CHAPTER – IV
TREND ANALYSIS
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TREND ANALYSIS

INTRODUCTION

Trend analysis is an important tool of financial analysis. This method determines the direction upwards or downwards and involves the computation of the percentage relationship that each statement item bears to the same item in the base year. The index figures or trend percentages give a bird’s eye view of the comparative data by presenting it in the form of easy to interpret. By this analysis, it is easy to understand the direction in which the business is going on and take proper future decisions: It is stated thus: “In this way the analyst is able to detect any important improvement or deterioration in its financial condition and performance”1

Keeping this in view, the analysis related to Production, Cost and Sales trend has been made.

1. Production Trends

Production is one of the most important areas of performance. The trends of production by the industry may give an idea as to how the industry has performed in the year under review as compared to the past or how the company has performed as compared to other industries. Production performance of an industry can also be measured by analyzing
capacity utilization. The production of a concern can be compared for different years with that of the companies in the same industry and with the industry as a whole of which the company is a part.

2. Cost Trends

A study on cost trend helps in measuring efficiency or inefficiency with which each task has been carried out. It also helps in having control over expenditure and fixing prices. On the basis of the study of cost trend which plays an important role in forecasting, planning and budgeting and in break-even analysis available expenditure can be eliminated.

3. Sales Trends

The figure of sales is the index of progress made by the company. It can also be used as an indicator of managerial efficiency. Marketing of the product is also one of the most important areas of operation. In this process of performance evaluation, sales indices are computed and compared with that of other industries, for arriving at an objective conclusion. Computed trend value of sales may also be derived by applying linear least square method and then performance of the company may be measured by comparing the actual sales with the computed sales.

This is an age of mass production as a result of which competition in every industry is cut-throat. Therefore, it is of utmost importance for the
company not only to increase the sales of its products but also, to ensure that its operations relating to production, administration, and sales are economical. Keen competition in the international markets makes it imperative that the costs of exports are kept at the minimum so as to make the export function profitable.

A proper analysis of costs enables an establishment to detect all sources of waste in production and marketing. It provides information to the management on the basis of which they can control day to day operations of the industry. In order to fulfill the second objective of the study, the following trend analysis has been made by the researcher.3

AUTOMOBILE INDUSTRY

TRENDS OF PRODUCTION, COST AND SALES

Table 4.1 indicates the actual value of production, cost and sales of automobile industry.

It is learnt from the table that the production showed an upward trend except in the years 2000 – 2001, and 2001 -2002. The indices also showed upward trend except in the years 2000 -2001 and 2007 -2008. Negative deviation of Production was recorded from the years 2000 -2001 to the year 2004 -2005. Highest production was recorded in the year 2007 -2008 (86476.86) and the lowest in the year 1998 -1999 (24942.70).
### TABLE 4.1
TRENDS OF PRODUCTION, COST AND SALES - AUTOMOBILE INDUSTRY

<table>
<thead>
<tr>
<th>YEAR</th>
<th>TRENDS OF PRODUCTION</th>
<th>TRENDS OF COST</th>
<th>TRENDS OF SALES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Actual Value (Rs. in Crores)</td>
<td>Indices</td>
<td>Trend Value (yc)</td>
</tr>
<tr>
<td>1998-99</td>
<td>24942.70</td>
<td>100.00</td>
<td>16922.16</td>
</tr>
<tr>
<td>1999-00</td>
<td>30719.87</td>
<td>123.16</td>
<td>24433.65</td>
</tr>
<tr>
<td>2000-01</td>
<td>30395.01</td>
<td>121.86</td>
<td>31945.15</td>
</tr>
<tr>
<td>2001-02</td>
<td>32788.57</td>
<td>131.46</td>
<td>39456.64</td>
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<tr>
<td>2002-03</td>
<td>36940.57</td>
<td>148.10</td>
<td>46968.13</td>
</tr>
<tr>
<td>2003-04</td>
<td>47347.90</td>
<td>189.83</td>
<td>54479.62</td>
</tr>
<tr>
<td>2004-05</td>
<td>60506.01</td>
<td>242.58</td>
<td>61991.11</td>
</tr>
<tr>
<td>2005-06</td>
<td>70402.84</td>
<td>282.26</td>
<td>69502.61</td>
</tr>
<tr>
<td>2006-07</td>
<td>86718.44</td>
<td>347.67</td>
<td>77014.10</td>
</tr>
<tr>
<td>2007-08</td>
<td>86476.86</td>
<td>346.70</td>
<td>84525.59</td>
</tr>
</tbody>
</table>

Where origin of x is 1998-99
X represents years, Y= Rupees in crores

**Chi-Square Analysis**

<table>
<thead>
<tr>
<th>Calculated value</th>
<th>Table Value</th>
<th>D.F</th>
<th>S/NS</th>
<th>Calculated value</th>
<th>Table Value</th>
<th>D.F</th>
<th>S/NS</th>
</tr>
</thead>
<tbody>
<tr>
<td>11010.42</td>
<td>21.67</td>
<td>9</td>
<td>S</td>
<td>8482.911</td>
<td>21.67</td>
<td>9</td>
<td>S</td>
</tr>
</tbody>
</table>

Where origin of x is 1998-99
X represents years, Y= Rupees in crores

**Chi-Square Analysis**

<table>
<thead>
<tr>
<th>Calculated value</th>
<th>Table Value</th>
<th>D.F</th>
<th>S/NS</th>
</tr>
</thead>
<tbody>
<tr>
<td>10803.01</td>
<td>21.67</td>
<td>9</td>
<td>S</td>
</tr>
</tbody>
</table>

Source: Compiled From Annual Reports of the Companies
FIGURE – 4.1

AUTOMOBILE INDUSTRY – TRENDS OF PRODUCTION

Trends of Production
Linear Trend Model
\[ Y_t = 9410.67 + 7511.49 t \]

Accuracy Measures
MAPE 14
MAD 5373
MSD 40312268
Trends of Cost
Linear Trend Model
\[ Y_t = 9605.35 + 6033.49t \]

**FIGURE - 4.2**
AUTOMOBILE INDUSTRY – TRENDS OF COST

Accuracy Measures
- MAPE: 13
- MAD: 4408
- MSD: 28779181
FIGURE – 4.3

AUTOMOBILE INDUSTRY – TRENDS OF SALES

Trends of Sales
Linear Trend Model
\[ Y_t = 9695.81 + 7402.90 \times t \]

Accuracy Measures
MAPE 13
MAD 5248
MSD 39740178

Variable
- Actual
- Fits

Accuracy Measures
MAPE 13
MAD 5248
MSD 39740178
The actual value of cost was also mounting up almost all the years except in the year 2007 -2008. The highest cost was incurred in the year 2006 -2007 (72310.02) and the lowest in the year 1998 -99. Negative deviation was recorded from the year 2001 -2002 to 2005 – 2006.

Further, the actual value of sales showed an upward trend upto the year 2007 -2008. Highest sales was recorded in the year 2006 -2007 (86554.95) and the lowest in the year 1998 –1999 (25280.78). Deviation was negative from the year 2000 – 2001 to 2004 -2005.

The significance of the difference between the actual and the trend values of production, cost, and sales was also examined by applying the statistical Chi-square ($\chi^2$) test. The calculated value of $\chi^2$ is greater than the tabulated value(21.67) and it is significant at 1% level with 9 degrees of freedom, which implies the difference between the actual values and the trend values of production, cost and sales are significant.

**CEMENT INDUSTRY**

**TRENDS OF PRODUCTION, COST AND SALES**

The actual value of production, cost, sales and the indices, trend values and the deviations with regards to the difference between the actual and the trend value are demonstrated in the table no. 4.2.
### TABLE 4.2
**TRENDS OF PRODUCTION, COST AND SALES - CEMENT INDUSTRY**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>TRENDS OF PRODUCTION</th>
<th>TRENDS OF COST</th>
<th>TRENDS OF SALES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998-99</td>
<td>Actual Value (Rs. in Crores)</td>
<td>14953.72</td>
<td>100.00</td>
</tr>
<tr>
<td>1999-00</td>
<td>Where origin of x is 1998-99</td>
<td>16357.55</td>
<td>109.39</td>
</tr>
<tr>
<td>2000-01</td>
<td>X represents years, Y= Rupees in crores</td>
<td>18059.69</td>
<td>120.77</td>
</tr>
<tr>
<td>2001-02</td>
<td></td>
<td>17704.21</td>
<td>118.39</td>
</tr>
<tr>
<td>2002-03</td>
<td></td>
<td>18195.74</td>
<td>121.68</td>
</tr>
<tr>
<td>2003-04</td>
<td></td>
<td>19828.18</td>
<td>132.60</td>
</tr>
<tr>
<td>2004-05</td>
<td></td>
<td>23104.51</td>
<td>154.51</td>
</tr>
<tr>
<td>2005-06</td>
<td></td>
<td>24828.43</td>
<td>166.04</td>
</tr>
<tr>
<td>2006-07</td>
<td></td>
<td>36925.07</td>
<td>246.93</td>
</tr>
<tr>
<td>2007-08</td>
<td></td>
<td>44723.49</td>
<td>299.08</td>
</tr>
</tbody>
</table>

**Chi-Square Analysis**

- Where origin of $x$ is 1998-99
- Where origin of $x$ is 1998-99
- Where origin of $x$ is 1998-99

**Calculated value**

- $Y_c = 8015.47 + 2809.56$ $x$ (GDR=10.13%)
- $Y_c = 7606.05 + 1431.49x$ (GDR=8.61%)
- $Y_c = 8058.21 + 2789.41x$ (GDR=10.95%)

**Source:** Compiled From Annual Reports of the Companies
FIGURE - 4.4
CEMENT INDUSTRY - TRENDS OF PRODUCTION

Trends of Production
Yt = 8015.47 + 2809.56*t

Accuracy Measures
MAPE 18
MAD 4141
MSD 21021420


PRODUCTION 45000 40000 35000 30000 25000 20000 15000 10000 5000 0
FIGURE – 4.5

CEMENT INDUSTRY – TRENDS OF COST

Trends of Cost
Linear Trend Model
\[ Y_t = 7606.50 + 1431.49t \]

Accuracy Measures

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAPE</td>
<td>13</td>
</tr>
<tr>
<td>MAD</td>
<td>1923</td>
</tr>
<tr>
<td>MSD</td>
<td>4348078</td>
</tr>
</tbody>
</table>
FIGURE – 4.6
CEMENT INDUSTRY – TRENDS OF SALES

Trends of sales
Linear Trend Model
Yt = 8058.21 + 2789.41*t

Accuracy Measures
MAPE 18
MAD 4062
MSD 20278294

Variable
Actual
Fits

SALES
10000 15000 20000 25000 30000 35000 40000 45000

YEARS

115.c
It is understood from table no.4.2 that the actual value of production showed an increasing trend throughout the study period except in the year 2001-2002. Similarly, indices of production was also increasing excepting the year 2001 – 2002 (118.39). The highest actual value of production was indicated in the year 2007-2008 (44723.49).

Actual cost of production was fluctuating year after year. It showed an upward trend except in the year 2001-2002 (12087.61). The highest cost was shown in the year 2007-2008 (25812.41) followed by the year 2006-2007 (21979.71) indices of cost was also fluctuating year after year.

Actual value of sales was showing an increasing trend except in the year 2001-2002. Maximum sales was indicated in the year 2007 -2008 (44295.74) and Minimum sales in the year 1998 -1999 (14927.46). The indices of sale was also increasing year after year excepting the year 2001-2002.

To study the significant relationship between actual and the trend value of production, cost, sales during the period of study, a Chi-square test ($\chi^2$) was applied. In this context the calculated value of chi-square is very high as compared to the table value of $\chi^2$ and the result is significant for 9 degrees of freedom which is 21.67. This infers that the differences
between actual production, cost, sales and trend value of production, cost, and sales are significant in Cement industry.

CHEMICAL INDUSTRY

TRENDS OF PRODUCTION, COST AND SALES

Table No. 4.3 describes the production, cost and sales trends of chemical industry.

It is understood from the table no.4.3 that the actual value of production showed an increasing trend through out the study period. Similarly, the indices of production also showed an upward trend. Negative deviation was recorded during the year 2001 -2002 to 2005-2006. The highest production was made during the year 2007-2008(72628.28) and lowest production in the year 1998-1999(22810.44).

Actual value of cost also showed an upward trend through out the study period. The indices of cost also indicated upward trend. The highest cost was shown in the year 2007-2008 (55691.59) and the lowest cost in the year 1998-1999(18144.18). Negative deviations were indicated from the year 2001-2002 to 2005 -2006.An upward trend was revealed as regards actual value of sales. Indices also showed upward trend.
### TABLE 4.3
TRENDS OF PRODUCTION, COST AND SALES - CHEMICAL INDUSTRY

#### TRENDS OF SALES

<table>
<thead>
<tr>
<th>Deviation</th>
<th>Trend value (Rs. in Crores)</th>
<th>Actual value</th>
<th>Trend Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>7156.70</td>
<td>18144.18</td>
<td>100.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3611.96</td>
<td>23440.27</td>
<td>100.00</td>
<td>0.00</td>
</tr>
<tr>
<td>-173.74</td>
<td>24170.92</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>-2931.80</td>
<td>26473.02</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>-5061.76</td>
<td>31534.78</td>
<td>0.00</td>
<td>0.00</td>
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<tr>
<td>-7358.76</td>
<td>38903.54</td>
<td>0.00</td>
<td>0.00</td>
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<td>-5365.07</td>
<td>44268.61</td>
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<tr>
<td>-2700.54</td>
<td>46969.15</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**Chi-Square Analysis**

<table>
<thead>
<tr>
<th>D.F</th>
<th>Observed Value</th>
<th>Expected Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>21.67</td>
<td>11.67</td>
</tr>
</tbody>
</table>

**Source:** Compiled From Annual Reports of the Companies

### TRENDS OF COST

<table>
<thead>
<tr>
<th>Deviation</th>
<th>Trend value (Rs. in Crores)</th>
<th>Actual value</th>
<th>Trend Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>4797.99</td>
<td>29719.44</td>
<td>100.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2661.58</td>
<td>32434.64</td>
<td>100.00</td>
<td>0.00</td>
</tr>
<tr>
<td>757.20</td>
<td>32115.35</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>-3432.83</td>
<td>32115.35</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>-5456.36</td>
<td>32115.35</td>
<td>0.00</td>
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<tr>
<td>-7752.59</td>
<td>32115.35</td>
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<tr>
<td>-5261.10</td>
<td>32115.35</td>
<td>0.00</td>
<td>0.00</td>
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<tr>
<td>-3261.27</td>
<td>32115.35</td>
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<td>0.00</td>
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</tbody>
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**Chi-Square Analysis**

<table>
<thead>
<tr>
<th>D.F</th>
<th>Observed Value</th>
<th>Expected Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>21.67</td>
<td>11.67</td>
</tr>
</tbody>
</table>

**Source:** Compiled From Annual Reports of the Companies

### TRENDS OF PRODUCTION

<table>
<thead>
<tr>
<th>Deviation</th>
<th>Trend value (Rs. in Crores)</th>
<th>Actual value</th>
<th>Trend Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>7759.20</td>
<td>25113.52</td>
<td>100.00</td>
<td>0.00</td>
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<td>3749.01</td>
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<td>0.00</td>
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<td>1.83</td>
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<td>0.00</td>
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<td>-3432.83</td>
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<td>0.00</td>
<td>0.00</td>
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<td>-5456.36</td>
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<td>-3261.27</td>
<td>25113.52</td>
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**Chi-Square Analysis**

<table>
<thead>
<tr>
<th>D.F</th>
<th>Observed Value</th>
<th>Expected Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>21.67</td>
<td>11.67</td>
</tr>
</tbody>
</table>

**Source:** Compiled From Annual Reports of the Companies
FIGURE – 4.7

CHEMICAL INDUSTRY – TRENDS OF PRODUCTION

Trends of Production
Linear Trend Model
\[ Y_t = 10020.11 + 5031.14 \times t \]

Accuracy Measures
MAPE 14
MAD 5033
MSD 36728757

YEARS

Produced by De Gruyter on 2023-02-09 16:10:40

118.a
CHEMICAL INDUSTRY - TRENDS OF COST

Trends of Cost
Linear Trend Model
\[ Yt = 9499.84 + 3846.35 \times t \]

Accuracy Measures

<table>
<thead>
<tr>
<th>Variable</th>
<th>Actual</th>
<th>Fits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAPE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSD</td>
<td>1563.3916</td>
<td></td>
</tr>
</tbody>
</table>

YEARS 2000-04 1999-99

COST 10000 20000 30000 40000 50000 60000
CHEMICAL INDUSTRY - TRENDS OF SALES

Trends of Sales
Linear Trend Model

\[ Y_t = 10423.11 + 4860.46t \]

Accuracy Measures
- MAPE: 4718
- MAD: 4718
- MSD: 31457916

YEARS

SALES

1999-09
2000-09
2001-09
2002-09
2003-09
2004-09
2005-09
2006-09
2007-09

10000
20000
30000
40000
50000
60000
70000

FIGURE 4.9
The highest sales was recorded in the year 2007-2008 (70109.6) and the lowest in the year 1998-1999 (22440.27). Negative deviations were shown from the year 2000-2001 to 2005-2006.

To test whether the significance difference between the actual and the trend values of production, cost, sales of chemical industry is significant or not, a Chi-square test has been applied. In this case the calculated value of Chi-square is higher than the table value of 21.67 and the result is significant at 5% level for 9 degrees of freedom. Thus, the difference between the actual values of production, cost, sales and the trend values are significant in Chemical industry.

COTTON INDUSTRY

TRENDS OF PRODUCTION, COST AND SALES

Table No. 4.4 reveals the details of production, cost and sales trend.

It is understood that production showed an increasing trend in all the years excepting the year 2001-2002. The Highest production was recorded in the year 2007-2008 (16694.61), and the lowest production was indicated in the year 1998-1999 (8298.79). Indices was also fluctuating.

Actual value of cost showed an upward trend in all the years excepting the year 2001-2002 and 2002-2003.
### TABLE 4.4
TRENDS OF PRODUCTION, COST AND SALES - COTTON INDUSTRY

<table>
<thead>
<tr>
<th>YEAR</th>
<th>TRENDS OF PRODUCTION</th>
<th>TRENDS OF COST</th>
<th>TRENDS OF SALES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Actual Value (Rs. in Crores)</td>
<td>Indices</td>
<td>Trend value (yc)</td>
</tr>
<tr>
<td>1998-99</td>
<td>8298.79</td>
<td>100.00</td>
<td>7326.21</td>
</tr>
<tr>
<td>1999-00</td>
<td>8711.42</td>
<td>104.97</td>
<td>8146.92</td>
</tr>
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<td>2000-01</td>
<td>10017.93</td>
<td>120.72</td>
<td>8967.62</td>
</tr>
<tr>
<td>2001-02</td>
<td>8881.44</td>
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<td>9788.32</td>
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<tr>
<td>2002-03</td>
<td>9629.38</td>
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<td>10609.03</td>
</tr>
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<td>2003-04</td>
<td>10183.28</td>
<td>122.71</td>
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<td>2004-05</td>
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<td>2005-06</td>
<td>12084.08</td>
<td>145.61</td>
<td>13071.14</td>
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<tr>
<td>2006-07</td>
<td>14878.7</td>
<td>179.29</td>
<td>13891.84</td>
</tr>
<tr>
<td>2007-08</td>
<td>16694.61</td>
<td>201.17</td>
<td>14712.55</td>
</tr>
</tbody>
</table>

\[ Y_c = 6505.51 + 820.70x \]
\[ CGR = 7.04\% \]

Where origin of \( x \) is 1998-99
X represents years, \( Y = \) Rupees in crores

Chi-Square Analysis

<table>
<thead>
<tr>
<th>Calculate d value</th>
<th>Table Value</th>
<th>D.F</th>
<th>S/NS</th>
<th>Calculate d value</th>
<th>Table Value</th>
<th>D.F</th>
<th>S/NS</th>
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<th>Table Value</th>
<th>D.F</th>
<th>S/NS</th>
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</thead>
<tbody>
<tr>
<td>1181.71</td>
<td>21.67</td>
<td>9</td>
<td>S</td>
<td>1041.89</td>
<td>21.67</td>
<td>9</td>
<td>S</td>
<td>1088.25</td>
<td>21.67</td>
<td>9</td>
<td>S</td>
</tr>
</tbody>
</table>

Source: Compiled From Annual Reports of the Companies
COTTON INDUSTRY – TRENDS OF PRODUCTION

Trends of Production
Linear Trend Model
\[ Y_t = 6505.51 + 820.704 \times t \]

Accuracy Measures
MAPE 10
MAD 1111
MSD 1364315

Variable
Actual
Fits

Accuracy Measures
MAPE 10
MAD 1111
MSD 1364315
Trends of Cost
Linear Trend Model
Yt = 5952.63 + 641.14*t
FIGURE – 4.12

COTTON INDUSTRY – TRENDS OF SALES

Trends of Sales
Linear Trend Model
Yt = 6421.99 + 796.136*t

<table>
<thead>
<tr>
<th>Variable</th>
<th>Actual</th>
<th>Fits</th>
</tr>
</thead>
</table>

Accuracy Measures
MAPE 10
MAD 1053
MSD 1248585

YEARS
SALES
16000 14000 12000 10000 8000 6000
The highest cost was recorded in the year 2007-2008 (14285.5) and the lowest in the year 1998-1999 (7387.96). Similarly indices was also showing fluctuating trend.

Actual value of sales showed an upward trend excepting the year 2001-2002 and the highest sales was recorded in the year 2007-2008 (16357.49) and the lowest sales was indicated in the year 1998-1999 (8030.97).

Negative deviations of production was indicated from the year 2001-2002 to 2005-2006. Negative deviations as regards cost was disclosed from the year 2001-2002 to 2005-2006. Similarly, negative deviations as regards sales was expected from the year 2001-2002 to 2005-2006.

The significance of the difference between the actual and the trend values of production, cost, sales are examined by applying the statistical Chi-square ($\chi^2$) test. The calculated value of $\chi^2$ is greater than the tabulated value of $\chi^2$ (21.67) and the result is significant at 5% level with 9 degrees of freedom, which implies the difference between the actual values and the trend values of production, cost, sales are significant Cotton industry.
METAL INDUSTRY

TRENDS OF PRODUCTION, COST AND SALES

Table No.4.5 presents the trend of production, cost and sales of mental industry.

The Actual value of production was the highest in the year 2007-2008 (49070.04) and the lowest in the year 1998-1999 (9815.37). Actual value of production showed a fluctuating trend in all the years excepting in the year 2001-2002. The indices also showed fluctuation and it showed an upward trend excepting the years 2001-2002 and 2002-2003.

Actual values of cost was also mounting up in almost all the years other than the year 2001-2002. The highest cost was indicated in the year 2007-2008 (40744.5) and the lowest cost in the year 1998-1999 (8035.79).

Actual values of sales was also increasing in almost all the years excepting the year 2001-2002. The highest sales was recorded in the year 2007-2008 (48568.74) and the lowest sales in the year 1998-1999 (9702.49).

Negative deviation was recorded as regards production in the year 2001-2002 to 2005-2006. As regards cost also negative deviation was indicated during the year 2001-2002 to 2005-2006. A negative sales deviation was showed during the year 2001-2002 to 2005-2006.
# TABLE 7.3

**TRENDS OF PRODUCTION, COST AND SALES - METAL INDUSTRY**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>TRENDS OF PRODUCTION</th>
<th>TRENDS OF COST</th>
<th>TRENDS OF SALES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Actual Value (Rs. in Crores)</td>
<td>Indices</td>
<td>Trend value ((y_c))</td>
</tr>
<tr>
<td>1998-99</td>
<td>9815.37</td>
<td>100.00</td>
<td>2279.19</td>
</tr>
<tr>
<td>1999-00</td>
<td>11242.95</td>
<td>114.54</td>
<td>6848.47</td>
</tr>
<tr>
<td>2000-01</td>
<td>11896.52</td>
<td>121.20</td>
<td>11417.75</td>
</tr>
<tr>
<td>2001-02</td>
<td>10587.01</td>
<td>107.86</td>
<td>15987.08</td>
</tr>
<tr>
<td>2002-03</td>
<td>14267.02</td>
<td>145.35</td>
<td>20556.31</td>
</tr>
<tr>
<td>2003-04</td>
<td>17345.61</td>
<td>176.72</td>
<td>25125.59</td>
</tr>
<tr>
<td>2004-05</td>
<td>24044.63</td>
<td>244.97</td>
<td>29694.87</td>
</tr>
<tr>
<td>2005-06</td>
<td>32805.69</td>
<td>334.23</td>
<td>34264.15</td>
</tr>
<tr>
<td>2006-07</td>
<td>47334.67</td>
<td>482.25</td>
<td>38833.43</td>
</tr>
<tr>
<td>2007-08</td>
<td>49070.04</td>
<td>499.93</td>
<td>43402.72</td>
</tr>
</tbody>
</table>

\[ Y_c = -2290.09 + 4569.28x \]
\[ \text{CGR} = 19.56\% \]

\[ Y_c = -1796.56 + 3614.3x \]
\[ \text{CGR} = 19.36\% \]

\[ Y_c = -2050.23 + 4453.74x \]
\[ \text{CGR} = 19.34\% \]

Where origin of \(x\) is 1998-99
Where origin of \(x\) is 1998-99
Where origin of \(x\) is 1998-99

X represents years, \(Y\) = Rupees in crores
X represents years, \(Y\) = Rupees in crores
X represents years, \(Y\) = Rupees in crores

Chi-Square Analysis
Chi-Square Analysis
Chi-Square Analysis

<table>
<thead>
<tr>
<th>Calculated value</th>
<th>Table Value</th>
<th>D.F</th>
<th>S/NS</th>
<th>Calculated value</th>
<th>Table Value</th>
<th>D.F</th>
<th>S/NS</th>
<th>Calculated value</th>
<th>Table Value</th>
<th>D.F</th>
<th>S/NS</th>
</tr>
</thead>
<tbody>
<tr>
<td>37653.97</td>
<td>21.67</td>
<td>9</td>
<td>S</td>
<td>30823.76</td>
<td>21.67</td>
<td>9</td>
<td>S</td>
<td>34218.83</td>
<td>21.67</td>
<td>9</td>
<td>S</td>
</tr>
</tbody>
</table>

Source: Compiled From Annual Reports of the Companies

123
FIGURE – 4.13

METAL INDUSTRY – TRENDS OF PRODUCTION

Trends of Production
Linear Trend Model
\[ Y_t = -2290.09 + 4569.28 \times t \]

Accuracy Measures
MAPE 32
MAD 5316
MSD 34402019

FIGURE – 4.13
METAL INDUSTRY – TRENDS OF PRODUCTION

Trends of Production
Linear Trend Model
\[ Y_t = -2290.09 + 4569.28 \times t \]

Accuracy Measures
MAPE 32
MAD 5316
MSD 34402019
FIGURE – 4.14

METAL INDUSTRY – TRENDS OF COST

Trends of Cost
Linear Trend Model
\[ Y_t = -1796.56 + 3614.3 \times t \]

Accuracy Measures
- MAPE = 31
- MAD = 4316
- MSD = 21982136

Variable
- Actual
- Fits

Accuracy Measures
- MAPE = 31
- MAD = 4316
- MSD = 21982136
FIGURE – 4.15

METAL INDUSTRY – TRENDS OF SALES

Trends of Sales
Linear Trend Model
\[ Y_t = -2050.23 + 4453.74 \times t \]

Accuracy Measures
MAPE 31
MAD 5288
MSD 32977773
To find out whether there is any significant difference between the actual and the trend value of sales, Chi-square test has been applied and tested. The calculated value of $\chi^2$ is more than the table value of 21.67 and the result is significant at 5% level 9 degrees of freedom. Hence, it proves that the deviation between the actual and trend values of production, cost, and sales in different years are significant in Metal industry.

PAPER INDUSTRY

TRENDS OF PRODUCTION, COST AND SALES

Table No.4.6 states the trends of production, cost and sales of paper industry.

It is understood from the table that the actual value of production showed an upward trend up to the year 2006-2007. The highest value of production was recorded in the year 2006-2007 (1145.95) and the lowest in the year 1998-1999(4668.49). The Indices also showed upward trend up to the year 2006-2007. Negative deviation was indicated during the years 1999-2000, 2001-2002, 2003-2004, 2004-2005, 2005-2006 and 2007-2008.

Further, it is known from this table that actual value of cost of production was also mounting up upto the year 2006-2007.
### TABLE 4.6
TRENDS OF PRODUCTION, COST AND SALES - PAPER INDUSTRY

<table>
<thead>
<tr>
<th>YEAR</th>
<th>TRENDS OF PRODUCTION</th>
<th>TRENDS OF COST</th>
<th>TRENDS OF SALES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Actual Value (Rs. in Crores)</td>
<td>Indices</td>
<td>Trend value (y_e)</td>
</tr>
<tr>
<td>1998-99</td>
<td>4668.49</td>
<td>100.00</td>
<td>4600.42</td>
</tr>
<tr>
<td>1999-00</td>
<td>5275.17</td>
<td>113.00</td>
<td>5294.77</td>
</tr>
<tr>
<td>2000-01</td>
<td>6359.31</td>
<td>136.22</td>
<td>5989.12</td>
</tr>
<tr>
<td>2001-02</td>
<td>6464.16</td>
<td>138.46</td>
<td>6683.48</td>
</tr>
<tr>
<td>2002-03</td>
<td>7501</td>
<td>160.67</td>
<td>7377.83</td>
</tr>
<tr>
<td>2003-04</td>
<td>7758.38</td>
<td>166.19</td>
<td>8072.18</td>
</tr>
<tr>
<td>2004-05</td>
<td>8237.51</td>
<td>176.45</td>
<td>8766.53</td>
</tr>
<tr>
<td>2005-06</td>
<td>9213.11</td>
<td>197.35</td>
<td>9460.88</td>
</tr>
<tr>
<td>2006-07</td>
<td>11145.95</td>
<td>238.75</td>
<td>10155.23</td>
</tr>
<tr>
<td>2007-08</td>
<td>10626.95</td>
<td>227.63</td>
<td>10849.59</td>
</tr>
</tbody>
</table>

Where origin of x is 1998-99, Y represents years, Y = Rupees in crores

Chi-Square Analysis

<table>
<thead>
<tr>
<th>Calculated value</th>
<th>Table Value</th>
<th>D.F</th>
<th>S/NS</th>
<th>Calculated value</th>
<th>Table Value</th>
<th>D.F</th>
<th>S/NS</th>
<th>Calculated value</th>
<th>Table Value</th>
<th>D.F</th>
<th>S/NS</th>
</tr>
</thead>
<tbody>
<tr>
<td>185.05</td>
<td>21.67</td>
<td>9</td>
<td>S</td>
<td>110.51</td>
<td>21.67</td>
<td>9</td>
<td>S</td>
<td>178.17</td>
<td>21.67</td>
<td>9</td>
<td>S</td>
</tr>
</tbody>
</table>

Where origin of x is 1998-99, Y represents years, Y = Rupees in crores

Chi-Square Analysis

Source: Compiled From Annual Reports of the Companies
Trends of Production

Linear Trend Model

\[ Y_t = 3906.07 + 694.351 \times t \]

Accuray Measures:

- MAPE
- MAD
- MSD
TABLE 4.17

<table>
<thead>
<tr>
<th>Variable</th>
<th>Actual</th>
<th>Fits</th>
</tr>
</thead>
</table>

Accuracy Measures:
- MAPE: 3.2
- MAD: 220.6
- MSD: 82378.0

Linear Trend Model:

\[ Y_t = 3496.67 + 508.42t \]

FIGURE 4.17

Trends of Cost

Yt = 3496.67 + 508.42*t
FIGURE – 4.18

PAPER INDUSTRY – TRENDS OF SALES

Trends of Sales
Linear Trend Model
Y_t = 3913.96 + 689.820*t

Accuracy Measures
MAPE  4
MAD    305
MSD    164858

Similarly, the highest value of sales was disclosed in the year 2006-2007 (11125.14) and the lowest sales in the year 1998-1999 (4679.66). Actual value of sales was also indicating an upward trend upto the year 2006-2007. Indices was also showing an upward trend upto the year 2006-2007. Negative deviation was revealed during the years 1999-2000, 2001-2002, 2003-2004, 2004-2005, 2005-2006 and 2007-2008.

For inferring the significance relationship between the actual values and the trend values of sales, a Chi-square ($\chi^2$) test was applied. The calculated value of $\chi^2$ is more than the table value of $\chi^2 (21.67)$ and the result is significant at 5% level with 9 degrees of freedom, which implies that the difference between the actual values and the trend values of production, cost, and sales are significant in Paper industry.

SUGAR INDUSTRY

TRENDS OF PRODUCTION, COST AND SALES

Table No.4.7 denotes the details of production, cost and sales of sugar industry.
# TABLE 4.7
## TRENDS OF PRODUCTION, COST AND SALES - SUGAR INDUSTRY

<table>
<thead>
<tr>
<th>YEAR</th>
<th>TRENDS OF PRODUCTION</th>
<th>TRENDS OF COST</th>
<th>TRENDS OF SALES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Actual Value (Rs. in Crores)</td>
<td>Indices</td>
<td>Trend value (y_c)</td>
</tr>
<tr>
<td>1998-99</td>
<td>4459.32</td>
<td>100.00</td>
<td>4311.91</td>
</tr>
<tr>
<td>1999-00</td>
<td>4586.32</td>
<td>102.85</td>
<td>4637.42</td>
</tr>
<tr>
<td>2000-01</td>
<td>5108.97</td>
<td>114.57</td>
<td>4962.92</td>
</tr>
<tr>
<td>2001-02</td>
<td>5340.02</td>
<td>119.75</td>
<td>5288.43</td>
</tr>
<tr>
<td>2002-03</td>
<td>5630.52</td>
<td>126.26</td>
<td>5613.94</td>
</tr>
<tr>
<td>2003-04</td>
<td>5248.71</td>
<td>117.70</td>
<td>5939.44</td>
</tr>
<tr>
<td>2004-05</td>
<td>5775.87</td>
<td>129.52</td>
<td>6264.95</td>
</tr>
<tr>
<td>2005-06</td>
<td>7258.38</td>
<td>162.77</td>
<td>6590.45</td>
</tr>
<tr>
<td>2006-07</td>
<td>7477.62</td>
<td>167.69</td>
<td>6915.96</td>
</tr>
<tr>
<td>2007-08</td>
<td>6881.16</td>
<td>154.31</td>
<td>7241.46</td>
</tr>
</tbody>
</table>

Where origin of x is 1998-99

\[ Y_c = 3986.41 + 325.51x \]  
CGR=5.60%

\[ Y_c = 3294.77 + 303.89x \]  
CGR=6.03%

\[ Y_c = 3821.31 + 332.62x \]  
CGR=5.95%

Where origin of x is 1998-99

\[ X \text{ represents years, } Y= \text{ Rupees in crores} \]

Chi-Square Analysis

<table>
<thead>
<tr>
<th>Calculated value</th>
<th>Table Value</th>
<th>D.F</th>
<th>S/NS</th>
<th>Calculated value</th>
<th>Table Value</th>
<th>D.F</th>
<th>S/NS</th>
<th>Calculated value</th>
<th>Table Value</th>
<th>D.F</th>
<th>S/NS</th>
</tr>
</thead>
<tbody>
<tr>
<td>260.19</td>
<td>21.67</td>
<td>9</td>
<td>S</td>
<td>245.99</td>
<td>21.67</td>
<td>9</td>
<td>S</td>
<td>272.73</td>
<td>21.67</td>
<td>9</td>
<td>S</td>
</tr>
</tbody>
</table>

Source: Compiled From Annual Reports of the Companies
Trends of Production

Linear Trend Model

\[ Y_t = 3986.41 + 325.5Q6 \cdot t \]
FIGURE 4.20

SUGAR INDUSTRY – TRENDS OF COST

Trends of Cost
Linear Trend Model
Y_t = 3294.77 + 303.893*t

Accuracy Measures
MAPE 5
MAD 263
MSD 132971
FIGURE – 4.21

SUGAR INDUSTRY – TRENDS OF SALES

Trends of Sales
Linear Trend Model
$Y_t = 3821.31 + 332.619*t$

Accuracy Measures
MAPE  5
MAD   324
MSD   175113

Variable
-■ — Actual
- — Fits

Years
Sales
4000  4500  5000  5500  6000  6500  7000  7500

The actual cost of sales was showing a fluctuating trend. The highest cost was recorded in the year 2007-2008 (6290.12) and the lowest cost 1998-1999 (3807.69). Negative deviation of cost was indicated in the years 1999-2000, 2003-2004, 2004-2005 and 2007-2008.

The indices of cost was also fluctuating. Sales was also fluctuating and the highest sales was indicated in the year 2006-2007 and the lowest sales in the year 1998-1999 (4250.12). Indices of sales showed an upward trend excepting the year 2003-2004 and 2007-2008. Negative deviations were disclosed in the years 1999-2000, 2003-2004, 2004-2005 and 2007-2008.

To test whether the difference between the actual and the trend value of production, cost, and sales are significant or not a Chi-square ($\chi^2$) test has been applied. The calculated value of Chi-square is more than the table
value of (21.67) and the result is significant at 5% level for 9 degrees of freedom.

Hence, it is inferred that the difference between the actual and the trend value of production, cost, and sales are significant.

**ANALYSIS OF VARIANCE - PRODUCTION**

The performance of manufacturing industries largely depends upon its performance of production. The efficient production system is based on the proper planning of production. The trend analysis of the sample industries in view of production has been analyzed as under.

With a view to test the significance of variations among the sample industries under the study ‘F’ test has been applied. Table 4.8 shows the results of analysis of variance.

**Hypothesis**

“There is no significant difference in the production among the select industries”
### TABLE-4.8

**ANALYSIS OF VARIANCE – PRODUCTION**

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>S/NS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>11601573370</td>
<td>6</td>
<td>1933595562</td>
<td>19.47961</td>
<td>1.05499</td>
<td>NS</td>
</tr>
<tr>
<td>Within Groups</td>
<td>6253541080</td>
<td>63</td>
<td>99262556.83</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>17855114450</td>
<td>69</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NS – NOT SIGNIFICANT AT 5% level (P Value >=0.05)

It is evident from table 4.8 that the hypothesis is accepted at 5% level for $V_1=6$ and $V_2=63$. It is concluded that there is no significant difference in production among the selected seven industries.

**ANALYSIS OF VARIANCE - COST**

The study of cost trends helps in measuring the efficiency with which each task has been carried out. On the basis of the study, the proper analysis of costs enables an establishment to detect all sources of waste in production and marketing. The analysis of cost of the sample industries has been analyzed as under.

With a view to test the significance of cost among the sample industries under the study, ‘F’ test has been applied. Table 4.9 shows the results of analysis of variance.
Hypothesis

“There is no significant difference in the cost among the select industries”

TABLE-4.9
ANALYSIS OF VARIANCE – COST

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>S/NS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>11601573370</td>
<td>6</td>
<td>1933595562</td>
<td>19.4796</td>
<td>1.05499</td>
<td>NS</td>
</tr>
<tr>
<td>Within Groups</td>
<td>6253541080</td>
<td>63</td>
<td>99262556.83</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>17855114450</td>
<td>69</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NS – Not Significant At 5% Level (P Value >=0.05)

It is found from table 4.9 that the hypothesis is accepted at 5% level for $V_1=6$ and $V_2=63$. It is concluded that there is no significant difference in cost among the selected seven industries.

ANALYSIS OF VARIANCE - SALES

The figures of sales is the index of progress made by a concern. Policies are laid down for the purpose of maximizing profit from expected sales. The business concern cannot function profitably if the sales are not adequate. The earnings of the business concern are affected to a very great extent by the trend of its sales.
In order to test the significance of sales among the sample industries under the study, the F test has been applied. Table 4.10 shows the analysis of variance.

**Hypothesis**

"There is no significant difference in the sales among the select industries"

**TABLE-4.10**

ANALYSIS OF VARIANCE – SALES

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>S/NS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>16342426452</td>
<td>6</td>
<td>2723737742</td>
<td>16.97334</td>
<td>1.49928</td>
<td>NS</td>
</tr>
<tr>
<td>Within Groups</td>
<td>10109706288</td>
<td>63</td>
<td>160471528.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>26452132739</td>
<td>69</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NS – Not Significant AT 5% level (P Value >=0.05)

It is found from table 4.10 that the hypothesis is accepted at 5% level for $V_1=6$ and $V_2=63$. It is concluded that there is no significant difference in sales among the selected seven industries.
SUMMARY

On the whole it can be concluded that among the select industries under the study, the production progress was the highest in AUI followed by CHEI, METI, CEI and COTI. With a view to identify an overall production performance, it indicated a better performance in respect of the above mentioned industries. It may also be suggested that all the industries under the study should solve the problems of power shortage, industrials relations and adopt modern research and development techniques either by purchasing in the indigenous market or by importing, so as to increase the productivity and improve the capacity utilization. In this regards, especially, the management of SUGI and PAPI may find an alternative for power crisis through launching wind mills in the southern part of Tamil Nadu or they may try for solar energy system.

The industry wise cost of production of AUI revealed that in AUI steadily increased throughout the period of the study from 1998-99 to 2007-08. The cost of production showed an increasing trend in all the sample industries except in METI in the initial period. The fluctuation in the proportion was due to increase in rent, rates and taxes, postage, telephones and telegrams and other general expenses.
The lowest cost of production was found in SUGI and PAPI under the study which indicates control over fixed costs and operating costs are necessary.

An inter-industry comparison of sales trends for the years from 1998-99 to 2007-08 of the sample industries under the study shows that as regards to total sales in absolute figure, AUI was the largest industry, followed by CHEI,METI,CEI and COTI. On the whole, it can be concluded that on the basis of growth of sales, the performance of the select industries showed a good progress. But still there is a need for it to adopt better market strategies to compete in the cut-throat global competition by reducing the costs and by revising selling prices to enhance the volume of turnover so as to reach the maximum profit. Further, it is suggested that these select industries should concentrate to utilize the plant at the optimum level through efficient management of man power and other resources.
REFERENCES

