Data Envelopment Analysis: A Non-Parametric Approach to Evaluate the Efficiency of Selected Equity Mutual Funds

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ABSTRACT

With the robust growth of the Mutual Fund industry within the past 20 years, the analysis and evaluation of the performance of mutual funds has become imperative. Generally, a mutual fund performance is evaluated on the basis of its risk and return parameters. Moreover, the fund Manager's performance is also considered as an important parameter to rank the performance of the fund. The traditional investment avenues and their returns have become less attractive, and it is the reason of the rapid growth of Mutual funds in India. Therefore, it becomes really important to grasp and evaluate the factors affecting the efficiency of Mutual Funds. Data Envelopment Analysis, a non-linear programming method which will evaluate the efficiency of a fund with reference to its Inputs and Outputs. The current research takes into account the 10 years data of selected equity diversified mutual funds for the purpose of DEA Analysis.

***Keywords:** Mutual funds; Data envelopment analysis; Risk return.*

1.0 Introduction

Financial markets have become more confined by introducing a vast range of innovative financial instruments. A large number of mutual funds are floated into the market like, sectoral, equity diversified, balanced, income and ELSS funds. Usually the performance of mutual funds is usually evaluated on the basis of risk- return parameters only. Mutual funds have become the most popular investment avenue amongst the investors to fulfil their financial goals.

2.0 Literature Review

Hasan Qamar and Sanjay Singh (2017) used DEA approach- the non parametric method to analyze the efficiency of mutual funds. They studied 46 funds for the period of 10 years. The study reveals that the top ranking mutual funds as per CRISIL has also rated an inefficient mutual funds by DEA Model.

D K Malhotra, Rashmi Malhotra, Vivek Bhargava (2016) has done analysis of 35 funds on an efficiency scale of 1 to 100. By considering a 12 month return, turnover ratio, SD, Expense Ratio, as inputs and outputs of DEA, it was found that only 11 growth funds were 100% efficient.

Shubhasis DasGupta and Mayank Patel (2015) in the paper "Performance evaluation of Indian Mutual Funds using Data Envelopment Analysis" suggested that DEA is a useful approach in understanding mot only the performance pattern of mutual funds but also other variables affecting its efficiency.

Leila Zamani, Resia Beegam and Samad Borzoian (2014) studied portfolio selection using DEA of selected Indian companies, wherein 3 different portfolios of stocks were analyzed, which provided a super efficiency coefficient ranging between 1.3909 to 2.0934.

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Antonella Basso and Stefania Funari (2014) in her study concluded that DEA approach allows defining performance measures that are able to treat the multidimensional nature of the fund's performance, besides the traditional risk- return parameters.

Foroogh Ahmadizadeh (2014) studied the potential of peak moments of mutual funds in context of DEA. Assuming constant returns to scale, out of total 24 funds 9 only 9 funds were found 100% efficient during the study period.

Nikhat Afshan (2013) made an attempt to evaluate the relative performance of Mutual Funds under Balanced category using DEA approach from 2009 to 2012. The results showed that the overall performance of both types of has increased over a period of time, out of which some funds have remained 100% efficient right through the period of study.

3.0 Objectives of the Study

- To analyze the inputs and outputs affecting the efficiency of equity mutual funds.
- To evaluate and measure the efficiency of selected growth funds by using DEA approach.

4.0 Methodology of the Study

Data Envelopment Analysis evaluates the efficiency of an individual unit, corresponding to its inputs and outputs. It defines the efficiency measure of a production unit mathematically by a ratio of weighted sum of total outputs to weighted sum of total inputs.

5.0 Data Envelopment Analysis

5.1 Inputs for DEA
- Minimum Investment
- Standard Deviation
- Beta
- Expense Ratio
- Total Assets

5.2 Output for DEA
- Annual Return
- Sharpe Ratio
- Alpha

6.0 Limitations of the Study

- It only focuses on selected equity diversified mutual funds for the purpose of study.
- The funds which are operative for the past 10 years are considered for the purpose of study.

The Table 1 indicates the input variables and output variables of the selected 12 equity growth mutual funds for the study.

The Table 2 depicts the efficiency scores of selected equity mutual fund schemes by using Data Envelopment Analysis approach. The schemes having efficiency score of one are said to be performing efficiently, while the schemes having efficiency score of less than one are inefficient.

Table 1: Input and Output Variables for selected Mutual Funds

Sr. No	Name of the Scheme	Expense Ratio	Mini Investment	SD	Total Assets (Cr)	Beta	Annual Return (%)	Turnover (%)	Sharpe Ratio	Alpha
1	Birla Sunlife Equity Fund	1.97	1000	14.33	10035	0.98	19.19	100	0.87	1.21
2	Baroda Hybrid Equity Fund	2.70	5000	11.33	686	0.89	12.57	107	0.50	-1.98
3	DSP Equity Opportunity Fund	2.08	1000	15.56	5439	1.02	18.23	115	0.70	-0.62
4	HDFC Equity Savings Fund	2.09	5000	5.61	6254	1.07	10.42	35.89	1.02	2.19
5	Sundaram Diversified Equity Fund	2.21	500	15.45	2539	1.07	15.71	63	0.61	-1.71
6	IDFC Core Equity Fund	2.08	1000	14.79	2826	0.92	14.19	41	0.45	-1.08
7	Invesco India Dynamic Equity Fund	2.21	5000	10.30	1036	0.85	16.04	300	0.64	-0.70
8	Kotak Equity Opportunity Fund	2.09	5000	13.41	2332	0.88	18.02	95.72	0.75	1.50
9	SBI Focused Equity Fund	2.36	5000	14.01	3452	1.02	26.04	80	0.78	-1.05
10	Mirae Asset India Equity Fund	2.05	5000	13.27	1458	0.95	23.18	48	0.94	2.67
11	Reliance Growth Fund	2.15	5000	15.71	6452	0.87	18.14	157	0.62	-0.43
12	Tata Equity PE Fund	1.98	5000	15.05	5029	0.70	20.86	47.29	0.95	3.48

Table 2: DEA Analysis of Selected Mutual Fund Schemes

Name of the Scheme	Constant Returns to Scale	Variable return to Scale
Birla Sunlife Equity Fund	1	1
Baroda Hybrid Equity Fund	**0.893**	**0.815**
DSP Equity Opportunity Fund	1	1
HDFC Equity Savings Fund	1	1
Sundaram Diversified Equity Fund	**0.726**	**0.827**
IDFC Core Equity Fund	0.937	1
Invesco India Dynamic Equity Fund	1	1
Kotak Equity Opportunity Fund	1	1
SBI Focused Equity Fund	1	1
Mirae Asset India Equity Fund	1	1
Reliance Growth Fund	1	1
Tata Equity PE Fund	1	1

DEA uses two types of scales Constant Return to Scale and Variable Return to Scale. CRS assumes that an increase in input will result in the proportionate increase in output. In other words, there is a significant relationship between input resources and output. In case of Mutual Fund scheme

if the inputs will deviate than there will be a proportionate change or increase be observed. All the Mutual Funds except Baroda Hybrid Equity Fund, Sundaram Diversified Equity Fund, and IDFC Core Equity Fund have their efficiency scores less than 1.

On other hand Variable return to scale proposes that an increase in input resources will result in disproportionate increment in output. It means, either a growth or a decline in inputs or outputs does not result in proportionate change in inputs and outputs respectively. As per the above analysis it is been observed that Baroda Hybrid Equity Fund and Sundaram Diversified Equity Fund has the least efficiency score which is below 1. These funds are inefficient as compared with the other funds operating in the market considered for the study.

7.0 Conclusion

Mutual fund efficiency analysis throws the light on the fact that the performance of the funds is not only affected by its risk quotient but also the other factors like Expense Ratio, Turnover and total Assets. Therefore in this paper DEA approach- a non-parametric method is been used to analyze the efficiency of mutual funds. The results reveal that in spite of the good returns, some of the funds failed to prove it efficiency on the DEA parameter. So it becomes imperious that a Fund Managers also controls and analyzes the other parameters also to evaluate the efficiency of the Mutual Funds.

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