Equity Hybrid (G) Fund	0.9695	13	0.917	12	0.9455	12
11	SBI ETF Sensex	0.9885	8	0.4065	20	0.4115	22
12	SBI Blue chip Fund Growth	0.9885	8	0.9595	6	0.9705	6
13	Franklin India Credit Risk fund (G)	1	1	1	1	1	1
14	Franklin Ultra SBF Direct Growth	1	1	0.9415	9	0.9415	13
15	Franklin India ST-Retail Growth	1	1	0.9505	8	0.9505	10
16	Franklin India Equity Fund growth	1	1	1	1	1	1
17	Kotak Bond Short Term Plan -D(G)	1	1	0.462	17	0.462	20
18	Kotak Liquid Direct Plan Fund	1	1	0.146	22	0.146	25
19	Kotak Standard Multi(D)	0.998	2	0.9975	2	0.999	2
20	ABSL Liquid Fund (D)(G)	0.9985	8	0.5645	16	0.5645	18
21	ABSL Frontline /Equity(G)	0.995	4	0.9595	6	0.964	7
22	ABSL Corporate Bond (D)(G) Fund	0.992	7	0.1615	21	0.163	24
23	ABSL Equity Hybrid 95 Fund(G)	0.997	3	0.9785	3	0.9815	4
24	CPSE	1	1	0.656	15	0.656	17
25	Nippon India Liquid- Growth	1	1	1	1	1	1
26	Nippon India Large Cap –Growth	0.9925	6	0.953	7	0.96	8
27	Nippon India Multi Cap-Growth	0.9935	5	0.9665	5	0.9725	5
28	UTI Equity- Growth	1	1	1	1	1	1
29	UTI Hybrid Equity Fund Growth	1	1	1	1	1	1
30	UTI Liquid Cash – Growth	0.9985	2	0.0705	24	0.0705	26
31	UTI Money Market Fund DP Growth	1	1	0.8955	13	0.8955	15
32	UTI ULIP Direct Fund	1	1	1	1	1	1

Interpretation

From the above table, ICICI Prudential Balanced Advantage(G), Franklin India Credit Risk fund (G), Franklin India Equity Fund growth, Nippon India Liquid Fund Direct Plan Growth, UTI Equity Fund Growth, UTI Hybrid Equity Fund Growth, UTI ULIP Direct Fund have ranked first under three assumptions.

Table 5: Inefficient Mutual Fund schemes with score and peer group weights:

MF's	Efficiency Score	Efficient Peers and Weights				
		1	0.865	(MF32)0.015	(MF28)0.032	(MF13)0.271
2	0.957	(MF16) 0.006	(MF 13) 0.013	(MF 20)0.108	(MF 3)0.616	(MF32)0.257
4	0.448	(MF 14)0.170	(MF 12)0.189	(MF 20) 0.642		
5	0.956	(MF 13)0.055	(MF 16)0.332	(MF 32)0.607	(MF 20)0.006	
8	0.922	(MF 29)0.183	(MF 28)0.010	(MF 20)0.361	(MF 32)0.019	(MF13)0.426
9	0.449	(MF 31) 0.059	(MF 20) 0.024	(MF 17)0.066	(MF 24)0.850	
10	0.957	(MF 32)0.616	(MF 12)0.003	(MF 20)0.169	(MF 3)0.205	(MF13)0.006
27	0.972	(MF 13)0.050	(MF 29) 0.476	(MF 32)0.185	(MF20)0.283	(MF28)0.005

Peer Group and Virtual Inputs

The above table gives the information of inefficient mutual fund schemes and reduction in their input weights so as to move towards the efficient frontier. Each one of the inefficient mutual fund scheme has to follow an efficient scheme which can be called as a reference set or peer group so as to increase their efficiency level. The peer groups are role models for the inefficient schemes as they achieved efficiency score of 100 percent. HDFC balanced advantage fund scheme 1 from the above table, its peer group schemes are MF32, MF28, MF13, and MF20 with their corresponding weights as 0.015, 0.032, 0.271 and 0.682 respectively. In order to gain efficiency by MF1 it should follow its peer group 1.5 percent of MF32, 3.2 percent of MF28, 27.1 percent of MF13 and 68.2 percent of MF20. All other schemes excluding in the above table has efficiency score of 1.00 and do not require any reduction or improvement in the inputs.

FINDINGS

The results from the study are as follows

- According to the assumption of VRS, the efficiency score on an average resulted in 99.16%, under CRS assumption it was 76.9%. The scale efficiency has recorded 77.9%.
- The efficiency score resulted from VRS method is higher than the efficiency score resulted from CRS assumption.
- From the study only eight schemes need to improve in their efficiency scores, which can be improved by following their peer groups given in the table 5.

CONCLUSION

Present paper measured the efficiency scores of 32 top performing schemes from November 2017 to November 2019. In the study we considered the outputs Sharpe and Treynor Ratio's and the inputs such as Exit Load, Expense Ratio, Minimum Investment, Asset Size of the Fund, age of the fund since its inception, and the Beta (market risk).

Based on the efficiency scores, ranks have been given to the Mutual Funds under CRS, VRS and Scale efficiency. The schemes which are efficient according to three scales considered are

1. ICICI Prudential Balanced Advantage
2. Franklin India Credit Risk fund
3. Franklin India Equity Fund growth
4. Nippon India Liquid Fund Direct Plan Growth
5. UTI Equity Fund Growth
6. UTI Hybrid Equity Fund Growth
7. UTI ULIP Direct Funds; among 32 schemes, ranked first under three assumptions.

Few schemes resulted inefficient under the study and has to reduce their inputs like load, expense ratio and they must follow their peer groups and their weights. Depending upon the efficiency scores of the selected mutual funds, investors can choose their scheme for investment.

Fund managers role is to analyse the efficiency of top rating funds so as to suggest in the investment decisions on behalf of investor. Fund manager should play efficient role in identifying the cause of inefficiencies and the sources of the same. Further, reduction in inputs should be taken care, so that the other schemes which are near to efficient score can perform better in the future. By the DEA analysis, fund manager can suggest a portfolio of mutual funds which are performing well.

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