CHAPTER III

RESEARCH METHODOLOGY

The Study
Sample
Tools for Data Collection
Tools for Data Analysis
Hypotheses
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3.1 The Study

The study is aimed to evaluate the differences in characteristics and to study the extent of diversification of selected public sector and selected private sector sponsored mutual funds. The study also focused on evaluating and comparing the performance of selected funds.

3.2 Sample

There are 51 mutual fund companies operating in the Indian market with almost 882 schemes by the end of March 2010. These funds are mainly classified into private sector and public sector on the basis of sponsorship. However, private-sector sponsored funds were further subdivided into Indian and Foreign sponsors. Out of these some of the companies who are major market players were chosen randomly. The research was conducted on 11 schemes of 5 public sectors sponsored mutual fund, 13 schemes of 6 private sectors Indian sponsored mutual fund and 6 schemes of 3 private sector Foreign sponsored mutual funds.
Public Sector Mutual Fund and their schemes selected for the study are as follows:

1) BARODA PIONEER MUTUAL FUND
   i. Growth Fund – Dividend Plan
   ii. Growth Fund – Growth Plan

2) CANARA ROBECO MUTUAL FUND
   i. Equity Diversified Fund – Dividend Plan
   ii. Equity Diversified Fund – Growth Plan

3) LIC NOMURA MUTUAL FUND
   i. Equity Fund – Dividend Plan
   ii. Equity Fund – Growth Plan
   iii. Growth Fund – Dividend Plan

4) PRINCIPAL MUTUAL FUND
   i. Growth Fund – Dividend Plan
   ii. Growth Fund – Growth Plan

5) SBI MAGNUM MUTUAL FUND
   i. Equity Fund – Dividend Plan
   ii. Global Fund 94 – Dividend Plan
Private Sector Indian Sponsored Mutual Fund and their schemes selected for the study are as follows:

1) Birla Sun Life Mutual Fund
   i. Equity Fund – Dividend Plan
   ii. Equity Fund – Growth Plan

2) HDFC Mutual Fund
   i. Equity Fund – Dividend Plan
   ii. Equity Fund – Growth Plan
   iii. Growth Fund – Dividend Plan
   iv. Growth Fund – Growth Plan

3) ICICI Prudential Mutual Fund
   i. Discovery Fund – Growth Plan

4) Reliance Mutual Fund
   i. Growth Fund – Dividend Plan
   ii. Growth Fund – Growth Plan

5) Sahahra Mutual Fund
   i. Growth Fund – Dividend Plan
   ii. Growth Fund – Growth Plan

6) Tata Mutual Fund
   i. Equity Opportunities Fund – Dividend Plan
   ii. Equity Opportunities Fund – Growth Plan
Private Sector Foreign Sponsored Mutual Fund and their schemes selected for the study are as follows:

1) **DSP BLACKROCK MUTUAL FUND**
   i. Opportunities Fund - Dividend plan
   ii. Opportunities Fund - Growth plan

2) **FRANKLIN TEMPLTON MUTUAL FUND**
   i. India Bluechip Fund – Dividend Plan
   ii. India Bluechip Fund – Growth Plan

3) **HSBC MUTUAL FUND**
   i. Equity Fund – Dividend Plan
   ii. Equity Fund – Growth Plan

Net Asset Value (NAV) for the term period from April, 2005 to March, 2010 of these selected mutual funds along with the index value of the benchmark market index S & P CNX NIFTY is taken.

**S & P CNX NIFTY Index**

The Standard & Poor's CRISIL NSE Index 50 or S&P CNX Nifty nicknamed Nifty 50 or simply Nifty (NSE: ^NSEI), is the leading index for large companies on the National Stock Exchange of India. It is a market index and is used by funds to benchmark their fund performance. It is a well diversified 50 stock index accounting for 22 sectors of the economy. It is used for a variety of purposes such as benchmarking fund portfolios, index
based derivatives and index funds. It is owned and managed by India Index Services and Products Ltd. (IISL), which is a joint venture between NSE and CRISIL. It is professionally maintained and is ideal for derivatives trading.

The S&P CNX Nifty covers 22 sectors of the Indian economy and offers investment managers exposure to the Indian market in one portfolio. The S&P CNX Nifty stocks represent about 66.90 percent of the total market capitalization of the National Stock Exchange (NSE).

Daily Net Asset Values (NAVs) are obtained for each of the schemes of the funds and also for the index. The returns are computed using formula:

\[
\text{Return} = \frac{\text{NAV}_t - \text{NAV}_{t-1}}{\text{NAV}_{t-1}}
\]

where,

- \( \text{NAV}_t \) is Net asset value of a mutual fund for a day \( t \),
- \( \text{NAV}_{t-1} \) is Net asset value of a mutual fund for day \( t-1 \).

For the S & P Index, the returns are:

\[
\text{Return} = \frac{\text{Index}_t - \text{Index}_{t-1}}{\text{Index}_{t-1}}
\]

where,

- \( \text{Index}_t \) is S&P Index for a day \( t \),
- \( \text{Index}_{t-1} \) is S&P Index for a day \( t-1 \),
3.3 Tools for Data Collection

The data is basically secondary in nature and has been collected from the journals, publications and various websites like www.mutualfundsindia.com, www.valueresearchonline.com, www.amfiindia.com, www.njfundz.com to name a few.

3.4 Tools for Data Analysis

The data have been analyzed with the help of appropriate statistical techniques like Residual Variance, Mann Whitney U test which are used to measure diversification of portfolio while performance of mutual fund is measured by using Sharpe, Treynor and Jenson Ratio.

To study the diversification pattern of mutual fund, mutual funds were studied in terms of characteristics such as Stock percent, holdings, top ten percent, net assets, and market capitalization.

where, Stock percent is common stock investments as percentage of the fund’s assets, Holdings is the total number of companies held by the fund, Top ten percent is the percentage of net assets invested in the fund’s top ten holdings which is calculated by summing percentage of net assets in top ten holdings. Net Asset is the size of mutual fund. It is in crores of Indian Rupee. Cap is the median market capitalization of the companies / securities held by the fund. Median market capitalization is calculated from the sorted market capitalization of the companies held by the fund.
The fund characteristics that can be used to measure portfolio diversification are capitalization, holdings and top ten percent. Besides, residual variance is also an important measure of fund diversification. Number of companies held by the mutual fund (holdings) and the percentage of assets in top ten holdings can prove to be very useful in gaining insight into mutual fund portfolio diversification because when the number of companies held by the mutual fund is lower or the percentage of assets invested in the top ten holdings is higher, the mutual fund is more concentrated in a few companies and the mutual fund is more susceptible to market fluctuations in these holdings.

**Residual Variance:**

Residual variance can be used to evaluate mutual fund performance by measuring diversification. It is also called unexplained variance. In general, it is known as the variance of any residual. In particular, it is the variance \((y - Y)\) of the difference between any variate \(y\) and its regression function \(Y\). Residual variance tends to decrease as the number of shares held by the mutual fund increases. Thus, higher the residual variance, the less diversified the mutual fund is. Mutual fund portfolio \(p\)'s residual variance, normalized by the total variance of the fund portfolio (or RV) is estimated as:

\[
RV = 1 - \left( \frac{\beta_p^2 \sigma_m^2}{\sigma_p^2} \right)
\]

where,
\[
\beta_p^2 = \text{Beta or systematic risk}
\]
\[
\sigma_m^2 = \text{Variance of return on benchmark}
\]
\[
\sigma_p^2 = \text{Variance of portfolio return}
\]
This estimated residual variance is used to compare the levels of unsystematic risk in portfolios of selected public-sector sponsored and private-sector sponsored mutual funds.

**Mann–Whitney U test**

The **Mann–Whitney U** test (also called the **Mann–Whitney–Wilcoxon** (MWW) or **Wilcoxon rank-sum test**) is a non-parametric statistical hypothesis test for assessing whether one of two samples of independent observations tends to have larger values than the other. It is one of the most well-known non-parametric significance tests as it can be used for both qualitative and quantitative data. It assumes that all the observations from both groups are independent of each other, and the responses are ordinal (i.e. one can at least say, of any two observations, which is the greater).

To perform this test, first of all data is combined and arranged in ascending or descending order of magnitude and are ranked. Rank 1 is given to the lowest item, rank 2 to the next higher value and so on.

For very small samples i.e. (neither of the two samples is greater than 8) When both samples are not more than 8, Mann and Whitney had given a table of exact probabilities. (Goon et al., 1998)

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For small samples i.e. size of larger sample is in between 9 and 20 and size of other sample is less than 20.

The result of this test is given by following formula

\[ U_1 = n_1 \cdot n_2 + n_1 (n_1+1)/2 - R_1 \]

or

\[ U_2 = n_1 \cdot n_2 + n_2 (n_2+1)/2 - R_2 \]

where,

\( n_1 \) and \( n_2 \) are the sample sizes and

\( R_1 \) is the sum of the ranks assigned to the first data and

\( R_2 \) is the sum of the ranks assigned to the second data.

The least of the two values of \( U_1 \) and \( U_2 \) will be \( U \).

The computed value of \( U \) will be compared with the tabulated value of \( U \). If the computed value is less than or equal to tabulated value, then the null hypothesis will be rejected at the stated level of significance.

For large samples i.e. for samples above 20, \( U \) has a normal distribution with

\[ \text{Mean (} \mu \text{)} = \frac{n_1 \cdot n_2}{2} \]
Standard Deviation (or the standard error) is given by

\[ \sigma_U = \sqrt{\frac{n_1 n_2 (n_1 + n_2 + 1)}{12}}. \]

The test statistics is

\[ Z = \frac{U - m_u}{\sigma_u} \]

This value of \( Z \) is compared with the critical value and a decision to accept or reject the null hypothesis is taken.
Sharpe Ratio

Sharpe Ratio or Sharpe Index or reward to variability ratio is a measure of the mean excess return per unit of risk in an investment asset or a trading strategy. Since its revision by the original author made in 1994, it is defined as:

\[ S = \frac{E[R - R_f]}{\text{S.D.} \sqrt{\text{Var}[R - R_f]}} \]

Here R is the asset return, R_f is the return on a benchmark asset, such as the risk free rate of return, E[R - R_f] is the expected value of the excess of the asset return over the benchmark return, and S.D. is the standard deviation of the excess return. The Sharpe ratio is used to characterize how well the return of an asset compensates the investor for the risk taken. When comparing two assets each with the expected return E[R] against the same benchmark with return R_f, the asset with the higher Sharpe ratio gives more return for the same risk. Investors are often advised to pick investment with high Sharpe ratio.
**Treynor Performance Index:**

This model measure the relationship between fund’s additional return over risk free return and market return measured by Beta (β). This is called as Reward to Volatility measure (RVOLp).

\[
(RVOL_p) = \frac{(R_p - R_f)}{\beta_p}
\]

where,

- \(R_p\) = Average rate of return on the portfolio.
- \(R_f\) = Return on risk free asset.
- \(\beta_p\) = Beta or the systematic risk

\(R_p\) and \(R_f\) are calculated in the similar manner as for Sharpe.

For the calculation of Beta the end of the month’s returns for S&P CNX Nifty and the NAV value for the individual funds were taken for a period of 60 months starting from 1\(^{st}\) April 2005 to 31\(^{st}\) March 2010.

The beta used in the formula depicts the systematic risk component. It is calculated as follows:

\[
\beta = \frac{n \sum XY - (\sum X)(\sum Y)}{n \sum X^2 - (\sum X)^2}
\]

where,

- \(X\) = S&P CNX Nifty’s Monthly closing return
- \(Y\) = Fund’s monthly closing NAVs
- \(n\) = Number of observations (in this case \(n = 60\))
Jenson Performance Index:

Jenson's model proposes another risk adjusted performance measure. This measure was developed by Michael Jenson and is sometimes referred to as the Differential Return Method. This measure involves evaluation of the returns that the fund has generated vs. the returns actually expected out of the fund given the level of its systematic risk. The surplus between the two returns is called Alpha, which measures the performance of a fund compared with the actual returns over the period. To calculate Jensen’s alpha we need to estimate the following regression model:

\[ R_{pi} - R_f = \alpha_i + \beta_i (R_m - R_f) \]

where,
- \( R_{pi} \) = Average return on the portfolio,
- \( R_f \) = Risk free return
- \( \alpha_i \) = Jensen’s Alpha for the fund
- \( \beta_i \) = Beta value of funds
- \( R_m \) = Market Return

Jensen’s Performance Index basically calculates the value of Alpha. So the final formula for Jensen’s Alpha becomes:

\[ \alpha_i = (R_{pi} - R_f) - \beta_i (R_m - R_f) \]

Jensen’s alpha is based on the ideas contained in the Capital Asset Pricing Model (CAPM). It, like the Treynor measure, measures how well a portfolio
manager does at dealing with systematic risk. Positive value of \( \alpha \) indicates good performance, whereas negative value indicates poor performance. Jensen’s alpha allows us to get a performance measure that incorporates information from more than one time period.

3.5 Hypotheses

1) \( H_0 \): There is no significant difference in the investment performance of a public sector mutual fund and private sector mutual fund.

2) \( H_0 \): There is no significant difference between diversification of a public sector mutual fund and private sector Indian sponsored mutual fund portfolio.

3) \( H_0 \): There is no significant difference between diversification of a public sector mutual fund portfolio and private sector Foreign sponsored mutual fund portfolio.

4) \( H_0 \): There is no significant difference between diversification of a private sector Indian sponsored mutual fund portfolio and private sector Foreign sponsored mutual fund portfolio.