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# A Study on Factors Affecting Performance of Indian Cement Industry

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**Abstract**

The study was designed to investigate the performance efficiency in terms of capacity utilization, factor productivity, profit rate and cost effectiveness;In detail the research methodology used for the study that has focused on the past, present and the future performance of Indian Cement Industry (ICI) at the macro level and the Chettinadu Cement Corporation Limited (CCCL) at the micro level as a case firm. The study purely relies on secondary data. The secondary data were collected for a period of fifteen years (1991-92 to 2005-06) from the database maintained and made available by several organizations viz., Cement Manufacturers Association, Export Import Bank of India, Center for Monitoring Indian Economy etc. for the purpose of effective periodical analysis. In order to know the Performance of the industry was evaluated with the help of factors productivity for labour, energy and other resources aggregated in value. Total factor productivity including the contribution of technology was also studied Financial strength of ICI was analysed with the help of eight financial ratios. Debt-Equity Ratio (DER), Current Ratio (CR), Profit Before Tax (% to sales) (PBT), Profit After Tax (% to sales) (PAT), Dividend (%) (D), Return Over Capital Employed (%) (ROCE), Return Over Net Worth (%) (RONW), Average Profit per Unit (Rs. /t) (AUP). All these analyses were done to the case firm – CCCL also.In the end of the study implications and conclusion were provided.
**Keywords:** Performance, Cement, Manufacturers, Industry,

## 1. Introduction

For any firm, the cost of production increases with the volume of production. However with additional production, average cost would decline upto a level and would increase thereafter. Therefore, a 'U' shaped average cost curve is generally assumed in theory and empirical analysis of cost is carried out. However, the firms would try to avoid the rising part of the average cost curve by building additional capacity, exploiting economies of scale and application of technology that would enable more effective and efficient use of resources and considerable improvement of productivity. The resulting reduction in unit cost might be off set by the rate of inflation when the cost was measured in nominal value. A correction for the rate of inflation would give the real cost per unit. First, the nominal unit cost of production of cement, its price, operating margin and net profit were studied.

Cement producers of ICI had not only achieved growth in production but also efficiency in their performance through the increase in profit margin and EPS, both contributing for substantial increase in their net worth. Their performance efficiency was studied in detail and the results were found similar in respect of case firm CCCL. Performance of both ICI and CCCL and their comparative analysis is hereunder made. The performance of units in ICI was improved not only by improvement in the utilization of unutilized capacity but also by the application of technology appropriate for the efficient use of resources. These efforts contributed to the reduction in unit cost of production and consequent increase in net profit. Therefore, the performance of the industry and the case firm during the study period was analysed in terms of unit cost, net profit and operating profit margin and compared with each other.

## 2. Research Methodology

### *2.1 Objectives of the Study*

to evaluate the performance efficiency in terms of capacity utilization, factor productivity, profit rate and cost effectiveness;

### *2.2 Methodology*

The research methodology used for the study that has focused on the past, present and the future

 

performance of Indian Cement Industry (ICI) at the macro level and the Chettinadu Cement Corporation Limited (CCCL) at the micro level as a case firm. The study purely relies on secondary data. The secondary data were collected for a period of fifteen years (1991-92 to 2005-06) from the database maintained and made available by several organizations viz., Cement Manufacturers Association, Export Import Bank of India, Center for Monitoring Indian Economy etc. for the purpose of effective periodical analysis.

**3. Data Analysis**

The performance of the industry was evaluated with the help of factors productivity for labour, energy and other resources aggregated in value. Total factor productivity including the contribution of technology was also studied Financial strength of ICI was analysed with the help of eight financial ratios. Debt-Equity Ratio (DER), Current Ratio (CR), Profit Before Tax (% to sales) (PBT), Profit After Tax (% to sales) (PAT), Dividend (%) (D), Return Over Capital Employed (%) (ROCE), Return Over Net Worth (%) (RONW), Average Profit per Unit (Rs. /t) (AUP). All these analyses were done to the case firm – CCCL also.

In the analysis, the labour input L(t) is measured in terms of number of employees including supervisory staff. The capital K(t), is measured in terms of real gross investment. Current book values are first worked out by taking net fixed capital stock (ΔNFK) for successive years and adding depreciation to it. The real capital stock in period t, is given by $K(t) = K(e) + \sum_{t=1}^{n} I(t)$. Thus, the generation of capital stock series – first nominal series *K (t)* and then real series *k(t)* requires an initial or benchmark capital stock and the investment series *I (t)*. This method is called the standard perpetual inventory method and it is widely used in time series analysis of trends in productivity.

The required data were readily available for the case firm. For the industry the sources of data were: (i) Annual survey of industries (ASI) and (ii) Economic survey of India (both published annually). The nominal gross investment series were then deflated by the gross fixed capital formation deflates (GDCF) (1990-91=100) to obtain the real gross investment series for ICI and CCCL.

With the help of time series of human power (Labour for short) L(t), measured in terms of cost of human power and of real capital stock k(t), the productivity of labour and capital were studied first. The estimated productivities are presented in Table 5.13 for both ICI and CCCL.

**Productivity of capital ($P_k$)**

As could be seen in the table, productivity Pk coverage value product) of capital was 1.45 in 1991-92, meaning that a rupee of real investment in cement production would yield ceteris Paribas, a real return of Rs.1.45. The productivity was decreasing over the years-more clearly seen in the index number of $P_k$ with 1991-92=100. The choice of base you might change the numerical values of the index number but not their relative order. In all the years $P_K$ was positive and larger than unity that showed a declining trend from 100 in 1991-92 to the index of 70.34 (lowest) in 1999-00, and then increased to 78.62 in 2005-06. A positive but a falling average product curve was evident. It showed that capital in ICI was in the rational zone of production. The managerial productivity should be falling too.A look at columns 6 and 7 would show a similar result for CCCL also, but the decline in average productivity of capital was slower than that for ICI. The smallest index number for capital productivity in CCCL was 78.17 in 2005-06 and it was close to that of 78.62 for ICI. Thus, both ICI and CCCL were seen to have made rational use of capital.

**Productivity of Labour ($P_L$)**

The productivity in ICI was Rs. 5.2 per rupees spent on labour in 1991-92 and over the years it decreased, the trend being reversed only in the last two years. More clearly seen in index number with 1991-92=100, the index of labour productivity became smaller over the years to become as low as 27.64 in 2002-03 and increased in the next three years to be 53.55 in 2005-06. Therefore a falling but positive productivity of labour was seen. Index number of labour productivity (PL) showed a decreasing trend, to reach 3.488 in 2002-03. But it went up in the next three years and was 50.26 in 2005-06. Thus, the variation in average productivity of labour clearly showed that the use of labour in CCCL was rational. Thus, the results for CCCL was closely similar to that of ICI, revealing that the former was a representative of the latter and inferences for CCCL could be generalized to ICI.

**Production Function**

In order to understand the relative influence of capital and labour in the production of cement, their partial elasticities were estimated with the help of a Cobb- Douglas form specified below.

$Q = AL^{\beta 1} + K^{\beta 2} \varphi^{u}$

 

Due to heterogeneity of product, labour and capital, all of which on log transformation estimate form were measured in real values in Rs.

lnQ = lnA+β1lnL+β2lnK +u

(or) q = $\alpha+\beta_1 l+\beta_2 k+u$

Where q= log value of production

l= log value of labour used

k= log value of capital used

α= log of A

α, $\beta_1$, $\beta_2$ were parameters to be estimated

u= random error term

The equation (2) in linear (in log) form was estimated by ordinary least square method. The estimated equation was used to study production elasticity of labour (β1) and of capital (β2), the economies of scale ($\beta_1+\beta_2$) and the Solow residualα.

The production function (2) estimated for ICI is presented below.

q = 3.462 **+1.964 l** +0.9713 k**

(62.49) (5.17) (-7.103)

$R^2$ = 0.887** F=? d.f =12

Note: figures within ( ) are t values

** Significant at 1% level.

Estimated equation had a good fit as shown by the high value of $R^2$ and statistically significant values of the regression constant and the two partial regression coefficients. The estimated equation would explain nearly 87 percent of variation in aggregate production of cement in ICI. It was a macro level production for the industry as a whole. It has values to draw inferences.

As production, labour and capital were measured in log values (to base e), the coefficients of l and k would show the elasticity of production with respect to L and K. The partial elasticity coefficient of labour was 1.716 and it was significant at one per cent level. It would show that for one per cent increase in the value of labour used in cement production would *Ceteris Paribas* increase production by 1.964 per cent, evaluated at *centroid*. This implies that the marginal productivity of labour was positive. In capital, the elasticity of production was -0.9713, showing that one per cent increase in capital used would Ceteris Paribas decrease production by 0.97 percent. The marginal productivity of capital was negative and therefore use of capital had to be altered with care and without distributing the production relationship. More specifically capital should be technology augmenting. The estimated value of the regression constant was 3.462 and it was statistically significant. With the assumption of exogenous technology and the high explanatory power of the estimated production functions, the value of regression constant could be treated as a measure of productivity of technology. Therefore, technology was significantly contributing to the increase in production of cement in ICI. The sum of two partial regression co-efficient would show the return to scale. It ($\beta_1+\beta_2$) was 0.9927 showing that constant return to scale was prevailing in cement production in ICI and CCCL.

The production function estimated for CCCL is presented below

q = 2.625 **+2.473 l** +1.475 k**

(18.02) (2.27) (3.95)

$R^2$ = 0.775** F=27.66 SE =0.157

Note: Figures within ( ) are t values

* - Significant at 5% level

** - Significant at 1% level

The estimated equation was a good fit with statistically significant values for $R^2$, regression constant, and partial regression coefficients. It was valid to draw inferences. The production elasticity with respect to labour and capital were 2.473 and -1.475, showing that marginal productivity of labour was positive while it was negative for capital. There was need to rationalize the use of capital. The sum of the partial regression coefficients was 0.998 showing constant returns to scale in production of cement by CCCL. As shown by the statistically significant value of the regression constant (2.625), production technology used by CCCL had also significantly contributed to the increase in production of cement. These inferences were similar to that for ICI, stated earlier.

Therefore, in production of cement in both the case firm (CCCL) and the industry (ICI):Elasticity of production with respect to labour was positive and significant and the marginal productivity of labour was positive

- The elasticity of production with respect to capital was also statistically significant, but it had a negative sign showing a negative marginal productivity for capital.
- There was constant return to scale.

 

- Technology adopted in production of cement was also a critical contributor to production. It was assumed to be exogenous and its contribution was supplementing the productivity of labour and capital. Therefore, it might be treated as a third factor of production.

**Production Technology**

Technology for cement production consisted of three different processes: (a) Wet process, (b) Semi wet process and (c) dry process. The dry process is more fuel efficient and cost effective, though it requires additional investments when compared to wet process which requires 0.28 tonnes of coal and 110 kWh of power to manufacture one tone of cement, where as the dry process requires only 0.18 tons of coal and 100kWh of power (IBEF – 2006) and semi-dry process comes half way in between. Therefore the proportion of cement capacity by the wet and semi-wet processes was decreasing over the past decades.

In 1950-51, the major share of cement capacity was from the wet process (97 per cent); the semi-wet process contributed only 3 per cent, with no plants using dry process for production. Since then there was no concentration for the technological up gradation. But today only 2 per cent of capacity uses wet process. The case firm CCCL changed to the dry process in 1971-72 itself. Therefore it was using most appropriate technology during the period of study. It had helped not only a reduction in energy cost but also increase in production. It was capital saving technology.India is producing different varieties of cement under BIS specifications and the quality is comparable with the best in the world. Varieties differ in composition mainly in percentage of clinker content to most specific end uses, like ordinary Portland Cement (OPC). Portland Pozzolana Cement (PPC), Portland Blast Furnace Slag Cement (PBFS), Oil Well Cement, Rapid hardening Portland Cement, Sulphate Resisting Portland Cement and White cement etc. The production of Ordinary Portland Cement had decreased from 71.28% in 1989-90 to 31.21% now. Percentage of production of Portland Pozzolana Cement increased from 17.37 per cent in 1989-90 to 60.12 per cent in the year 2006-07. This was a favourable change in the product mix of Indian cement industry as PPC was more specialized type of cement.In an environment of growing competition witnessed in the post decontrol era, one of the major developments has been the introduction of higher grades of cement. Grade is the 28 days compressive strength of Ordinary Portland Cement, when tested as per Indian Standards under standard conditions. Depending upon the strength requirement, OPC is thus classified as OPC-33 OPC-43 and OPC-53 grades. However, the consumers preferred the durability more than strength. This would require redefinition of grades based on durability.

**Total factor productivity**

With significant impact of technology on production and its contribution being studied by Solow's concept is explained residual. The data series of operating surplus, the measures of labour and capital productivity were used to estimate total factor productivity as the weighted average of productivity of three factors, labour, capital and technology. The weights were the relative share of the factors in total cost of production. The estimated total productivity in real value (ie, value adjusted for inflation) was then converted into index with base year 1991-92=-100. The total productivity indices for ICI and CCCL , total factor productivity was decreasing over the years up to 2002-03 and increasing in the following years. This was the case for both ICI and CCCL. In 1992-93, and from 1996-97 to 2001-02, the indices were less than hundred for ICI and were above 100 for other years.

A comparison of indices for ICI and CCCL showed that the TFP was larger for ICI than that for CCCL in the years in which TFP was declining. It was reversed in the following years, including the last three years when TFP had marginally increased. Thus, the inferences were that factor productivity in production of cement showed slow decline in the industry and CCCL also. It showed that the average product curve showing that the cement production was economically in rational zone. Technology adoption particularly changing to dry process was a contributing factor for this improvement in productivity. It would also explain a declining trend in unit cost of production and the widening profit margin- both operating profit and net profit of both ICI and CCCL, the later showing relatively better performance. CCCL adopted the dry processing technology from 1971-72 onwards.

**Other contributing factors**

Apart from technology, other factors contributing to improvement of TFP were economies of scale, favourable business environment and prices of cement. The economies of scale were studied first.

**Economies of scale**

The economies of scale in cement production can be achieved by any firm by (i) building additional capacity; (ii) increase in capacity utilisation and also by (iii) mergers, acquisitions, joint ventures or green filed projects. Indian cement industry was witnessing this process of consolidation

**Market and Increased Competition**

Though the industry saw consolidation by domestic players starting in the mid-1990s, it was only in the late 1990s the foreign players entered the market. The structure of the industry was fragmented, although the concentration at the top had increased. The top five players controlled about 60.28% of market share, which was

 

at 55 percent in 1989-90, and the remaining 39.72 percent of market share was under the control of 50 players relatively smaller in size. The fragmented structure was a result of the low entry barriers in the post-decontrol period and the ready availability of technology and finance. By consolidation, the companies were able to achieve economies of scale, resulting from the larger size of operations, savings in the time and cost required for setting up a new unit, access to newer markets, access to special facilities / features of the acquired company and benefits of tax shelter.The booming demand for cement, both in India and abroad, attracted global majors to India. In 2005-2006, four of the top five cement companies in the world entered into India. These included Lafarge from France's, Holcim from Switzerland, Ital cementi from Italy and Heidelberg Cements from Germany. The consolidation witnessed in the industry in recent years had resulted in two crucial domestic deals: (i) the de-merger of L&T's cement (renamed as Ultratech Cement Ltd.) division and its acquisition by Grasim (ii) Acquisition of 14.4 percent stake in ACC in 2000 (India Infoline 2003) by Gujarat Ambuja. Thus the two groups in the industry, Aditya Birla Group (Grasim and Ultratech Cements Ltd. Combine) and Holcim Group (Ambuja Cements Ltd. – ACC Ltd. Combine) now control more than 48 percent of total capacity in ICI.It was also seen that both CCCL and ICC had made substantial addition (140 per cent and 150 per cent, respectively) to capacity and improved capacity utilization to 72.36 per cent and 76.48 per cent, respectively. Therefore, there was possibility of reaping the benefits of economies of scale, in terms of a reduction in unit cost of production and increase in net profit per unit. This possibility was studied with the help of simple correlation between the variables. The correlation co-efficient (r) is presented in Table 1.below.As could be seen in the table, the correlation between installed capacity and unit cost and also unit profit was small and not significant, but it was strong and significant for production. The correlation coefficients were estimated for the indices (with base 1991-92=100) for the four variables to avoid the problems that might arise from the differences in the unit of measurement. The simple correlation coefficient between production and real unit cost had a negative sign and its value, though small, was statistically significant. It showed that with increase in size of production, real unit cost decreased in both ICI and CCCL. The correlation coefficient for production and unit profit had a positive signs and it was statistically significant for both ICI and CCCL. Therefore as and when production expanded, unit profit also increased, in spite of a free market determination of price for cement. Thus, the prevalence of economies of scale in production of cement was verified with respect to the post-reform period. It implied that the industry had learnt the strategy to perform successfully in freely competitive market.

**Competitiveness**

A firm's competitiveness could therefore be examined as function of factors such as (i) its own resources (ii) its market power; (iii) its behaviour toward rivals and other economic agents; (iv) its capability to adapt to changing circumstances; (v) its capability to create new markets; and (vi) its institutional environment, largely provided by the government and available physical infrastructure and the quality of government policies.The variables that constitute the competitiveness index for Indian cement industry have been identified on the basis of factors related to competitiveness at the firm level, considering the specific issues peculiar to the industry. For the study, the variables were identified with sub indicators in them. They are listed in Table-2The technique used for normalization and aggregation of indicators in cement industry competitiveness index of firms in cement industry was the method used by Burange and Yamini (2008) by assigning weights to all indicators. This method is a participatory method in which experts were requested to assign scores on a 10 point scale to indicate the importance of the indicators. There were 1-2 experts and 10 sample firms including CCCL. As experts in the field participate, weights necessarily reflect the viewpoint of the industry in question, as a whole.

After weight allocation to each of the indicators, these scores were aggregated linearly into a composite score. Also industry average scores were calculated to measure the average competitiveness in the industry. The weights are shown in Table:3

Index of industry average score was 42.10 which was used to analyse the competitive performance of firms above and below it. It is hence used to benchmark the firms' competitive standings in the industry. Eight firms from the sample of (60 percent) of the total sample firms were above industry average and remaining four (40 percent) below this. CCCL was close to the industry average with a score of 44.54.

**Business Environment**

With a vigorous pursuit of the new economic reforms policy by the Government of India since 1990-91, all the private industries came out of the protectionist mode of the past and became experiencing the advantages and challenges of a free market economy that was emerged from liberalization and globalisation. This helped the cement industry also and it had to function by quickly and effectively responding to the forces of demand and supply. While the supply was within the producers' domain of capacity addition, capacity utilization, inventory

 

and cost management, the demand was market determined. The demand for cement would largely depend upon the growth of the economy in general and growth of the housing, other constructions and infrastructure sections in particular. The GDP at current prices (to allow for changes in the general price level that also influenced market sentiment for construction activities and cost of investment) and also aggregate contribution of the section of construction activities were considered as important factors determining the demand for cement. The values of GDP, and sectoral contribution to GDP at factor cost at current prices and their indices with base 1991-92 = 100 and the WPI are presented in Table 4.As could be seen in the table, GDP at factor cost in current prices (Nominal) increased more than fivefold (index was 551.3) during the period from 1991-92 to 2005-06, while domestic production arising from the construction section increased more than six fold (index =665.46), and the WPI nearly doubled (index was 195.6). This provided a push factor to the demand for cement. Thus, the business environment (market condition) was very favourable to the Indian cement industry. Had the industry availed it? The answer was found in the correlation between production (proxy for supply) and the determinants of demand. The correlation coefficients are presented in Table :5 below.As shown in the table, production of cement had near perfect correlation with all the three macro variables viz., GDP, sector contribution to GDP and WPI. This was the case both for ICI and CCCL. Only the correlation of production with WPI was smaller but approximately equal to 0.9 in CCCL. It never changed the inference. This strong correlation would emphasize that the prospects of the ICI depended on the growth of the economy. For the post reform years, the growth of the economy as measured by GDP, was large (Index with base 1991-92 increased to 551.30 by 2005-06) and it had helped the growth of cement industry also and there seemed to be no industry specific constraint such as scarcity of resources. However, for continuing profitability, the cement producers would require to be ready to manage any market stocks. Their readiness was evaluated with the help of ratio analysis.

**4. Findings and Discussion**

- The performance of the industry and the case firm during the study period was analysed in terms of unit cost, net profit and operating profit margin. For bulk sales, price was stated per tonne (1000kg) of cement and for retail sales, price was stated per bag of 50 kgs of cement. Therefore, a bag of 50 kg was taken as the unit to measure cost price, profit earned by the firm – both operating profit and net profit.
- As the cost included both variable and fixed costs, price minus cost showed net profit per bag. The operating profit referred to the differences between the price and the operating expenses only.
- Both net profit and operating profit per unit were positive in all the years and their size was dependent more on the price than on the cost. While the firms had control over cost, they were all price takers in the market that was totally decontrolled in 1989 and acted freely, encouraging entry of several small firms.
- Thus, the profit of CCCL was not only larger than that for ICI, but was also relatively more stable (smaller CV) than that of ICI, revealing the fact that the performance of ICI was good and CCCL was better than ICI.
- The cost of all the components and the total cost- in nominal terms (uncorrected for inflation) were increasing over the years.
- The energy cost accounted for about 31 percent and other costs for 38 percent of total cost of production of cement in ICI. In the total cost, non human resource costs accounted for nearly 93-94 per cent of total cost, while labour cost had a share of six to seven percent. This pattern was seen to have changed only marginally in the period of study. Thus, cement production was capital and labour intensive.
- In CCCL, the increase in the cost of energy was six fold and seven fold for other costs. The collective effect of these increases pushed total cost of production by more than six fold (index was 679.61). This rising trend in cost of production was expected because production of cement by CCCL itself was increasing. Production had become labour and capital intensive.
- The real cost was defined as the nominal cost corrected for the rate of inflation. The real unit cost decreased for both ICI and CCCL, and relatively more rapidly for CCCL, through the improvement in efficiency of production, effective use of resources, technology adoption and upgradation and increasing factor productivity. This was made possible.

**4. Conclusion**

The salient findings of the study and helped drawing specific conclusions. The Indian cement industry is on the dynamic growth path in capacity, production, factor productivity and financial parameters. The future prospects are also bright. However, it needs attention to increase export and build net worth, which required more detailed and effective planning and management. If past trend is the source of

 

confidence for sustainable growth and viability of ICI, it has to be taken with adequate caution to avoid excessive surpluses. As the industry has learned to survive free market competition and grow with financial stability not withstanding three years cycle and large and growing cost of energy and heavy taxes – it is reasonable to infer that the prospect of ICI is fairly high, especially if Indian economy grows at eight percent or higher in the five years of the Eleventh Five Year Plan.

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**TABLE:1**
**ESTIMATES OF SIMPLE CORRELATION COEFFICIENTS**

| Variables | Correlation with | | | |
|---|---|---|---|---|
| | Unit cost | | Unit profit | |
| | ICI | CCCL | ICI | CCCL |
| Capacity | 0.196 | -0.194 | -0.145 | 0.284 |
| Production | -0.336 | -0.483 | 0.517 | 0.719 |

**TABLE-2**

| Indicators | Sub-indicators |
|---|---|
| 1. Productive Performance | Capacity utilization |
| | Labour productivity |
| 2. Financial Performance | Return on Net Worth (ROE) |
| | Return on Capital Employed (ROCE) |
| 3. Cost Effectiveness | Cost As % of Gross Sales |
| 4. Sales and Marketing Strategy | Market Share |
| 5. Stock Market performance | Earnings Per Share |
| 6. Technology and Environmental Indicators | Grades of Ordinary Portland Cement Produced |
| | Power and Fuel expenses |
| 7. Human Resource Development and Social Indicators | Employee Cost as % of Total cost |
| 8. Foreign Trade Measure | Exports as % of Gross Sales |
| 9. Growth Variables and Potential | PAT (NNRT) |
| | Net Sales |

**TABLE: 3**
**WEIGHTS FOR THE INDICATORS OF COMPETITIVENESS**

| Indicators | Average Weights |
|---|---|
| 1. Productive Performance | 12 |
| 2. Financial Performance | 15 |
| 3. Cost Effectiveness | 10 |
| 4. Sales and Marketing Strategy | 10 |
| 5. Market Share | 08 |
| 6. Consumer Satisfaction | 12 |
| 7. Technological Indicators | 12 |
| 8. Human Resource Development | 10 |
| 9. Foreign Trade | 06 |
| 10. Growth Performance and Potential | 05 |
| **Total** | **100** |

 

**TABLE: 4**
**MAJOR DETERMINANTS OF DEMAND FOR CEMENT**

| Year | GDP | | Sector | | General |
|---|---|---|---|---|---|
| | Rs. '000 Cr | Index | Rs. '000 Cr | Index | WPI |
| 1991-92 | 594.17 | 100.00 | 250.07 | 100.00 | 92.80 |
| 1992-93 | 681.52 | 114.70 | 292.87 | 117.12 | 96.70 |
| 1993-94 | 792.15 | 133.32 | 340.86 | 136.31 | 100.00 |
| 1994-95 | 925.24 | 155.72 | 411.57 | 164.58 | 112.60 |
| 1995-96 | 1083.29 | 182.32 | 500.29 | 200.06 | 121.60 |
| 1996-97 | 1260.71 | 212.18 | 577.68 | 231.01 | 127.20 |
| 1997-98 | 1401.93 | 235.95 | 645.47 | 258.12 | 132.80 |
| 1998-99 | 1616.08 | 271.99 | 733.16 | 293.18 | 140.70 |
| 1999-00 | 1786.53 | 300.68 | 798.16 | 319.17 | 145.30 |
| 2000-01 | 1925.02 | 323.99 | 887.29 | 354.82 | 155.70 |
| 2001-02 | 2097.73 | 353.05 | 959.89 | 383.85 | 161.30 |
| 2002-03 | 2261.40 | 380.60 | 1061.70 | 424.56 | 166.80 |
| 2003-04 | 2539.17 | 427.18 | 1206.71 | 482.55 | 175.90 |
| 2004-05 | 2877.71 | 484.32 | 1432.38 | 572.79 | 187.30 |
| 2005-06 | 3275.67 | 551.30 | 1664.11 | 665.46 | 195.60 |

**Source: Economic Survey 2006-07 Table A-b and Abb, GOI**
**Note: (i) *Sector here refers to housing, other business construction and infrastructure.**
**(ii) Index computed with 1991-92 =100 for GDP & Sector. Index for WPI from the source with 1993-94=100.**

**TABLE :5**
**CORRELATION BETWEEN CEMENT PRODUCTIONS AND DEMAND DETERMINANTS IN ICI**

| Production in | Correlation co-efficient | | |
|---|---|---|---|
| | GDP | Sector | HPI |
| ICI | 0.995 | 0.988 | 0.993 |
| CCCL | 0.905 | 0.912 | 0.896 |

Note: Single Pearson's "r"
Sector as defined in the text.