METHODOLOGY

A stock split is the division of a share into two or more parts. By splitting the share, the value of the company is not increased, but only the capital is redistributed by the increased number of shares. A majority of the companies across the globe have undertaken stock splits for various reasons like liquidity, earnings potential, trading range, recognition etc., and in India, companies have undertaken stock splits since 1999. The earlier studies have shown that most of the companies undertake splits either to create liquidity or to get recognition in the stock market, if they are neglected by the investors. Stock split is seen as a reason to encourage retail investors to trade more in the market. This may be to discourage the Institutional investors to hold their investments as they psychologically feel that retail investors are given more importance and may finally divest their investments. The present study has tried to explore the effect of stock split on price, returns, volume of trade, volatility and profits. The issues are to study the change in the profits, returns, price and volume of trade before and after the split date of the sample companies. The study identifies the variable or group of variables influencing stock split decision. Also, the samples are classified according to different categories of shares listed in BSE India. The purpose of this classification is to explore whether the reasons for splitting shares are same or different in all the category of shares. This chapter discusses the methodology to substantiate the study:

i. Objectives

ii. Hypotheses
iii. Research Design

iv. Population and Sample

v. Sampling Design

vi. Period of Study

vii. Data Collection

viii. Data Analysis

ix. Limitations

i. Objectives

The following are the objectives of the study:

1. To study the universal stock split phenomenon and also process of stock splits among the BSE listed companies during the period of study.

2. To analyse the change in the earnings of the companies prior and post stock split period.

3. To develop a model supporting stock split decisions by analyzing the factors influencing such decisions.

4. To study the effect of stock split decision on price, returns and volume of trade between the pre and post stock split period.

5. To analyse whether splits have created or destroyed the wealth of shareholders during the period of study.

6. To study the information content of stock split and valuation of the sample companies.
7. To analyse the change in earnings of the companies under different categories of split ratio and also according to BSE India categories of companies.

8. To study the influence of stock split decisions on companies under different categories of BSE listed companies.

**ii. Hypotheses**

The following are the hypotheses statements developed for the study,

H1: There is a significant change in Profit after Tax (PAT) before and after the split period.

H2: There is a significant change in the volume of trade of the companies before and after stock split date

H3: There is a significant change in price of shares before and after the split date.

H4: There is a significant change in the returns between pre and post stock split date.

H5: There is a significant association between stock splits and shareholders earnings.

H6: There is a significant association between the information content of stock splits and valuation of stocks.

H7: Stock split is significantly associated with Mangers’ signal of companies’ improved future earnings.
H8: There is a significant change in the profits of companies under various categories of split ratio.

H9: There is no significant difference in the factors influencing stock split decisions among the various categories of companies listed in Bombay Stock Exchange (BSE) India.

H10: There is a significant difference in the PAT (Profit after Tax) prior to split date among different categories of shares listed in Bombay Stock Exchange (BSE) India.

iii. Research Design

Descriptive research is to describe the characteristics of the relevant groups. The descriptive research determines the degree of relationships between variables and also helps in making certain specific predictions. The present study on stock splits is about analyzing the market reaction to stock splits in India and also study the changes in profits, volume of trade, price, and returns before and after the stock split date of the sample companies. The study also aims at exploring the factors determining stock splits in India and hence, Descriptive Research Design is identified as more appropriate for the present study.

iv. Population and Sample

In India, SEBI permitted to split stocks in the year 1999 (Mishra A.K, 2007) and hence the companies which have split their shares between 2000 and 2008 have been considered for the study. This period was selected because a large number of companies had undertaken stock splits during 2000-2008. A total of 629
companies had split stocks during the period of study. The companies which had all the details required for the study viz., profit after tax, share prices, volume of trade etc., were only considered for the study. Efforts were also made to collect the data for the remaining companies but in vain. Some of the companies did not have websites and companies with websites did not update the financials. Therefore only 372 companies (Companies with all the necessary and relevant details such as profit after tax, earnings, stock prices etc.) were considered as the population for the study.

The sample size was determined based on the following:

\[ N = \frac{\pi(1-\pi)z^2}{D^2} \]

\( \pi \) = population proportion

\( z \) = value associated with the confidence level

\( D \) = desired precision

A sample size of 189 was calculated from using the above referred formula. The population proportion was taken as 15% (0.15). 15% of the population was companies with a split ratio of 0.8. Hence population proportion was taken as 0.15.

v. **Sampling Design**

Stratified sampling method was used to draw a sample of 189 for conducting the study. In this method, proportional stratified sampling was used to select samples from each year. Since, the companies are listed in the same stock exchange (Bombay Stock Exchange), wherein the rules for listing companies are the same
across all the categories, proportional stratified sampling was considered appropriate for the study. The population was subdivided into various strata. The total population for the study is 372 companies. Each year was considered as a stratum. The strata sample size is proportionate to strata’s share in the total population which is detailed below. The following method was used to calculate the proportion of each stratum’s share to total population (Panneerselvam, 2005).

No. of companies in each stratum (n)/ Total number of companies (N)

\[ n_1 = 20, \quad n_2 = 10, \quad n_3 = 18, \quad n_4 = 17, \quad n_5 = 25, \quad n_6 = 102, \quad n_7 = 67, \quad n_8 = 60, \quad n_9 = 53 \]

For the year

2000 = \( \frac{n_1}{N} = \frac{20}{372} = 0.05 \)

2001 = \( \frac{n_2}{N} = \frac{10}{372} = 0.03 \)

2002 = \( \frac{n_3}{N} = \frac{18}{372} = 0.04 \)

2003 = \( \frac{n_4}{N} = \frac{17}{372} = 0.04 \)

2004 = \( \frac{n_5}{N} = \frac{25}{372} = 0.07 \)

2005 = \( \frac{n_6}{N} = \frac{102}{372} = 0.27 \)

2006 = \( \frac{n_7}{N} = \frac{67}{372} = 0.18 \)

2007 = \( \frac{n_8}{N} = \frac{60}{372} = 0.17 \)

2008 = \( \frac{n_9}{N} = \frac{53}{372} = 0.15 \)
Table 3.1

Table showing proportion of stratum’s share to Total Population

<table>
<thead>
<tr>
<th>Strata</th>
<th>Number of Companies (n)</th>
<th>Proportion of stratum’s share to total population</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>20</td>
<td>0.05</td>
</tr>
<tr>
<td>2001</td>
<td>10</td>
<td>0.03</td>
</tr>
<tr>
<td>2002</td>
<td>18</td>
<td>0.04</td>
</tr>
<tr>
<td>2003</td>
<td>17</td>
<td>0.04</td>
</tr>
<tr>
<td>2004</td>
<td>25</td>
<td>0.07</td>
</tr>
<tr>
<td>2005</td>
<td>102</td>
<td>0.27</td>
</tr>
<tr>
<td>2006</td>
<td>67</td>
<td>0.18</td>
</tr>
<tr>
<td>2007</td>
<td>60</td>
<td>0.17</td>
</tr>
<tr>
<td>2008</td>
<td>53</td>
<td>0.15</td>
</tr>
<tr>
<td>Total(N)</td>
<td>372</td>
<td>1.00</td>
</tr>
</tbody>
</table>

The sample size is 189 and the strata sample size is calculated in the ensuing page.
Table 3.2
Table showing selection of sample from each stratum

<table>
<thead>
<tr>
<th>Strata</th>
<th>Sample size*proportion of strata</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>189*.05</td>
<td>9</td>
</tr>
<tr>
<td>2001</td>
<td>189*.03</td>
<td>6</td>
</tr>
<tr>
<td>2002</td>
<td>189*.04</td>
<td>8</td>
</tr>
<tr>
<td>2003</td>
<td>189*.04</td>
<td>8</td>
</tr>
<tr>
<td>2004</td>
<td>189*.07</td>
<td>13</td>
</tr>
<tr>
<td>2005</td>
<td>189*.27</td>
<td>51</td>
</tr>
<tr>
<td>2006</td>
<td>189*.18</td>
<td>34</td>
</tr>
<tr>
<td>2007</td>
<td>189*.17</td>
<td>32</td>
</tr>
<tr>
<td>2008</td>
<td>189*.15</td>
<td>28</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>189</strong></td>
</tr>
</tbody>
</table>
vi. **Period of Study**

The period of study was between 2000 and 2008. The period was pegged to 2008 because average profit after tax two years prior and post stock split was considered for the analysis. Hence companies splitting stocks in 2008, the profit after tax up to 2010 was taken as post split period.

vii. **Data Collection**

Primary data was not collected for the study as it was not necessary for the analysis. Secondary data was considered for the analysis. *Nayak et al., (2001), Chen Gow et al., (2006), Mishra, A.K. (2007)* have all used secondary data for conducting research in stock splits. Hence, the researcher has considered secondary data for the present study.

The data for the study were collected from online database like Capital Market and Prowess of **CMIE** (Centre for Monitoring Indian Economy). CMIE is a leading private sector economic research institution which monitors the Indian economy. They undertake research activities and build databases. One such database is PROWESS. It is a database of large and medium Indian firms. It contains detailed private information on all the companies traded on Indian stock exchanges. This database contains information about 22000 companies and around 100 industries. It has all the details about a company viz., date of incorporation, promoters’ details, product profile and financial details for 17 years (1993 to 2008). This database is updated on monthly basis Only those companies which have split stocks for the period of study were considered. From the
companies’ database, key statistical details regarding profits after tax, volume of trade and share prices were extracted and further analysis was carried out.

Capital Market is a fortnightly published magazine exclusively for information of companies listed on BSE and NSE. Capital Line magazine was used as a source to collect the list of companies opting for stock splits year wise.

**viii. Data Analysis**

The companies which have split stocks were classified according to year wise, according to the split ratio and according to the nature of economic activity for the purpose of study. The price of shares five days prior to stock split date of all the companies are extracted from the database. The thirty days average volume of trade prior to stock split of all the companies were collected from the database. Also, two years quarterly average profit after tax prior to and post stock split was considered for the study.

The closing price of the companies shares 15 days prior and post stock split is taken for the study (*Sriram and Senthil, 2009*). The pre split share prices were adjusted for the split ratio before the analysis was done. The split date is referred as $t_0$, the pre split period is $t-1$ and post split period is $t+1$.

The daily returns of the sample shares are extracted from the CMIE (Prowess) database. The Index (to calculate returns from the market $R_m$) considered for the study is BSE 100 Index. The $R_m$ for the period of study is also extracted from the database.

The daily returns of BSE 100 index is considered as the expected return for the sample under study (*Sriram and Senthil, 2009*).
Average Abnormal returns (AAR) and Cumulative Average Abnormal Returns (CAR) were considered to evaluate whether the stock split decision has had any impact on the shareholders’ wealth. Abnormal Returns for company i, period t is calculated as follows:

i. \( \text{AR} = R_{i,t} - R_{m,t} \)

ii. Average abnormal returns (AAR) on a day \( t = \frac{1}{n} \sum_{i=1}^{n} A_{i,t} \)

iii. Cumulative Average Abnormal returns (CAR) = \( \sum_{t=1}^{t+1} A_{ar} \)

Security Return Variability (SRV) model is used to know the market reaction to stock splits. This tool is used to study whether stock split as an event contains information relevant for valuation of securities (Raja et al., 2010). The following is the calculation of the SRV:

\[ SRV_{i,t} = \frac{AR^2_{i,t}}{V(AR)} \]

Where,

\( SRV_{i,t} = \text{Security Returns Variability of security } i \text{ in time } t \)

\( AR^2 = \text{Abnormal Returns of security } i \text{ on day } t \)

\( V(AR) = \text{Variance of Abnormal Returns during the announcement period.} \)
Average Security Returns Variability (ASRV)

\[ \text{ASRV} = \frac{1}{n} \sum_{i,t} \text{SRV}_{i,t} \]

\(\text{SRV}_{i,t}\) = Security Returns Variability of security \(i\) in time \(t\)

\(n\) = Number of stock splits

**Statistical and Financial Tools Used for the Analysis**

<table>
<thead>
<tr>
<th>Statistical Tool</th>
<th>Justification</th>
<th>Hypothesis Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent Sample z test</td>
<td>This test was used to study whether the average abnormal returns calculated from -15 to +15 (total of 31 days) are statistically significant.</td>
<td>H5</td>
</tr>
<tr>
<td>Paired t &amp; z test</td>
<td>This test was used to study the change in the price, returns, profits and volume of trade prior to and post stock splits. Also the change in the average abnormal returns prior to and post split was studied and statistically interpreted.</td>
<td>H1, H2, H3, H4, H5</td>
</tr>
<tr>
<td>AAR &amp; CAR</td>
<td>This tool is used to calculate the abnormal returns for individual companies for each day. Abnormal returns are the difference between the stock return and the index return. This was used to study the abnormal returns earned by the companies prior and post stock split date.</td>
<td>H5</td>
</tr>
<tr>
<td>ASRV</td>
<td>This tool was used to analyse whether stock split contained any information relevant to the valuation of the companies</td>
<td>H6</td>
</tr>
<tr>
<td>Statistical Tool</td>
<td>Justification</td>
<td>Hypothesis Number</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Correlation Matrix (r)</td>
<td>This tool was used to study the correlation between the independent variables. It was used to identify the presence of multicollinearity (i.e., whether the independent variables are highly correlated).</td>
<td>H7, H9</td>
</tr>
<tr>
<td>$R^2$</td>
<td>This tool was used to study the strength of the relationship between the dependent and the independent variables</td>
<td>H7, H9</td>
</tr>
<tr>
<td>Durbin Watson d Statistic</td>
<td>This tool was used to study the presence of autocorrelation among the dependent variable and to prove that there exists a linear relationship between the dependent and the independent variables</td>
<td>H7, H9</td>
</tr>
<tr>
<td>Residual Statistics</td>
<td>This tool was used to test one of the important assumptions of regression, i.e., the standardized predicted values should have a mean of 0 and standard deviation of 1.</td>
<td>H7</td>
</tr>
<tr>
<td>One Way ANOVA</td>
<td>This tool was used to test whether there is any significant difference in the profits after tax among the companies classified according to the split ratio and also according to different categories of shares listed in BSE</td>
<td>H8, H10</td>
</tr>
</tbody>
</table>
Split ratio is calculated in the following way:

\[
\frac{\text{Pre split face value} - \text{Post split face value}}{\text{Pre split face value}}
\]

For instance, if the split ratio is 1:5 i.e., every rupee of a share before split (pre split) will be reduced to \(1/5\)th of the pre split value and post stock split face value will be 0.2

\[
\frac{1 - 0.2}{1} = 0.8
\]

The following is the multiple regression model,

\[
y = a + \beta_1 \text{SP}_i + \beta_2 \text{VOL}_i + \beta_3 \text{PAT}_i + \beta_4 \text{RP}_i + \beta_5 \frac{P}{B_i} + e_i
\]

\(y\) = Split ratio

\(\beta_1, \beta_2, \beta_3, \beta_4\) and \(\beta_5\) are the slopes of the regression coefficients, \(\text{SP}_i, \text{VOL}_i, \text{PAT}_i, \text{RP}_i, \frac{P}{B_i}\) and “\(a\)” is the intercept and ‘\(e\)’ is the residual term.

**Explanatory Variables:**

1. **Price of Shares (SP):** The natural log of price of shares five days prior to split is considered for the analysis. It is found that high priced company shares are likely to split.

2. **Volume of trade:** The natural log of 30 days average volume of trade prior to split is considered for the analysis.
3. **Profit after Tax (PAT):** The natural log of two years average profit after tax prior to the split is considered for the analysis.

4. **Run up (RP):** The ratio of price of shares five days prior to split to share price one year prior to split is considered for the analysis.

5. **Price to Book Ratio (P/B):** This price to book ratio five days prior to split is considered for the analysis. This variable is basically used to explore whether valuation factor influences the stock split decision.

ix. **Limitations**

The following are the limitations of the study:

i. The companies which are listed in Bombay Stock Exchange (BSE) are only considered for the study.

ii. The ‘other incomes’ are not considered for the analysis. Only Profit after tax was considered as the database did not contain information of the other income for most of the companies.

iii. The study and the findings on stock splits are limited to Indian context and hence cannot be generalised.