Research Methodology
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3.1 Introduction

This chapter deals with the methodology followed for carrying out the study. The method of sample selection, data and sources of data, framework of analysis, the hypotheses framed and important terms used in the study are discussed here.

3.2 Sample

The study pertains to Indian Steel Companies. Secondary data have been used for the study. Corporate database, 'PROWESS', maintained by the Center for Monitoring Indian Economy (CMIE) Pvt. Ltd, Mumbai, India and CAPITALINE PLUS of Capital Market Publishers India Pvt. Ltd, Mumbai, India, are the sources of data. Twenty three Steel Companies have been selected for the study. They are given in Table 3.1
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Company Name</th>
<th>Abbreviation Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Adhunik Metaliks Ltd</td>
<td>AML</td>
</tr>
<tr>
<td>2</td>
<td>Bhushan Power and Steel Ltd</td>
<td>BPSL</td>
</tr>
<tr>
<td>3</td>
<td>Bhushan Steel Ltd</td>
<td>BSL</td>
</tr>
<tr>
<td>4</td>
<td>Essar Steel Ltd</td>
<td>ESL</td>
</tr>
<tr>
<td>5</td>
<td>The Indian Seamless Metal Tubes Ltd</td>
<td>ISMT</td>
</tr>
<tr>
<td>6</td>
<td>Ispat Industries Limited</td>
<td>IIL</td>
</tr>
<tr>
<td>7</td>
<td>Jindal SAW Limited</td>
<td>JSL</td>
</tr>
<tr>
<td>8</td>
<td>JSL Stainless Limited</td>
<td>JSLSL</td>
</tr>
<tr>
<td>9</td>
<td>JSW Steel Ltd</td>
<td>JSWL</td>
</tr>
<tr>
<td>10</td>
<td>Lloyds Steel Industries Ltd</td>
<td>LSIL</td>
</tr>
<tr>
<td>11</td>
<td>Mahindra Ugine Steel Company Ltd</td>
<td>MUSCL</td>
</tr>
<tr>
<td>12</td>
<td>Mukand Ltd</td>
<td>ML</td>
</tr>
<tr>
<td>13</td>
<td>National Steel &amp; Agro Industries Ltd</td>
<td>NSAIL</td>
</tr>
<tr>
<td>14</td>
<td>Ramsarup Industries Ltd</td>
<td>RIL</td>
</tr>
<tr>
<td>15</td>
<td>Rashtriya Ispat Nigam Ltd</td>
<td>RINL</td>
</tr>
<tr>
<td>16</td>
<td>Steel Authority of India Ltd</td>
<td>SAIL</td>
</tr>
<tr>
<td>17</td>
<td>Shah Alloys Ltd</td>
<td>SAL</td>
</tr>
<tr>
<td>18</td>
<td>Sunflag Iron &amp; Steel Company Ltd</td>
<td>SISCL</td>
</tr>
<tr>
<td>19</td>
<td>Surya Roshni Ltd</td>
<td>SRL</td>
</tr>
<tr>
<td>20</td>
<td>Tata Steel Ltd</td>
<td>TSL</td>
</tr>
<tr>
<td>21</td>
<td>Tata Steel Processing &amp; Distribution Ltd</td>
<td>TSPDL</td>
</tr>
<tr>
<td>22</td>
<td>Usha Martin Ltd</td>
<td>UML</td>
</tr>
<tr>
<td>23</td>
<td>Uttam Galva Steels Ltd</td>
<td>UGSL</td>
</tr>
</tbody>
</table>
3.2.1. Sampling Procedure

The first step in selecting companies is the identification of the population from which further selection has been carried out. List of companies listed in Bombay Stock exchange available under Indian Steel companies in the corporate databases constitutes the population. The study units have been chosen on the basis of convenience sampling. Initially six hundred and twelve steel companies in India that are listed in the Bombay Stock Exchange were identified. But on verification it has been found that some companies have data for the entire study period while others don’t have. Out of the six hundred and twelve companies identified, twenty six large steel companies in India listed in the Bombay Stock Exchange were selected. Out of these, companies for which financial statements are available for a ten year period from 2001-02 to 2010-11 have been included in the sample are selected for the study. As such sample size had to be restricted to twenty three-(88 per cent of the population) due to the non-availability of data for a ten-year period.

3.3 Data and Sources of Data

Data used for the study are secondary in nature. Corporate databases ‘Prowess’ and ‘Capitaline Plus’, which contain the annual reports of the companies are the sources of data. Variables used in the study have been selected after a detailed examination of literature available on the research topic and also after consultation with the subject experts. Data for the following items have been collected for the purpose of the study.
3.3.1. Adjustment in the Data

Data used in the study are taken from database, which compile the data based on financial statements published by the companies. Some of the companies report data for a period lesser or greater than 12 months, but such data have been annualized.

3.4. Framework of Analysis

For the purpose of analysis of data, accounting ratios, statistical tools and few models on working capital is used. The various accounting ratios employed are given below.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Variable</th>
<th>S. No.</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>Current Assets</td>
<td>x</td>
<td>Net Working Capital</td>
</tr>
<tr>
<td>ii</td>
<td>Quick Assets</td>
<td>xi</td>
<td>Current Liabilities</td>
</tr>
<tr>
<td>iii</td>
<td>Cash and Bank Balance</td>
<td>xii</td>
<td>Loans and Advances</td>
</tr>
<tr>
<td>iv</td>
<td>Inventory</td>
<td>xiii</td>
<td>Total debts</td>
</tr>
<tr>
<td>v</td>
<td>Sundry Debtors</td>
<td>xiv</td>
<td>Return on assets</td>
</tr>
<tr>
<td>vi</td>
<td>Sundry Creditors</td>
<td>xv</td>
<td>Sales</td>
</tr>
<tr>
<td>vii</td>
<td>Total Assets</td>
<td>xvi</td>
<td>Size of the firm</td>
</tr>
<tr>
<td>viii</td>
<td>Fixed Assets</td>
<td>xvii</td>
<td>Growth Rate</td>
</tr>
<tr>
<td>ix</td>
<td>Gross Working Capital</td>
<td>xviii</td>
<td>Cash Conversion Cycle</td>
</tr>
<tr>
<td>S. No.</td>
<td>Ratios</td>
<td>S. No.</td>
<td>Ratios</td>
</tr>
<tr>
<td>-------</td>
<td>--------------------------------------------</td>
<td>-------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>i</td>
<td>Current Assets to Total Assets</td>
<td>ix</td>
<td>Inventory Turnover Ratio</td>
</tr>
<tr>
<td>ii</td>
<td>Current Assets to Gross Fixed Assets</td>
<td>x</td>
<td>Debtors Turnover Ratio</td>
</tr>
<tr>
<td>iii</td>
<td>Current Assets to Sales</td>
<td>xi</td>
<td>Creditors Turnover Ratio</td>
</tr>
<tr>
<td>iv</td>
<td>Net Working Capital to Current Assets</td>
<td>xii</td>
<td>Return on Asset</td>
</tr>
<tr>
<td>v</td>
<td>Leverage</td>
<td>xiii</td>
<td>Total Current Liabilities/Total Assets</td>
</tr>
<tr>
<td>vi</td>
<td>Current Ratio</td>
<td>xiv</td>
<td>Inventory to Current Assets</td>
</tr>
<tr>
<td>vii</td>
<td>Quick Ratio</td>
<td>xv</td>
<td>Loans and Advances to Current Assets</td>
</tr>
<tr>
<td>viii</td>
<td>Cash Turnover Ratio</td>
<td>xvi</td>
<td>Liquid Funds to Current Assets</td>
</tr>
</tbody>
</table>

In addition to ratios, cash conversion cycle, gross working capital, net working capital, current liabilities, size, and growth rate have also been used for assessing working capital.

Statistical tools applied include Arithmetic Mean, Standard Deviation, Coefficient of Variation, Analysis of Variance (ANOVA), Kendall’s Coefficient of Concordance, Chi-square test, Correlation, Simple Regression, Multiple Regression, and Stepwise Regression.

Popular models on working capital also have been used. They are:

(i) Bhattacharya’s Efficiency Index Model and
(ii) Motaal’s Ultimate Test of Comparative Liquidity.
Ratios, statistical tools and models as employed in each chapter are discussed below.

3.4.1. Tools Used - Chapter IV

Chapter IV is divided into two parts. In the first half, the size of the working capital in the steel companies has been measured through gross working capital, current assets to total assets, current assets to gross fixed assets, current assets to sales, and net working capital. Ratio analysis is used to measure the size. Growth in working capital, growth in sales and relationship between these two is studied with the help of regression analysis.

In the second half, components of working capital, such as inventory, sundry debtors, cash and bank balances and loans and advances, are measured to examine how large are the investment in current assets and the investments in its various components, by computing the mean, standard deviation and coefficient of variation for company wise and year wise for the period of ten years from 2001-02 to 2010-11. proportion of each component to total current assets is calculated by percentage analysis and presented in a table.

3.4.2. Tools Employed - Chapter V

Working capital policies have been examined in this chapter. Exercising of proper working capital policy and maintenance of proper finance are very important for every organization and they have significant impact on company’s performance and growth. To measure the degree of aggressiveness of investments in current assets, the current assets to total assets ratio is used. The total current liability to total assets ratio is used to measure the degree of aggressive of financing policy. To examine of significance of the differences among the working capital investment policies of the select companies one-way ANOVA test is applied. The mean values are subject to the Turkey’s Honestly Significant Difference (HSD) test. To measure the relationship between current asset investment and financing policies, rank order correlation is performed to test the null
hypothesis. Regression analysis is employed to examine the changes in policies and the changes in their relationship among the companies.

The following null hypotheses have been framed and tested through one-way ANOVA.

1. Ho – There is no difference in the investment policies across steel companies.
2. Ho – There is no difference in the financing policies across the companies.
3. Ho – An aggressive current assets investment policy is not accompanied by an aggressive current assets financing policy.

3.4.3 Tools Used - Chapter VI

Efficiency of working capital performance is examined in the sixth chapter. An attempt is made here to assess the working capital efficiency of selected steel companies through ratio analysis, Motaal's Ultimate Test of Comparative Liquidity, and Bhattacharya's efficiency index model.

Ratios selected for the analysis are:

i. Current Ratio
ii. Quick Ratio
iii. Inventory Turnover Ratio
iv. Debtors Turnover Ratio
v. Cash Turnover Ratio and
vi. Creditors Turnover Ratio

Apart from these ratios cash conversion cycle is calculated to assess how many days it takes to convert from cash to cash.

Mean values and coefficient of variation are ascertained for ratios for comparisons. Standard deviation is used for calculating coefficient of variation. To find out the differences among the mean values across years as well as across companies, null hypothesis have been framed and tested through ANOVA. They are
1. Ho- Mean values of current ratios do not differ significantly across years and across companies.

2. Ho- Mean values of quick ratios do not differ significantly across years and across companies.

3. Ho- Mean values of inventory turnover ratios do not differ significantly across years and across companies.

4. Ho- Mean values of debtors turnover ratios do not differ significantly across years and across companies.

5. Ho- Mean values of cash turnover ratios do not differ significantly across years and across companies.

6. Ho- Mean values of creditors turnover ratios do not differ significantly across years and across companies.

7. Ho- Mean values of cash conversion cycle do not differ significantly across years and across companies.

For assessing the liquidity, Motaal’s Comprehensive test is employed. Net working capital to current assets, liquid funds to current assets, loans and advances to current assets, and inventory to current assets are used for ranking. Kendell’s Coefficient of Concordance (W) has been computed to assess the degree of uniformity in liquidity of steel companies and chi-square test has been applied for testing the significance of Kendell’s Coefficient (W). The confidence level chosen is five per cent.

The following hypothesis has been framed and tested.

_Ho: There is no significant difference in liquidity among the companies._

In order to evaluate how the components of individual current assets have performed, how efficiently current assets are utilized and how efficiently such assets are
managed Bhattacharya’s Efficiency index model is used. This model involves construction of performance index, utilization index and efficiency index.

3.4.4 Tools Used - Chapter VII

While conducting the day to day business activities, a firm is required to maintain a balance between liquidity and profitability. Considering the potential contribution of steel companies to the economy of India, an attempt to measure and analyze the association between efficient management of working capital and the profitability of steel companies has been made in this chapter.

Independent variables representing working capital have been identified to assess their impact on profitability. These variables are Current Ratio, Quick Ratio, Inventory Turnover Ratio, Debtor’s Turnover Ratio, Creditors Turnover Ratio, Cash Turnover Ratio, Cash Conversion Cycle, Size, Leverage and Growth. The dependent variable ‘profitability’ is measured in terms of Return on Asset (ROA) ratio.

i. Correlation analysis

Pearson’s Correlation analysis has been performed to find out the nature and strength of relationship between independent variables respectively working capital and return on asset. The level of confidence chosen for ‘r’ statistic is five per cent. When the value of ‘r’ is significant at five per cent level, the relationship is inferred as highly significant.

ii. Multiple regression analysis

Multiple regression technique has been applied to study the combined influence of the selected ratios relating to working capital management on the profitability of steel companies. All the variables used in correlation analysis are introduced in the regression equation as shown below:

\[
\text{ROA}_t = a + b_1 \text{CR}_t + b_2 \text{QR}_t + b_3 \text{ITR}_t + b_4 \text{DTR}_t + b_5 \text{CRTR}_t + b_6 \text{CTR}_t \\
+ b_7 \text{CCC}_t + b_8 \text{GR}_t + b_9 \text{Lev}_t + b_{10} \text{size}_t + e
\]
where,

\[
\begin{align*}
\text{ROA} & = \text{Return on Asset} \\
a & = \text{Intercept term} \\
b_{1...13} & = \text{Regression coefficients} \\
t & = \text{time period} \\
\text{CR} & = \text{Current ratio} \\
\text{QR} & = \text{Quick ratio} \\
\text{ITR} & = \text{Inventory turnover ratio} \\
\text{DTR} & = \text{Debtors turnover ratio} \\
\text{CRTR} & = \text{Creditors turnover ratio} \\
\text{CTR} & = \text{Cash turnover ratio} \\
\text{CCC} & = \text{Cash conversion Cycle} \\
\text{GR} & = \text{Growth rate} \\
\text{Lev} & = \text{Leverage} \\
\text{size} & = \text{Size} \\
e & = \text{Error term}
\end{align*}
\]

The significance of the regression coefficient is tested through 't' statistic. \(r^2\) value, calculated to ascertain the goodness of fit of the regression equation, has been tested for its significance through 'F' statistic. The levels of confidence chosen for 't' and F' statistics is five per cent. If the regression coefficient is significant at five per cent level, then the association is said to be highly significant. Same methodology is followed for \(r^2\) also.

iv. Step-wise Regression Analysis

To examine the factors that are prominently associated with profitability, stepwise regression analysis has been performed. Cash turnover ratio, leverage, growth, size, quick ratio and inventory turnover ratio are the variables introduced step by step from step one to six.
3.5 Definition of Terms

Few terms used in the study are defined here. They are

i. Working Capital Policy
   The policy adopted in the management of short term assets and liabilities.

ii. Matching Approach
   Under this approach, the firm attempts to approximate asset and liability maturities.

iii. Conservative Approach
   This approach refers to the usage of long-term capital to finance both permanent assets and seasonal requirements. This approach is considered to be a very safe working capital financing policy.

iv. Aggressive Approach
   In an aggressive approach a firm will finance seasonal current assets and part of the permanent current assets with short-term credit.

v. Cash Conversion Cycle
   It is the flow of cash from the suppliers to inventory to accounts receivable and back into cash.

vi. Performance Index of Working Capital Management
   Performance Index of working capital indicates the average performance of different components of current assets.

vii. Utilization Index of Working Capital Management
   Utilization Index indicates the ability of a company in utilizing current assets for generating sales.

viii. Efficiency Index of Working Capital Management
   This index indicates the ultimate efficiency in working capital management. It has been computed by multiplying the overall Performance Index by Utilization Index.
ix. Size of company

This refers to total assets and natural log of sales is taken for measuring size.

The size and composition of working capital of Indian Steel Companies are focused in the next chapter.