CHAPTER III
DATA BASE AND RESEARCH METHODOLOGY

This chapter discusses the universe of the study, sample selection, techniques of data collection, the statistical tools used in the analysis of data, hypotheses and the definitions of various variables used in this study.

3.1 UNIVERSE AND SAMPLE OF THE STUDY

BT-500 companies from the private sector rated on the basis of their market capitalisation constitute the universe of this study (BT-500 India’s Most Valuable Private Sector Companies for the year ended March 31, 2007).

The following filters were applied to select the sample:

I) The companies belonging to the financial service sector (i.e. banks and financial institutions) were eliminated.

II) The companies not existing in ‘PROWESS”, database of CMIE were eliminated.

III) The companies, for which data regarding all the explanatory variables for a period of 15 years (i.e. from 1993-94 to 2007-08) was not available, were eliminated.

Thus, as a result of these filters, a resultant sample of 312 non-banking and non-financial companies was selected and studied for the period 1993-94 to 2007-08 to identify the determinants of corporate growth.

Since industry characteristics have vital concern in the analysis of growth of companies (Schmalensee, 1989), so both expanding and stagnant industries have been taken in the study to give it an approximate balance. Hence inter industry research can help to a great extent in formulating sound theory and making policies for specific industries. The industry - wise classification of the selected companies has been given in table 3.1.
Table 3.1 Industry Wise Classification of the Sample Companies

<table>
<thead>
<tr>
<th>Industry</th>
<th>Number of Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agro</td>
<td>25</td>
</tr>
<tr>
<td>Automotive</td>
<td>43</td>
</tr>
<tr>
<td>Capital and Engineering goods</td>
<td>46</td>
</tr>
<tr>
<td>Cement</td>
<td>13</td>
</tr>
<tr>
<td>Chemical</td>
<td>18</td>
</tr>
<tr>
<td>FMCGs</td>
<td>31</td>
</tr>
<tr>
<td>Entertainment and Media</td>
<td>13</td>
</tr>
<tr>
<td>Petrochemical</td>
<td>15</td>
</tr>
<tr>
<td>Life sciences and Pharmaceutical</td>
<td>44</td>
</tr>
<tr>
<td>Software, IT and ITES</td>
<td>27</td>
</tr>
<tr>
<td>Steel</td>
<td>18</td>
</tr>
<tr>
<td>Textile</td>
<td>23</td>
</tr>
<tr>
<td>Total</td>
<td>312</td>
</tr>
</tbody>
</table>

3.2 DATA SOURCE

This study is based on secondary data. The data related to all the explanatory corporate growth variables for a period of 15 years (i.e. from 1993-94 to 2007-08) have been taken from PROWESS, the database of CMIE (Center for Monitoring Indian Economy). Also, balance sheet and profit and loss statements published by these companies every year in their annual reports have been a source of information which was accessed from the site of SEBI (http://sebiedifar.nc.in/).

3.3 ANALYSIS OF DATA

Analysis of data has been done objective wise discussing the statistical tools used in the analysis.
3.3.1 Measuring the Extent of Corporate Growth

The extent of corporate growth focuses on studying movement of companies between the different growth categories over the selected period of time. Thus a growth extent will indicate whether companies have moved towards higher growth categories, or shifted back to low growth categories, or did not move over entire study period. This analysis has been carried out for individual companies and also for industries to which these companies belong.

Based on the theoretical considerations\(^1\) and empirical research\(^2\), compounded annual growth rate of net sales (CAGRNS) and compounded annual growth rate of market capitalisation (CAGRMC) have been used as growth measures for measuring extent of corporate growth. These measures have been used in the studies conducted by Kumar (1982), Kaur (1997), Shergill and Sarkaria (1999), Kakani et al. (2001) and Sarkaria (2001).

To estimate the compounded annual growth rate of net sales and market capitalisation, the following model was used:

\[
\ln Y = \gamma + \beta t + U \tag{1}
\]

Where

\[Y = \text{value of the variable;}\]
\[t = \text{time variable;}\]
\[U = \text{stochastic disturbance term.}\]

The compounded growth rate \(\hat{\beta}\) is worked out with the following formula:

\[
r = (\text{Antilog } \hat{\beta} - 1) \times 100 \tag{2}
\]

Where \(\hat{\beta}\) is the ordinary least square of \(\beta\) in model (1).

But before proceeding with the empirical validity of the growth rates, it is an implied condition to check statistically the conformity of compounded growth rate distributions to the normal distributions. For this purpose, Skewness and Kurtosis statistics have been estimated, which represent good descriptive indices for measuring the normality (see

---

\(^1\) For details, see Chapter I, Introduction: Theoretical Framework for Corporate Growth.
\(^2\) For details, see Measuring Growth, pp. 33 to 35, Chapter II, Review of Literature.
The Skewness index measures the degree of symmetry of a distribution i.e. if $\sqrt{\beta_1} > 0$ it is skewed to the right, while $\sqrt{\beta_1} < 0$ correspond the skewness towards left. Similarly, Kurtosis index measures the flatness or the peakedness of the distribution. Hence, a distribution with $\beta_2 > 3$ will have a thicker tail than the normal distribution where as the distribution with $\beta_2 < 3$ will exhibit a lighter tail and a broader peak than the normal distribution.

For the first objective (i.e. to examine the extent of corporate growth), companies under the study have been divided into three categories i.e. High Growth Companies, Medium Growth Companies, and Low Growth Companies on the basis of their growth rates. In order to identify the range of high, medium and low growth rates, 33.3 and 66.7 percent percentiles respectively have been calculated (see Kumar, 1982; Kaur, 1997; National Human Development Report, 2005; Rajamohan, 2006; Ozonoff et al., 2009).

**Descriptive Statistics**

Descriptive statistics like minimum, maximum, mean, standard deviation and range were computed to describe and summarize the given data, bringing out their important features.

**3.3.2 Relationship between Gibrat’s Law and Growth of Firms in India**

For the second objective (i.e. whether the growth of different size classes has the same average proportionate rate of growth), compounded annual growth rate of net sales and market capitalisation have been regressed on opening size. If the growth rates will be systematically different for different size classes, then size would explain at least a part of firm’s growth process (Mansfield, 1962; Brusco et al., 1979; Kumar, 1985; Evans, 1987; Dunne and Hughes, 1994; Rufin, 2005).

Thus, in order to investigate the growth behavior of the firms, following relationship was used:

$$ g_i = \gamma_i + \beta_i S_i + u_i $$

Where

- $g_i$ = compounded annual growth rate (of net sales and market capitalisation) for the $i$th firm in percent per annum;

---

3 For details, see Chapter IV, Extent of Corporate Growth.
\[ S_i = \text{opening size (measured in terms of total assets for the accounting year 1993-94) of the firm } i; \]
\[ u_i = \text{disturbance term;} \]

And \((\gamma_i \& \beta_i)\) are the parameters to be estimated.

Hence, if parameter \(\beta = 1\), firm size has no effect on its growth and Gibrat’s law will hold (assuming that the disturbances, \(U_{it}\), are independently distributed over time). However, if parameter \(\beta \neq 1\), size and growth relationship will depart from Gibrat’s law and would follow another line of research. That is, if parameter \(\beta > 1\), then firm growth path is explosive and firms tend to grow faster as they get larger. Otherwise, if parameter \(\beta < 1\), smaller/younger firms will grow faster than larger one’s.

3.3.3 Determinants of Corporate Growth in India in Post Liberalisation Period

For the third objective (i.e. to study the determinants of corporate growth in India in post liberalisation period), the analysis has been divided into two sections.

Section I of the analysis deals with the determinants of growth of selected Indian companies during the period 1993-94 to 2007-08. Section II has examines the inter industry determinants of corporate growth.

The growth of a firm measured in CAGRNS and CAGRMC have been taken as the dependent variables. There are a number of variables which affect the growth of a firm, such as, size, age, profitability, R&D intensity, advertising intensity, exports, efficiency, leverage, liquidity, market value added ratio, market share, retention ratio, diversification and nature of industry. All these variables have been taken as independent variables.

Following statistical techniques have been applied:

Pearson Product Moment Correlation (r) has been computed to examine the correlation between the dependent and independent variables.

Factor Analysis Technique was run to reduce the large number of variables to a few factors that explain a lot of variance. In the present study the extracted factors had explained maximum variance of 65.39 percent and 65.15 percent respectively with

---

\(^4\) For details, see Chapter V, Gibrat’s Law and Growth of Firms in India.
compounded annual growth rate of net sales and market capitalisation. There were problems in labelling of the factors (i.e. some variables with different nature grouped in one factor) and exclusion of some important variables which have been perceived to be important (e.g. age, market share, R&D intensity and market value added ratio).

Therefore, in order to examine the impact of various determinants on corporate growth, Multiple Regression Analysis has been applied. The following model has been used:

\[
Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + \beta_{13} X_{13} + \beta_{14-25} X_{14-25} + \varepsilon
\]

Where

- \( Y \) = Compounded annual growth rate of net sales and market capitalisation of a firm;
- \( X_1 \) = Size of a firm measured by total assets or net sales;
- \( X_2 \) = Profitability of a firm measured in ROCE or RONW or Net Profit Ratio;
- \( X_3 \) = Age of a firm (from year of incorporation till March, 2008);
- \( X_4 \) = Advertising intensity of a firm;
- \( X_5 \) = Retention ratio of a firm;
- \( X_6 \) = Liquidity position of a firm expressed in current ratio or quick ratio;
- \( X_7 \) = Efficiency ratio of a firm measured by asset turnover ratio;
- \( X_8 \) = Leverage position of a firm;
- \( X_9 \) = Diversification of a firm measured as a proxy of number of products;
- \( X_{10} \) = Research and development intensity of a firm;
- \( X_{11} \) = Export ratio of a firm;
- \( X_{12} \) = Market value added ratio of a firm measured by market price to book value of outstanding shares;
\(X_{13}\) = Market share of a firm measured as proportion of firm’s sales in the total sales of industry to which it belongs in the same period;

\(X_{14-25}\) = Industry type\(^5\)

\(\beta\) = Slope of the independent variables while \(\beta_0\) is a constant or the value of \(Y\) when all values of \(X\) are zero;

\(\varepsilon\) = The error term, normally distributed about a mean of 0.

For the variables namely size, profitability, advertising intensity, retention ratio, liquidity, efficiency, leverage, diversification, R&D intensity, export ratio, market value added ratio and market share, averages have been computed. Similar measures have been used in the past researches also (see, Kumar, 1982; Nagarajan and Barthwal, 1990; Grinyer and Mc Kiernam, 1991; Kaur, 1997; Narayan, 1998; Rama, 1998; Glancey, 1998; Fenny and Roger, 1999; Shergill and Sarkaria, 1999; Kakani et al., 2001; Harabi, 2003 and Chander and Aggarwal, 2007).

Two separate regression models were tested for each of the dependent variables (i.e. compounded annual growth rate of net sales and compounded annual growth rate of market capitalisation). Different equations were run with the different surrogate measures of profitability (i.e. ROCE or RONW or net profit ratio) and liquidity (i.e. current ratio or quick ratio) for each of these dependent variables. The best fit equation has been picked for discussion with each of the dependent variable.

Thus, after analyzing the results of Multiple Regression Analysis, Backward Stepwise Regression Analysis has been used to refine the regression models, separating non-contributing variables from contributing variables in an iterative process. The fit of the model is tested after the elimination of each variable to ensure that the model still adequately fits the data. When no more variables can be eliminated from the model, the analysis has been completed (Malhotra, 2006, p.548)\(^6\).

\(^5\) 14=Agro; 15=Capital & Engineering Goods; 16= Cement; 17= Chemical; 18= FMCGs; 19= Media, Entertainment; 20= Petrochemicals; 21= Life sciences & Pharmaceuticals; 22= Software, IT, and ITES; 23= Steel; 24= Textiles; 25= Automotive (Dummy).

\(^6\) For details, see Chapter VI, Section I, Determinants of Corporate Growth in India in Post Liberalisation Period.
Therefore, variables have been removed one by one and based on the contribution to explained variance, improved value of Adjusted $R^2$, behaviour of significant variables and assumption of auto correlation i.e. Durbin Watson value in predicted direction (Gujarati, 2006, p.260), the best fit model has been picked for discussion with each of the dependent variable (i.e. CAGRNS and CAGRMC) respectively.

For the purpose of analyzing the role of industry membership in explaining the growth of companies operating in different industries, Backward Stepwise Regression Analysis has been used. Two separate regression models have been tested for both dependent variables i.e. compounded annual growth rate of net sales and market capitalisation for companies in each industry. However, due to the presence of insufficient number of companies in cement industry (13), chemical industry (18), media and entertainment industry (13), petrochemical industry (15), steel industry (18) and textile industry (23); for the final model with both dependent variables (i.e. compounded annual growth rate of net sales and market capitalisation) the variance – co variance matrix is singular. Hence influence statistics cannot be computed.

3.3.4 Inter-Temporal Variations in the Determinants of Corporate Growth

For the fourth objective (i.e. to examine variations in growth overtime), the entire period of 15 years has been divided into three sub-periods from 1993-94 to 1997-98, 1998-99 to 2002-03, and 2003-04 to 2007-08. Product Moment Correlation Coefficient Analysis and Backward Stepwise Regression Analysis was used to examine the impact of various firm specific attributes on the growth behavior of the companies in the three different sub periods through which Indian economy has passed in the post liberalisation period.

3.4 HYPOTHESES OF THE STUDY

Keeping into consideration the objectives of the study, the following null and alternate hypotheses were framed and tested.

---

7 For details, see Chapter VI, Section II, Inter Industry Determinants of Corporate Growth in India in Post Liberalisation Period.
8 For details, see Chapter VII, Inter temporal Variations in the Determinants of Corporate Growth.
9 For details, see, Chapter V, VI and VII.
3.4.1 Hypotheses related to Gibrat’s Law and Growth of Firms in India

\[ H_01: \text{The growth of different size classes has the same average proportionate rate of growth.} \]

\[ H_1: \text{The growth of different size classes has not the same average proportionate rate of growth.} \]

\[ H_02: \text{The size of companies in different industries does not significantly influence their growth rates.} \]

\[ H_2: \text{The size of companies in different industries significantly influences their growth rates.} \]

3.4.2 Hypotheses related to Determinants of Corporate Growth in India in Post Liberalisation Period

\[ H_{01}: \text{The size of a firm as measured by total assets has no significant impact on its growth.} \]

\[ H_1: \text{The size of a firm as measured by total assets has a significant impact on its growth.} \]

\[ H_{02}: \text{The profitability of a firm as measured by ROCE or RONW or Net profit ratio has no significant impact on its growth.} \]

\[ H_2: \text{The profitability of a firm as measured by ROCE or RONW or Net profit ratio has a significant impact on its growth.} \]

\[ H_{03}: \text{The age of a firm has no significant impact on its growth.} \]

\[ H_3: \text{The age of a firm has a significant impact on its growth.} \]

\[ H_{04}: \text{The advertising intensity of a firm as measured by the ratio of advertising and marketing expenditure to net sales has no significant impact on its growth.} \]
**H₄:** The advertising intensity of a firm as measured by the ratio of advertising and marketing expenditure to net sales has a significant impact on its growth.

**H₀₅:** The retention ratio of a firm has no significant impact on its growth.

**H₅:** The retention ratio of a firm has a significant impact on its growth.

**H₀₆:** The liquidity position of a firm as measured by current ratio or quick ratio has no significant impact on its growth.

**H₆:** The liquidity position of a firm as measured by current ratio or quick ratio has a significant impact on its growth.

**H₀₇:** The efficiency ratio of a firm as measured by assets turnover ratio has no significant impact on its growth.

**H₇:** The efficiency ratio of a firm as measured by assets turnover ratio has a significant impact on its growth.

**H₀₈:** The leverage of a firm has no significant impact on its growth.

**H₈:** The leverage of a firm has a significant impact on its growth.

**H₀₉:** The diversification of a firm as measured by number of products has no significant impact on its growth.

**H₉:** The diversification of a firm as measured by number of products has a significant impact on its growth.

**H₀₁₀:** The research and development intensity of a firm as measured by the ratio of research and development expenditure (both current and capital) to net sales has no significant impact on its growth.
**H_{10}:** The research and development intensity of a firm as measured by the ratio of research and development expenditure (both current and capital) to net sales has a significant impact on its growth.

**H_{011}:** The export ratio of a firm as measured by exports to net sales has no significant impact on its growth.

**H_{11}:** The export ratio of a firm as measured by exports to net sales has a significant impact on its growth.

**H_{012}:** The market value added ratio of a firm as measured by the market price to the book value of shares has no significant impact on its growth.

**H_{12}:** The market value added ratio of a firm as measured by the market price to the book value of shares has a significant impact on its growth.

**H_{013}:** The market share of a firm measured as proportion of a firm’s sales to the total sales of an industry to which it belongs in the same period has no significant impact on its growth.

**H_{13}:** The market share of a firm measured as proportion of a firm’s sales to the total sales of an industry to which it belongs in the same period has a significant impact on its growth.

**H_{014}:** The nature of industry to which a particular firm belongs does not significantly affect its growth.

**H_{14}:** The nature of industry to which a particular firm belongs significantly affects its growth.
3.4.3 Hypotheses related to Inter Temporal Variations in the Determinants of Corporate Growth in India

The hypotheses listed above (i.e. null hypotheses from $H_{01}$ to $H_{014}$ and alternate hypotheses from $H_1$ to $H_{14}$ related to determinants of corporate growth in India in post liberalisation period) have been tested for three sub periods from 1993-94 to 1997-98, 1998-99 to 2002-03 and 2003-04 to 2007-08 in order to study the inter temporal variations in the determinants of corporate growth in India.

3.5 DEFINITION OF VARIOUS VARIABLES USED

3.5.1 Growth of a Firm

Growth of a firm has been measured in two explanatory variables, namely net sales and market capitalisation.

Net Sales \[=\] Total Sales \(-\) Sales Returns, Allowances and Discounts

Market Capitalisation \[=\] Market Capitalisation as on March 31 of the financial year since 1993-94 to 2007-08

3.5.2 Size of a Firm

Size of a firm has been measured in either net sales or total assets.

Net Sales \[=\] Total Sales \(-\) Sales Returns, Allowances and Discounts

Total Assets \[=\] Net Fixed Assets + Total Current Assets

3.5.3 Profitability of a Firm

Profitability of a firm has been measured in either return on net worth (RONW) or return on capital employed (ROCE) or net profit ratio.

ROCE \[=\] \(\frac{\text{PAT (NNRT)}}{\text{Capital Employed}}\)

RONW \[=\] \(\frac{\text{PAT (NNRT)}}{\text{Net Worth}}\)

Net Profit Ratio \[=\] \(\frac{\text{Net Profit}}{\text{Net Sales}}\)

---

\(10\) PAT (NNRT)= Profit after Tax, net of non-recurring transactions;

---

42
3.5.4 Age of a Firm

Age of a firm has been measured from the year of incorporation till March 31, 2008.

3.5.5 Advertising Intensity of a Firm

Advertising intensity of a firm has been measured as ratio of advertising and marketing expenditure to net sales.

3.5.6 Retention Ratio of a Firm

The retention ratio of a firm has been measured as the ratio of retained profits to net profits.

3.5.7 Liquidity Position of a Firm

Liquidity position of a firm has been measured as the current ratio (current assets to current liabilities) or quick ratio (quick assets to current liabilities).

3.5.8 Efficiency of a Firm

The efficiency ratio of a firm has been measured by assets turnover ratio.

3.5.9 Leverage of a Firm

Leverage of a firm has been measured as a ratio of total debt to equity.

3.5.10 Diversification of a Firm

Diversification of a firm has been measured by its number of products.

3.5.11 Research and Development Intensity of a Firm

Research and Development intensity of a firm has been measured as a ratio of firm’s research and development expenditure (both current and capital) to its net sales.

3.5.12 Export Ratio of a Firm

The export ratio of a firm has been measured by its total exports to net sales.

3.5.13 Market Value Added Ratio of a Firm

Market value added ratio of a firm has been measured as market price to the book value of shares.
3.5.14 Market Share of a Firm

The market share of a firm has been measured as proportion of a firm’s sales to the total sales of an industry to which it belongs.

3.5.15 Nature of Industry

The companies have been categorized on the basis of industry classification done by BT-500 companies (BT-500 India’s Most Valuable Private Sector Companies for the year ended March 31, 2007).

For convenience, media and telecommunication, capital goods and engineering and construction industries have been combined. The sample of 312 companies was divided into 12 industries as follows:

1=Agro; 2=Capital & Engineering Goods; 3= Cement; 4= Chemical; 5= FMCGs; 6= Media & Entertainment; 7= Petrochemicals; 8= Life sciences & Pharmaceuticals; 9= Software, IT & ITES; 10= Steel; 11= Textiles; 12= Automotive (Dummy).

Automotive industry has been picked up as a proxy industry in the regression analysis. Hence the growth of other industries has been measured in relation to proxy (i.e. automotive) industry.