CHAPTER 4

RESEARCH METHODOLOGY

This chapter deals with the research methodology applied for fulfilling the objectives of the study. The most appropriate statistical techniques for analysis of data were identified after going through the literature review and consulting various books. Primary data has been used to study the financial advisors’ behavior and perception while secondary data has been used to analyze the performance of mutual fund managers. The sections given below discuss in detail, the attributes and attribute levels taken for the study, data used and its collection, time period of the study, population, sample and the tools and techniques employed for analyzing the data for the three objectives separately.

4.1 OBJECTIVE 1: INVESTING BEHAVIOR OF INVESTMENT PROFESSIONALS

4.1.1 DATA AND DATA COLLECTION

This section deals with the selection of attributes and attribute levels, designing of questionnaire, sampling method and data collection for the same.

Attribute Selection

The literature review done for this study shows that there are certain important factors which are taken into consideration by the investors as well as the advisors before selecting a particular mutual fund scheme for investment. Initially, nine attributes were selected on the basis of literature review, which were further narrowed down to six attributes after consulting the experts in the industry. The investment professionals in the industry were consulted by conducting an opinion poll as well as through personal interviews. Further, they were also asked to share their knowledge regarding the various attribute levels, which they think as important while judging a mutual fund scheme on the basis of selected attributes.

Hence, based on the literature review the nine attributes which were initially selected are as follows: past performance, fund manager’s experience, expense ratio, ratings, fund size, investment style of the fund manager, portfolio turnover, fund house reputation, commission.
After discussing with the experts in the industry, the six attributes which were shortlisted are as follows:

i) Past Performance
ii) Fund manager’s Experience
iii) Expense Ratio
iv) Ratings
v) Fund size
vi) Investment Style of the fund manager

The levels of these attributes were selected, thereafter, on the basis of the importance given by the investment professionals in the industry to different levels, as a criterion for fund selection. In this case also, firstly, the following levels were selected for each attribute:

**TABLE 4.1 Initial List of Attributes and Attribute Levels**

<table>
<thead>
<tr>
<th>ATTRIBUTES</th>
<th>ATTRIBUTE LEVELS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAST PERFORMANCE</td>
<td>Steady growth in last 5 years</td>
</tr>
<tr>
<td></td>
<td>Impressive performance during last year</td>
</tr>
<tr>
<td></td>
<td>Supernormal growth in last 3 years</td>
</tr>
<tr>
<td>FUND MANAGER’S EXPERIENCE</td>
<td>0-3 yrs.</td>
</tr>
<tr>
<td></td>
<td>4-7 yrs.</td>
</tr>
<tr>
<td></td>
<td>&gt;7 yrs.</td>
</tr>
<tr>
<td>INVESTMENT STYLE OF FUND MANAGER</td>
<td>Cautious</td>
</tr>
<tr>
<td>FUND SIZE</td>
<td>Small</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>Large</td>
</tr>
<tr>
<td>EXPENSE RATIO</td>
<td>0-1 %</td>
</tr>
<tr>
<td></td>
<td>&gt;1-2 %</td>
</tr>
<tr>
<td></td>
<td>&gt; 2 %</td>
</tr>
</tbody>
</table>
Again, after consulting with the experts, the changes were made in the attributes and attribute levels. The last three attributes along with their levels were removed from the list and amendments were done in the attribute levels of the remaining attributes on the basis of suggestions given by the fund advisors.

The final list of attributes and attribute levels selected for the study is as follows:

**TABLE 4.2 Final List of Attributes and Attribute Levels**

<table>
<thead>
<tr>
<th>ATTRIBUTES</th>
<th>ATTRIBUTE LEVELS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAST PERFORMANCE</td>
<td>Impressive performance during last year</td>
</tr>
<tr>
<td></td>
<td>Supernormal growth in last 3 years</td>
</tr>
<tr>
<td>FUND MANAGER'S EXPERIENCE</td>
<td>More than 4 years</td>
</tr>
<tr>
<td></td>
<td>Less than 4 years</td>
</tr>
<tr>
<td>INVESTMENT STYLE OF FUND MANAGER</td>
<td>Cautious</td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td>Aggressive</td>
</tr>
</tbody>
</table>
Thus, the above table shows that, for the final study, six attributes were selected out of which three are having three levels while the other three are having only two levels each for designing the questionnaire.

The questionnaire was designed for studying the investing behavior of the investment professionals in the mutual fund industry. The questionnaire is designed by creating combinations out of the selected attributes levels. Thus, considering all attribute levels, the possible number of profiles is 3x3x3x2x2x2=216. As respondents cannot possibly rate 216 mutual fund profiles, fractional factorial design was performed using SPSS 17.0, which gave the optimal number of profiles as twenty. After generating the above combinations, the questionnaire was designed & administered on investment professionals (Appendix A). In the questionnaire, the investment professionals were asked to rank the combinations according to their preferences for the levels of attributes present in each combination.

The present study aims at studying the investing behavior of investment professionals towards the mutual funds and the preferences given by them to various attributes and attribute levels while selecting a particular mutual fund scheme. To study the investment advisors’ behavior, primary data is considered. This requires primary data collection for which the present study has opted for both probabilistic and non-probabilistic sampling methods i.e. a combination of the two methods has been used which includes Judgment sampling and Random sampling.

In judgment sampling, a sample of experts having knowledge in a particular field is used for the study. Judgment sampling is a non-probability sampling method and it occurs when elements selected for the sample are chosen by the judgment of the researcher. Researchers often believe
that they can obtain a representative sample by using a sound judgment, which will result in saving time and money (Black, 2010, p.225) [5]. It is the only viable sampling technique in obtaining information from a very specific group of people. Thus, in this study due to the nature of the study and the objectives oriented towards the analysis of investing behavior and perception of investment advisors, judgment sampling is considered to be the most appropriate option for sampling.

Thus, the population or universe of the study is the investment professionals working in the field of mutual funds. As we know that the data required for the study from these professionals is related to the information regarding their selection strategies and investment techniques, they are hesitant to share the same. Moreover, they are also very much occupied in their work and are seldom available to share their views. Hence, the only way left to get their input was to visit them personally and get their responses. Therefore, due to the constraint of time and money, the scope of this study was limited to Delhi-NCR. The sample was finally selected for this study from the investment professionals working in Delhi-NCR.

From this target population of investment professionals having knowledge of mutual funds, the sample of the present study was selected by random sampling technique. Random sampling is one of the most popular types of random or probability sampling. In this technique, each member of the population has an equal chance of being selected as subject. Here, after selecting the target population of investment professionals in Delhi-NCR, random sampling is used to choose the respondents i.e. equal chance is given to all the professionals in Delhi-NCR to be chosen for the study.

As a result, in this study a combination of judgment and random sampling is used to collect the data from the primary sources i.e. from investment professionals. The target population of the study is the investment professionals dealing with the mutual funds, working in Delhi-NCR. They should be well versed with the terms related to mutual funds. Due to limitation of time and resources, the scope of the study has been limited to Delhi and National Capital Region. Moreover, the Delhi-NCR area is able to represent a satisfactory broad view of the investment professionals working in the field of mutual funds.

As the target population for this study was investment professionals, to collect responses from them was a tedious task due to their busy schedule. Hence, responses were received from 45 such investment professionals by visiting them personally and through email. The responses received
were then analyzed on SPSS. As each investment professional influences the financial decision making of a large number of clients, this sample size is big enough to represent a large population.

Primary data collection is done through questionnaire, which is designed after consulting the professionals regarding the attributes considered important by them for selecting a mutual fund scheme. As discussed earlier, the questionnaire was designed based on the attributes selected for studying the investing behavior of the investment professionals. With the help of this questionnaire, the investing behavior of professionals is judged i.e. how they change their preferences for a particular mutual fund scheme with the change in the combination of attributes present in that scheme. They were asked to rank the twenty combinations designed in the questionnaire according to their preference for each combination i.e. rank 1 to be given to the most preferred combination while rank 20 to the least preferred one. As the respondents were very specific group of people who were always very much occupied with their professional commitments, personal visit with prior appointment, was the only way to collect the information from them. Questionnaires were also sent to some of them through emails after explaining them the entire project telephonically. This resulted in collection of filled questionnaires from fifty respondents. Out of which forty-five questionnaires were filled completely and used for the study.

4.1.2 STATISTICAL TECHNIQUE USED FOR DATA ANALYSIS

Multivariate Data Analysis Technique

This study uses a multivariate data analysis technique known as conjoint analysis with a view to find out the combination of attributes governing the investment decision making by the investment advisors and portfolio managers.

Conjoint Analysis

Conjoint analysis is a multivariate technique developed specifically to understand the preferences developed by respondents for any type of object which may be a product, service or idea. Thus, it is a method of identifying consumer preferences for the features of a particular good or service that determines its demand. The method is usually used as a market research instrument to improve effective product design by determining the order of importance for the factors that consumers consider as significant when purchasing a product. It is based on the
principle that consumers evaluate a product’s value by combining the different amounts of values provided by each of its attributes. Conjoint analysis helps not only to identify which attributes of a product are relatively significant or insignificant for consumers but also to determine which level of each attribute is the most or least preferred. Thus, respondents are asked to rate product or service profiles with combinations of different levels of all attributes.

i) Terminology Used In Conjoint Analysis:

**Factor:** It represents a specific attribute of an object. It is the independent variable specified by the researcher. The factors are non-metric in nature. Each factor is defined by two or more values or levels which are again specified by the researcher.

**Level:** It is a specific non-metric value which describes the factor or attribute of an object. Each factor is represented by two or more levels but not more than four or five levels.

**Utility:** It is a subjective judgment of the preferences unique to each respondent. It is the basic concept in conjoint analysis for measuring the value given by the respondents to each attribute. The utility of an object can be accurately defined by all the attributes that affect its preference. The main factors that determine the utility are as follows:
- It is a measure of individual’s overall preference as it includes all the features of the object whether it is tangible or intangible.
- It is based on the value placed by the respondent to each of the level of attributes. While placing the values respondents react to different combinations with different levels of preferences.
- It is assumed that the products or services with higher utility values are more preferred and have more chances of selection.
- In conjoint analysis, utility is formed by combination of part worth estimates for any specified set of levels.

**Part- worth Utility:** It is an estimate of the overall preference or utility associated with each level of each factor used to define the product.

**Stimulus:** Stimulus is a specific set of levels (one of each factor) evaluated by the respondents. One method of defining stimuli design is factorial design, which creates separate stimuli for each combination of all levels. In many cases, the total number of combinations is too large for a
respondent to evaluate. In such instances, some subset of stimuli is created according to another method i.e. *fractional factorial design*.

**Holdout Stimuli/Validation Stimuli:** These are the set of stimuli that are not used in the estimation of part-worth utility. The part-worth utility estimated is then used to predict preference for the holdout/validation stimuli which eventually assesses the validity and reliability of the original estimates.

**Design:** Specific set of conjoint stimuli created to show the properties of orthogonality and balance.

**Fractional Factorial Design:** It is an alternative method to factorial design used to design stimuli. It uses only a subset of all the possible stimuli needed to estimate the results. Its main objective is to reduce the number of stimuli while still maintaining orthogonality among the levels.

**Orthogonality:** Mathematical constraint which requires that the part worth estimates are independent from each other. In the case of conjoint analysis, orthogonality refers to the ability to measure the effect of changing each attribute level and to separate it from the effects of changing other levels of the attributes.

**Reversal:** It refers to the violation from an expected relationship, where an estimated part-worth for a level is lower or higher than it should be in relation to another level.

**ii) Preference Gathering from Respondents:** After generating the stimuli with the help of fractional factorial design, the next step is to gather preferences of the respondents with the help of questionnaire designed. The conjoint analysis is also known as trade-off analysis because in making the judgment about the hypothetical object, the respondents have to consider both the good as well as the bad characteristics of the object in forming an opinion. Thus, they must weigh all the attributes simultaneously. Here, respondents are asked to rank-order the stimuli i.e. each combination on the basis of their preference.

**iii) Mathematical formula:**

The utility, which represents the total worth or overall preference of an object, is sum of the part-worth utilities i.e. the sum of the worth of product parts.

The general form of a conjoint model can be represented as follows:

Total worth for product= Part worth of level i for factor1+ Part worth of level j for Factor2+ ............+ Part worth of level n for factor m.
Where the product has m attributes, each having n levels.

4.2 OBJECTIVE 2: PERCEPTION OF INVESTMENT ADVISORS

4.2.1 DATA AND DATA COLLECTION

This section deals with the attribute selection; top 15 mutual fund scheme selection; designing of questionnaire; sampling method and data collection for the second objective.

Attribute Selection

The attributes selected for the first objective are taken as attributes for second objective. However, the fund manager’s investment style is replaced by risk in this case. It was done because in the analysis of the first objective, it was concluded that the aggressive investment style was considered as the most preferred one by the advisors. Hence, in place of style of fund manager, risk was considered as the most appropriate attribute. Thus, the six attributes for which the perception of fund advisors is judged are as follows:

- Expense Ratio
- Ratings
- Past Performance
- Fund size
- Fund manager’s Experience
- Risk

The levels for each of the above attributes, which were used in the questionnaire, to know the perception of financial advisors regarding the selected schemes on these attributes are as follows:

- Expense Ratio - Low, Medium, High.
- Ratings - Low, Medium, High.
- Past Performance – Average, Good, Excellent.
- Fund size – Small, Large.
- Fund manager’s Experience – Low, High.
- Risk - Low, Medium, High.

Selection of Mutual Fund Schemes

The top 15 open-ended equity mutual funds schemes were selected for the study. Open-ended mutual fund schemes possess several advantages over close-ended mutual funds, hence only this
type of scheme has been considered for this study. The open ended funds can be bought, sold and
redeemed everyday on an ongoing basis, which ensures that the investors are free to buy and sell
any number of open ended mutual fund’s units at any point of time. Thus, open ended mutual
fund schemes offer high level of liquidity to the investors. Investors are more interested to buy
this type of fund because of above mentioned reasons. Hence, these funds are selected to know
the fund advisors’ perception and to compare it with real figures.

The mutual fund research website www.valueresearchonline.com was used, to select the top 15
equity mutual funds, as this website gives a comprehensive analysis with the help of various
statistical tools for the different categories of funds throughout the year. The schemes selected
for the present study are top rated open-ended equity mutual funds as on June 2013. The top 15
selected mutual fund schemes are shown separately in a list. (Appendix B)

After the selection of attributes and top 15 mutual fund schemes, the questionnaire was designed.
The names of the mutual fund schemes in the rows are shown on the left hand side of the
questionnaire and the attributes with their levels in the columns at the top of it. (Appendix C)
The respondents i.e. the mutual fund advisors were asked to select an attribute level for each
mutual fund scheme on the basis of their own perception.

The present objective aims at judging the perception of fund advisors. To study the investment
advisors’ perception, primary data is considered in this objective also.

Same as in the first objective i.e. all the investment professionals dealing with the mutual funds,
working in Delhi-NCR were considered as the target population.

In the same way as in the first objective, responses were received from 45 such investment
professionals by visiting them personally and through email. The responses received were then
analyzed on SPSS.

In this objective they were asked to rate each of the selected mutual fund schemes on the given
levels of the six attributes shown in the questionnaire. Thus, they were asked to give their
perception regarding the given mutual fund schemes by selecting any one level of each attribute
for all the 15 mutual funds schemes. It emphasizes that the data collected is in such a manner that
for each of the mutual fund scheme the responses of all the 45 respondents are collected.

The professionals were not very much interested in sharing their views and hence, personal visits
were the only way to collect the responses. The data collected is cross-sectional and point in time
data. Finally, data was collected and data analysis was done in SPSS.
Data transformation

The aim behind data transformation is to make the data suitable for multidimensional scaling (MDS) procedure. This was done to discover a measure of similarity between the given mutual fund schemes for each of the characteristic on the basis of the ratings given by the respondents for the selected attribute levels.

The data collected in the form of a response sheet of the 15 mutual fund schemes for each attribute was transformed into a square symmetry matrix. These matrices show the rows and columns containing the same set of objects i.e. the 15 mutual fund schemes in this case. (Appendix E to Appendix J showing the square symmetry matrix of all the six attributes.)

4.2.2 STATISTICAL TECHNIQUE USED FOR DATA ANALYSIS:

Multidimensional Scaling

Multidimensional Scaling is a technique that analyzes the distance like data which is also known as similarity/dissimilarity data. The technique refers to a set of methods used to create a spatial representation of similarities or dissimilarities among entities which may be brands or products or individuals.

In other words, Multidimensional scaling (MDS) is a technique that creates a graph or map displaying the relative positions of a number of objects or entities, on the basis of a data table of the distances between them. The graph may consist of one, two or even more dimensions. It calculates either the metric or the non-metric solution. The table of distances is known as the similarity or proximity matrix.

When similarity data is metric in nature, the methodology utilized is metric MDS or classical metric MDS. This methodology includes the information which reflects real distances between items or the similarity responses from the subjects representing ratio or interval scale.

An alternate method of collecting responses is ordinal proximity data. The MDS procedure utilized for this situation is non-metric MDS. In this type of method, the similarity data can be provided either by a single individual or it can be an aggregate ranking of all the responses.

In the present study, the similarity data is collected and aggregate ranking of all the responses is done as we have to know the perception of all the investment advisors on the selected top 15 mutual fund schemes. Consequently, in this study the non-metric MDS procedure is utilized as it is the most pertinent one, for gathering data and its analysis.
Perceptual Mapping

It is a broadly utilized application of MDS. The ability of non-metric MDS is to get scaling of psychological distances in order to obtain the mental map of the thinking of the individuals. This was first used by Roger N. Shepard in 1962 to comprehend the subjective judgment of people with respect to distances between different US states.

Perceptual mapping can also act as a valuable tool in positioning new models of a product as well as repositioning old ones. It can be done by collecting data from sample consumers, asking each of them to rank the set of available products on the given characteristics on the basis of his/her own preferences.

The above application of perceptual mapping is utilized in this study to know the perception of financial analysts for the given mutual fund schemes on the chosen characteristics. Thus, this application will empower us to know the positioning of the mutual fund schemes in the minds of the financial analysts who can thus, strategically position them in the investors’ minds.

The three fundamental steps performed to do MDS analysis, are as per the following:
1. Gather measures of similarity or preferences for the entire set of items which are going to be analyzed.
2. Use MDS or perceptual mapping technique to assess the relative position of every item in multidimensional space.
3. Identify and interpret the axes of the dimensional space in terms of perceptual and/or objective characteristics.

To comprehend the graphical representation, we have to interpret the distances between points in the diagram to show how similar or dissimilar the items are i.e. greater the distance, greater the dissimilarity and vice versa.

Hence, it is a technique that permits a researcher to determine the perceived relative picture of a set of items in the respondents’ minds. The objective behind perceptual mapping is to convert the judgments of the consumer about the similarities/dissimilarities between the objects into distances depicted in multidimensional space.

This methodology can be classified into two types based on the nature of the responses acquired from the respondents. These are – de-compositional and compositional methods.
Here, we have applied compositional technique in which assessment of a group of items depends on a combination of particular characteristics.

In the MDS technique to find out the distance between each item Euclidean distance formula is used:

$$d_{ij} = \sqrt{\sum (x_{ia} - x_{ja})^2}$$

where $x_{ia}$ – $x_{ja}$ are the projections of point $i$ and point $j$ on dimension $a$ (a =1,2…)

**Dimensions applied for the study**

It is seen that the accuracy of representation of the observed dissimilarities increases as the number of dimensions applied in the analysis increase. In any case, the dimensions also make the representation more complex. It is seen that the goodness of fit of the model is most appropriate with two-dimensional representation, hence, the two dimensional representation is the best option for a research study.

**Dimension interpretation**

It is mostly based on the subjective evaluation of the attributes present in the items, which in turn depends on the researcher’s information with regard to those attributes. In this study, the expressed levels of the attributes of the objects (mutual fund schemes) are being utilized and the respondents are being requested to give ratings to the mutual fund schemes on the given levels of the six selected attributes. The dimensions are interpreted in case of each attribute by the researcher, depending on the levels on which the schemes are rated by the respondent.[74]

**Determining the object’s position in the perceptual map and measure of fit of the model**

MDS procedure decides the ideal location for every item in a predefined dimensionality. Computer program figures out and calculates the precise and comprehensive solution as the number of items and that of dimensions increases.

The essential criterion in all cases for getting the best representation of the data is protection of the expected relationship between the original rank data and the derived distances between the points.

Any measure of fit (e.g., stress) is just a measure of how adequately (or inadequately) the ranks on the basis of the distances on the graph conform to ranks given by the respondents.

There are two methods to figure out the model fit. They are:
a Stress Measure

b Index of Fit

• Stress measure:
Stress is the most widely used measure of fit, which was created by Kruskal (1964). It demonstrates the ratio of the variance of the disparities (differences in the distances between objects on the perceptual map and the similarity judgments of the respondents) not accounted for by the MDS model.

Kruskal’s stress is the most widely used measure for determining a model’s goodness-of-fit. It is defined by:

\[ \text{Stress} = \sqrt{(d_{ij} - \bar{d}_{ij})^2 / (d_{ij} - \bar{d}_{ij})^2} \]

where

\( d_{ij} \) original distance based on similarity judgment
\( \bar{d}_{ij} \) derived distance from the perceptual map
\( \bar{d}_{ij} \) average distance (\( \Sigma d_{ij} / n \)) on the map.

Stress value becomes smaller as the derived \( d_{ij} \) approaches the original \( d_{ij} \). Stress value is lowest when the objects are set in an arrangement so that the distances best match the original distances. Stress can vary between a maximum value of 1 and a minimum value of 0. As we can also say for our everyday life, the lesser the stress the better it is, similar situation exists in MDS. Stress value below 0.30 is viewed satisfactory for a model to be fit in this method.

• \( R^2 \) as index of fit:
Another measure of fit applied in MDS is the squared correction index or \( R^2 \) (named as RSQ in SPSS software). It can be interpreted as showing the ratio of variance of the disparities represented by the MDS model. In other words, how the raw data fit the MDS model i.e. RSQ demonstrates the amount of input data variance represented by the MDS model. Measure of .60 or higher than that is considered satisfactory estimation criteria in this technique also, as in other multivariate techniques. Thus, it can be inferred that the higher the \( R^2 \), the better the fit of the model.
4.3 OBJECTIVE 3: PERFORMANCE OF FUND MANAGERS

4.3.1 DATA AND DATA COLLECTION

Selection of Mutual Fund Schemes:
The top 15 open-ended equity mutual fund schemes were selected for the study. Open-ended mutual fund schemes possess several advantages over close-ended mutual funds, hence only this type of scheme has been considered for this study.

Similarly, the reason behind choosing top performing equity mutual fund schemes is that it is expected that the stock selectivity and market timing skills of the fund managers of these schemes should be significantly remarkable.

As a result, a group of 15 top performing open-ended equity mutual funds were identified and selected from the website www.valueresearchonline.com. This website provides a detailed online analysis of all the mutual fund schemes in each category. As done for the second objective, the top 15 open-ended equity mutual fund schemes as on June 2013, were selected for judging the performance of mutual fund managers. (Appendix B)

The period chosen for the performance measurement of fund managers is between Jan 2008 to Mar 2014. The reason behind choosing this period is that Indian capital market has witnessed major turmoil due to some important events occurring at the domestic as well as international front during this period. These were structural reforms and high volatility in the Indian mutual fund industry along with subprime crisis at the international level. Hence, it was the best period to judge the professional skills of the fund managers i.e. whether they are able to time the market accurately during this period or not. It will also help us to know that the extraordinary performance of these funds during this period is because of the market movements or it is because of the timing and selectivity skills of fund managers.

The data collected for this objective is secondary in nature. The secondary data have been collected for a sample of fifteen top performing equity mutual fund schemes during the period Jan 2008 to Mar 2014. The data used in the study mainly comprise of the daily net asset values (NAV) from Jan 2008 to Mar 2014 of the schemes, which has been collected from the factsheets of mutual fund companies, brochures and the various websites. (Snapshots of NAVs of ICICI FMCG FUND, KOTAK EMERGING MARKET FUND and AXIS EQUITY GROWTH FUND are shown as examples in Appendix O,P and Q respectively)
A number of research oriented websites like that of AMFI (http://www.amfiindia.com), and http://www.valueresearchonline.com has been used to download the NAV (net asset values) data as well as to select the top fifteen equity mutual fund schemes.

In this study BSE Sensex is used as a proxy for market rate of return or market index. The data related to benchmark index i.e. BSE Sensex has been collected from the website of Bombay stock exchange (http://www.bseindia.com) (Appendix K).

Similarly in the present study, 91 day treasury bill of GOI is used as a proxy for risk-free rate of return. The data for 91-day treasury bill has been obtained from the website of RBI (http://www.rbi.org.in) (Appendix M)

**Variable Description**

The variable return, is used to determine the performance of the fund managers.

**Return**

The return for each of the sample schemes has been calculated by using the following formula:

**Return on Portfolio:**

\[
R_{pt} = \frac{NAV_{p,t}}{NAV_{p,(t-1)}} - 1
\]

where \( R_{pt} \) =Return of the sample mutual fund scheme (portfolio) on the basis of NAV for period ‘t’

\( NAV_{p,t} \) = Net asset value of fund ‘p’ in period ‘t’

\( NAV_{p,(t-1)} \) = Net asset value of fund ‘p’ in period ‘t-1’

t & t-1 indicate present & previous day NAVs respectively.

**Market Return:**

\[
R_{mt} = \text{Market Index } t - \text{Market Index } t-1
\]

Where \( R_{mt} \) =Return of the market index for period t.

Market Index t =Market value of the index in period t.

Market Index t-1 = Market value of the index in period ‘t-1’.

‘t’ and ‘t-1’ are the present day and previous day market value of the index respectively.
The data of BSE Sensex is used to calculate Rm (market return) with the help of above formula. (Appendix L).

**Risk Free Return:**
Risk free return (R_{ft}) has been calculated by taking the yield of 91 – day treasury bill as the surrogate for risk free return.
We converted the T- bill yield in annualized form (R_{aft}) into daily form as follows:

\[ R_{ft} = \frac{\ln(1+ R_{aft})}{365} \]

$R_{aft}$ is the annualized yield as reported in the RBI website (http://www.rbi.org.in) at time t.
The data of 91 day treasury bills is used to calculate Rft (risk free return) with the help of above formula. (Appendix N).

The variables are appropriately amended as required by the models used in the study.

**4.3.2 STATISTICAL TECHNIQUES USED FOR DATA ANALYSIS**
The models used to analyze the selectivity and market timing skills of the fund managers, are explained in detail in this section.

**i) JENSEN’S MODEL:**
Jensen’s model helps to evaluate the selectivity skills of fund managers i.e. it finds out their ability to identify undervalued or overvalued securities. The excess returns earned because of the ability of stock selection of fund managers can be known from Jensen’s alpha. It is also represented in the form of Jensen’s Measure.

Jensen’s Measure:
The measure was first used by Michael Jensen in 1968 and was originally designed to evaluate fund managers, i.e. to gauge if it was possible for them to consistently outperform the market or not. It is a risk adjusted performance measure that represents the average return on a portfolio over and above that predicted by the Capital asset pricing model, given the portfolio’s beta and the average market return. This is the portfolio’s alpha. If the alpha value is positive, then it
shows that the portfolio is earning excess return and in turn confirms the stock selectivity skills of the fund managers.

Jensen’s measure may be represented in the following equations:

\[
R_{pt} - R_{ft} = \alpha_{pt} + \beta_{pt}(R_{mt} - R_{ft}) + \epsilon_{pt} \tag{1}
\]

Where \( R_{pt} \) = return of the fund ‘p’ for period ‘t’

\( R_{ft} \) = risk-free return for period ‘t’

\( R_{mt} \) = return on the benchmark (market) portfolio for period ‘t’

\( \epsilon_{pt} \) = random error term

\( \alpha_{pt}, \beta_{pt} \) are the parameters of the model and are estimated by OLS techniques. A positive and significant value of \( \alpha_{pt} \) will indicate superior selectivity skills of the fund managers.

As shown in equation (1) the excess fund return \( (R_{pt} - R_{ft}) \) is regressed with excess market return \( (R_{mt} - R_{ft}) \). Here, excess fund return and excess market return, with respect to the risk free return are acting as dependent and independent variables respectively. In this Jensen’s \( \alpha_{pt} \) i.e. the intercept of this regression equation measures the portfolio manager’s predictive and selectivity skills to achieve higher return than expected for the given riskiness. Beta coefficient measures the systematic risk of the portfolio.

Fig.4.1 Excess Returns on the Fund Plotted against Excess Returns on the Market
The excess returns on the fund are plotted against the excess returns on the market as shown above. The regression line has a positive (+ve) intercept. This shows the abnormal performance of the fund due to the selectivity skills of the fund managers.

As it is assumed that the systematic risk exposure is constant for the given time period i.e. $\beta_{pt}$ is constant, the above equation is actually evaluating the superior stock selectivity skills or its absence in a fund manager. Thus, a positive and significant value of $\alpha_{pt}$ will definitely show superior forecasting abilities of the fund manager, on the other hand, a zero or negative value indicates absence of forecasting abilities or forecasting in the wrong direction.

Thus, to rank the funds according to Jensen performance measure the formula is the higher the alpha, the more a portfolio has earned above the predicted level.

Two other models developed by Treynor & Mazuy (1966) and Henriksson & Merton (1984) have been employed in this study to test both the selectivity and market timing skills of the fund managers.

ii) TM Model:

In this model, Treynor and Mazuy (1966) added a quadratic term (squared term) to the Jensen’s single index model to determine the market timing skills of the portfolio managers. The model suggested by them can be represented in the following equation:

$$R_{pt} - R_{ft} = \alpha_p + \beta_p (R_{mt} - R_{ft}) + \gamma_p (R_{mt} - R_{ft})^2 + \epsilon_{pt} - - - (2)$$

where $R_{pt}$ denotes return on assets of the selected fund at time $t$,

$R_{mt}$ denotes return on stock market at time $t$,

$R_{ft}$ denotes risk free return rate at time $t$,

$\alpha_p$ denotes stock selectivity ability, and

$\gamma_p$ denotes the parameter measuring the market timing performance,

If $\gamma_p > 0$, a fund is showing superior market timing skills of the fund managers.

The difference between the standard CAPM model and this model is clearly depicted in the above equation. An addition of the term $\gamma_p (R_{mt} - R_{ft})^2$ changes the linear relationship between returns on market and that of a security or an asset into a quadratic one. Thus, if the return of the market goes up by one percent, the average return on assets of selected funds goes up by $\beta_p + 2 \gamma_p (R_{mt} - R_{ft})$. 
In the above equation $\alpha$, $\beta$, and $\gamma$ are the parameters of the model.

The parameters can be calculated by using standard regression methodology. According to this model, the presence of market timing skills in the fund managers can be determined with help of parameter $\gamma p$. It means that if $\gamma p$ has a statistically significant positive value it indicates that the mutual fund managers possess superior market timing skills where as if $\gamma p$ is negative valued it indicates that there is lack of market timing ability in the fund managers. An insignificant value of $\gamma p$ also indicates that the fund managers are not able to time the market efficiently.

The market timing skills of the fund managers are in fact the ability of the managers to forecast the broad movements of the market i.e. to assess the direction of market movements. Managers having market timing skills are able to judge whether the market is shifting from a bullish phase to a bearish phase or vice versa. They plan their strategies accordingly i.e. they would allocate their capital in stocks and cash to maximize the gains in the up market and to minimize the losses in the down market. Thus, it indicates the macro forecasting ability of fund managers.

Similarly, if $\alpha_p$ is having a significant positive value, it indicates the stock selectivity skills of the fund managers, as in the Jensen’s model. In other words, it finds out whether the fund managers have the superior skills to identify and select undervalued securities or not. This is also known as the micro forecasting ability of the fund managers.

iii) HM Model:

Henriksson & Merton (1981) developed a simpler model to assess the market timing abilities of the fund managers.

According to this model, the fund manager allocates the funds in risk-free assets and equities depending on his ability to assess the market i.e. expected market returns in future. Thus, he will select the securities with higher value of $\beta$ when the market is expected to perform better i.e. $R_m \geq R_f$ and on the other hand, will select those assets whose $\beta$ value is low when the market is expected to go southwards i.e. $R_m \leq R_f$. Thus, such a relationship can be estimated by involving the dummy variable. The relationship can be exhibited in the form of the following regression equation:

$$R_{pt} - R_{ft} = \alpha p + \beta p (R_{mt} - R_{ft}) + \gamma p [D(R_{mt} - R_{ft})] + \in_p t \quad Eq. (3)$$

Here, $\alpha$, $\beta$, and $\gamma$ are the parameters of the model.
Where D is the dummy variable that is equal to ‘0’ for the period when \( R_{mt} \geq R_{ft} \) i.e. when market return is more than risk free return and it will be -1 for the period \( R_{mt} \leq R_{ft} \) i.e. when market return is less than risk free return.

Thus, here two equations can be derived from the above equation 3.

The first one when \( R_{mt} \geq R_{ft} \) (up-market conditions),
\[
D = 0,
\]
Hence, \( \gamma p[D(R_{mt} - R_{ft})] = 0, \)
\[
R_{pt} - R_{ft} = \alpha + \beta p(R_{mt} - R_{ft}) + \epsilon + pt \quad \text{--- Eq.(4)}
\]
Thus, excess return of the fund is due to the shifting of the stocks by the fund manager to up market or bullish portfolio i.e. \( \beta p \) corresponds to up-market \( \beta \).

The second one derived is when \( R_{mt} \leq R_{ft} \) (down-market conditions),
\[
D = -1
\]
Hence, equation 3 changes to
\[
R_{pt} - R_{ft} = \alpha + \beta - \gamma p (R_{mt} - R_{ft}) + \epsilon + pt \quad \text{--- Eq.(5)}
\]
Here, the parameter \( \beta p \) corresponds to the up-market (bullish) beta of the portfolio whereas \( \beta p - \gamma p \) indicates the bearish or down-market beta of the portfolio.

Thus, the above computations confirm that \( \gamma p \) is the difference between the values of these two betas & a significantly positive value of \( \gamma p \) indicates the market timing ability of the fund managers. In other words, a statistically significant positive value of \( \gamma p \) indicates, superior macro forecasting skills of the fund manager and vice versa.