

# Financial Performance Evaluation of Cement-Majors in India: An Application of TOPSIS method

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**Abstract:** Physical infrastructure development, i.e., construction of roads, highways, school, hospitals, etc. is much focused in India nowadays. And its linkage with cement sector is quite evident. With the current level of competition and wide opportunities open in front, cement-majors of India need to evaluate their financial performance to claim a better future for them and their shareholders. This paper uses Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method, which is a multi criteria decision making tool, to evaluate the financial performance of ten cement-majors in India. It is found the relative preference of firms based on TOPSIS is quite different from that shown by their market capitalization.

**Keywords:** Financial Performance Evaluation; Indian Cement-majors; TOPSIS;

## 1. INTRODUCTION

Infrastructure development has been considered as the key to economic growth in any country. Literature shows that infrastructure growth positively affects economic growth in India (Sahoo & Dash, 2009). Economic growth in China is somewhat the outcome of infrastructure development that took place during last few decades (Meredith, 2008). This helped China to attract more FDI (Foreign Direct Investment) with respect to India. Huge share of Chinese infrastructure investment went to roads and highways as better transportation facilities accelerate economic development of the region.

Today, India is focused to attract FDI with its 'Make in India' policy. Number of policy measures has been taken by the under 'Make in India'. Few of them includes easing FDI norms in 15 sectors, increase FDI in various other, etc. But without physical infrastructure development everything would be in vain. So, the Government of India is planning to develop the roads, highways, houses, schools, hospitals, etc., in even the remotest location of the country. All of these would generate a huge requirement of cement. Cement industry which is facing low demand pressure would expect to have better sales in the upcoming years.

With the opportunities opening for the cement firms, the competition among the firms would be fierce. In the increased competitive market firms would have to analyze their financial performance time and again to improve it in future. Ratio Analysis, which is a traditional way to analyze any firm's financial performance, is incompetent to analyze financial performance and should be replaced by multi criteria decision making method (Tozum, 2009). This paper uses Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method, which is a multi criteria decision making tool, to evaluate the financial performance of ten cement-majors in India.

Literature reveals about the application of TOPSIS by number of researchers. It is one of the best alternative methods for decision making. This method was devised by Hwang and Yoon (1981) and has been in use since then. Feng and Wang (2000) used TOPSIS method in their study of performance evaluation of five domestic airlines in Taiwan with the help of financial ratios. Tien-Chin and Hsu (2004), in another study in Taiwan Stock Market, analyzed and ranked the relative performance of computer manufacturers by using entropy method to find the objective weights for each criterion and applying TOPSIS method thereon. Demirelli (2010) used TOPSIS to find the performance of state-owned commercial banks in Turkey by using equal weights to all the financial ratios chosen. Balgurcu (2012) chose to study the financial performance of various technology firms in Istanbul stock market using TOPSIS and used equal weights to chosen financial ratios. Das and Roy (2015) used TOPSIS to measure the financial performance of pharmaceutical companies in India.

After introduction section, the rest of the paper has been divided into four sections. Second section explains various financial ratios chosen. Third section deals with TOPSIS method and its analysis. Fourth section explains the application of the methods chosen in cement-majors. And final section contains the results of the study and suggestions for further research.

## 2. FINANCIAL RATIOS

Financial Ratios, which are traditionally used to evaluate financial performance of a firm, can be classified into following types on the basis of information provided by them.

- 1) Liquidity Ratios: Liquid assets are those which can be easily converted into cash, i.e., within an operating cycle. It denotes the firm's capability to meet its current obligations (Weston & Brigham, 1993).
- 2) Leverage Ratios: These ratios measure the firm's capability to meet its future debt obligations, esp., long-term debt obligation (Foster, 1978).
- 3) Activity Ratios: These ratios indicate the efficiency of the assets acquired by the firm. A comparison between firm's activity ratios with industry's average can help the firm to judge its efficiency in resource allocation (Moyer et al., 1992).
- 4) Profitability Ratios: These ratios refer to firm's operational efficiency. It is firm's capability to earn in excess of the expenses incurred during a period (Foster, 1978).

From the categories mentioned above following ratios, which are frequently used in literature, are chosen for the evaluation of the firms in this paper.

Current ratio (Current Assets/ Current Liabilities) is measure of firm's ability to meet its current obligations with its current assets. It is also considered as a good measure of working capital adequacy of the firm (Price et al., 1993).

Quick ratio or Acid test ratio is more stringent measure of liquidity than current ratio. It is based on highly liquid current assets. It is calculated by dividing the difference between current assets and inventories by current liabilities (Ercan and Ban, 2005).

Debt-Equity ratio is used to check the relative contribution of creditors and owners. It is calculated by dividing the firm's long term liabilities by equity shareholder's fund (Chandra, 2011).

Interest coverage ratio, also called times interest earned, indicates the ability of the firm to make its interest payment. It is calculated by dividing profit before interest and tax by interest amount (Chandra, 2011).

Inventory turnover ratio measures the speed of the inventory within the organization and its conversion into sales. It is calculated by dividing cost of goods sold by average inventory for the period. (Chandra, 2011)

Debtors turnover ratio, also known as accounts receivable turnover, is calculated by dividing net credit sales by average debtors. Higher turnover indicates better efficiency of the firm in collecting its receivables.

Number of Days in working capital determines the number of days the company takes to convert the working capital into revenue.

$$\text{Number of days in working capital} = \frac{\text{Average Working Capital} * 365}{\text{Annual Sales Revenue}} \quad (1)$$

Net asset turnover ratio measures the effectiveness of the resources used by the firm to generate sales. It can be calculated by dividing net sales by net asset of the firm.

Material cost composition ratio determines the share of raw material cost in total sales generated by the firm. This ratio is important for manufacturing sector where raw material cost is a major concern.

Imported cost composition is required where raw material is procured from abroad and major cost concern for the manufacturer. It is a ratio of cost of imported material to total sales.

Gross profit margin ratio determines the firm's efficiency of production and pricing. It is a ratio of gross profit and net sales. Gross profit is the difference between the net sales and cost of goods sold.

Net profit margin ratio indicates the firm's profitability after deduction of all expenses including tax and interest (Akguc, 2010). (Net Revenue / Net Sales)

Return on Net worth, also known as return on equity, measures how efficient a firm is at generating profits from every unit of owner's capital or equity shareholders' fund invested (Akguc, 2010). (Net profit / Shareholders' fund)

Return on capital employed measures the efficiency of the firm to generate profits per unit of capital invested in the firm. (Akguc, 2010) (Net profit / Total capital employed).

Earning per share is calculated by dividing net profit for the period by number of equity share of the firm.

## 3. METHODOLOGY

This paper uses TOPSIS method, developed by Hwang and Yoon in 1981, as a multi-criteria decision making method. This method is used to choose the best alternative from a given set of options, i.e., the one which is nearest to the ideal solution and farthest from the negative ideal solution (Benitez, Martin & Roman, 2007). The TOPSIS method is conducted using following steps:

Step 1: Prepare the original data matrix by using criteria value for each alternative.

Step 2: Normalize the alternative values in the original data matrix. The formula used for normalization is

$$r_{ij} = \frac{X_{ij}}{\sqrt{\sum_{j=1}^m X_{ij}^2}} \forall i, j; X_{ij} = \text{Index of } i^{\text{th}} \text{ ratio w.r.t. } j^{\text{th}} \text{ company.} \tag{2}$$

Step 3: Calculate the weighted normalized matrix by using the formula  $v_{ij} = w_i * r_{ij} \forall i, j$  where  $\sum w_i = 1$ .

Step 4: Determine the positive ideal ( $A^+$ ) and negative ideal ( $A^-$ ) solution

$$A^+ = \{(\max_i r_{ij} | j \in J), (\min_i r_{ij} | j \in J') | i = 1, 2, 3, \dots, m\} = \{A_1^+, A_2^+, \dots, A_j^+, \dots, A_k^+\} \tag{3}$$

$$A^- = \{(\min_i r_{ij} | j \in J), (\max_i r_{ij} | j \in J') | i = 1, 2, 3, \dots, m\} = \{A_1^-, A_2^-, \dots, A_j^-, \dots, A_k^-\} \tag{4}$$

$J = \{j= 1, 2, \dots, k | k \text{ belongs to benefit criteria}\}$  benefit criterion implies a larger indicator value and a higher performance score.  $J' \{j = 1, 2, \dots, k | k \text{ belongs to cost criteria}\}$  cost criterion implies a smaller indicator value and a higher performance score.

Step 5: Calculate separation measure (ideal separation and negative separation)

$$S_i^+ = \sqrt{\sum_{j=1}^k (r_{ij} - A_j^+)^2} \text{ and } S_i^- = \sqrt{\sum_{j=1}^k (r_{ij} - A_j^-)^2} \text{ where } i = 1, 2, \dots, m \tag{5}$$

Step 6: Calculate the relative closeness to the ideal solution ( $C_i^*$ )

$$C_i^* = \frac{S_i^-}{S_i^+ + S_i^-} \text{ where } 0 < C_i^* < 1 \tag{6}$$

Step 7: Rank the companies as per descending values of  $C_i^*$ .

**4. APPLICATION**

In this paper, the financial data of ten cement-majors of India, listed in NSE for five year time period 2011-2015, are used. Sixteen financial ratios are calculated with the help of company’s annual report. Then average of those ratios for five years have been calculated and used to prepare the original data matrix (10 x 16). Then equal weights are given to all the sixteen criteria as these ratios are of equal significance to this paper and no linguistic variables are used. Sum of weights must be equal to one. So, weights for each of the criteria would 0.0625. Finally, TOPSIS has been used to rank the firms on the basis of their financial performance. A ranking of the company’s chosen for the study is also prepared based on their market capitalization and spearman’s correlation is used to check for any association between the two rankings obtained by TOPSIS and market capitalization. The original data matrix, i.e., five years ratios average is presented in Table 1.

Table 1:Original Data Matrix

	GPM	NPM	ROCE	RONW	CR	QR	D/E	IC	ITR	DTR	ATR	NDWC	MCC	ICRMC	EPS
ultratech	15.486	11.278	17.046	14.566	0.69	0.456	0.294	11.782	9.33	23.612	1.126	2.586	21.042	10.394	77.794
shree	12.004	10.894	17.758	16.814	0.964	0.854	0.36	5.046	10.038	27.104	1.208	21.614	16.292	3.58	174.856
ambuja	16.864	14.73	20.726	15.128	1.202	0.93	0.01	29.802	10.362	45.278	1.064	41.262	15.592	12.532	8.542
acc	12.638	11.414	19.718	15.656	0.786	0.524	0.05333	19.706	11.886	40.004	1.374	-26.812	20.91	9.33	61.472
ramco	15.194	8.144	13.048	12.532	0.454	0.404	0.954	3.334	8.846	14.032	0.778	-1.904	22.396	4.54	11.596
dalmia	11.218	18.846	7.818	6.258	3.854	3.688	0.01	306.686	8.315	7.584	0.384	333.734	25.5925	50.4175	4.188
jk	11.232	5.236	12.502	10.204	0.926	0.772	1.098	2.346	6.52	29.04	0.916	57.27	21.992	24.352	20.848
prism	2.636	-0.088	6.242	-1.356	0.846	0.684	1.268	0.978	11.644	12.094	1.94	1.562	47.988	4.256	-0.242
jdklakshmi	10.312	5.602	10.24	8.85	0.744	0.654	0.982	3.05	14.96	44.088	0.818	-8.584	27.298	3.175	8.934
birla	9.896	9.084	10.904	9.836	0.99	0.934	0.468	6.02	6.032	49.486	0.788	63.846	26.218	8.148	29.454

Following the step 2 of the TOPSIS method, the normalized matrix has been prepared.

Table 2: Normalized Matrix

	GPM	NPM	ROCE	RONW	CR	QR	D/E	IC	ITR	DTR	ATR	NDWC	MCC	ICRMC	EPS
ultratech	0.39693	0.33171	0.37424	0.38304	0.14835	0.10687	0.12986	0.03811	0.29183	0.22957	0.31986	0.00741	0.25585	0.17287	0.37954
shree	0.30768	0.32042	0.38987	0.44215	0.20726	0.20015	0.15901	0.01632	0.31397	0.26352	0.34315	0.06195	0.19809	0.05954	0.85308
ambuja	0.43225	0.43325	0.45503	0.39782	0.25842	0.21796	0.00442	0.09641	0.32411	0.44021	0.30225	0.11827	0.18958	0.20843	0.04167
acc	0.32393	0.33571	0.4329	0.4117	0.16899	0.12281	0.02356	0.06375	0.37178	0.38894	0.39031	-0.07685	0.25424	0.15518	0.29991
ramco	0.38945	0.23953	0.28646	0.32955	0.09761	0.09469	0.42137	0.01079	0.27669	0.13642	0.221	-0.00546	0.27231	0.07551	0.05657
dalmia	0.28754	0.55431	0.17164	0.16457	0.82859	0.86436	0.00442	0.9921	0.26008	0.07373	0.10908	0.95662	0.31118	0.83854	0.02043
jk	0.2879	0.154	0.27448	0.26833	0.19909	0.18093	0.48497	0.00759	0.20394	0.28234	0.2602	0.16416	0.2674	0.40502	0.10171
prism	0.06757	-0.00259	0.13704	-0.03566	0.18189	0.16031	0.56006	0.00316	0.36421	0.11758	0.55109	0.00448	0.58348	0.07079	-0.00118
jkakshmi	0.26431	0.16477	0.22482	0.23273	0.15996	0.15328	0.43373	0.00987	0.46793	0.42864	0.23237	-0.02461	0.33191	0.05281	0.04359
birla	0.25365	0.26718	0.23939	0.25866	0.21285	0.2189	0.20671	0.01947	0.18867	0.48112	0.22384	0.18301	0.31878	0.13552	0.1437

Table 3 represents weighted normalized matrix which is prepared as per step 3.

Table 3: Weighted Normalized Matrix

	GPM	NPM	ROCE	RONW	CR	QR	D/E	IC	ITR	DTR	ATR	NDWC	MCC	ICRMC	EPS
ultratech	0.02481	0.02073	0.02339	0.02394	0.00927	0.00668	0.00812	0.00238	0.01824	0.01435	0.01999	0.00046	0.01599	0.0108	0.02372
shree	0.01923	0.02003	0.02437	0.02763	0.01295	0.01251	0.00994	0.00102	0.01962	0.01647	0.02145	0.00387	0.01238	0.00372	0.05332
ambuja	0.02702	0.02708	0.02844	0.02486	0.01615	0.01362	0.00028	0.00603	0.02026	0.02751	0.01889	0.00739	0.01185	0.01303	0.0026
acc	0.02025	0.02098	0.02706	0.02573	0.01056	0.00768	0.00147	0.00398	0.02324	0.02431	0.02439	-0.0048	0.01589	0.0097	0.01874
ramco	0.02434	0.01497	0.0179	0.0206	0.0061	0.00592	0.02634	0.00067	0.01729	0.00853	0.01381	-0.00034	0.01702	0.00472	0.00354
dalmia	0.01797	0.03464	0.01073	0.01029	0.05179	0.05402	0.00028	0.06201	0.01626	0.00461	0.00682	0.05979	0.01945	0.05241	0.00128
jk	0.01799	0.00963	0.01715	0.01677	0.01244	0.01131	0.03031	0.00047	0.01275	0.01765	0.01626	0.01026	0.01671	0.02531	0.00636
prism	0.00422	-0.00016	0.00857	-0.00223	0.01137	0.01002	0.035	0.0002	0.02276	0.00735	0.03444	0.00028	0.03647	0.00442	-7.4E-05
jkakshmi	0.01652	0.0103	0.01405	0.01455	0.01	0.00958	0.02711	0.00062	0.02925	0.02679	0.01452	-0.00154	0.02074	0.0033	0.00272
birla	0.01585	0.0167	0.01496	0.01617	0.0133	0.01368	0.01292	0.00122	0.01179	0.03007	0.01399	0.01144	0.01992	0.00847	0.00898

The separation measures from positive ideal solution and negative ideal solution are calculated as follows

$$S^+ = (0.00468; 0.00438; 0.00456; 0.00451; 0.00557; 0.00564; 0.00516; 0.00582; 0.00537; 0.00479)$$

$$S^- = (0.00416; 0.00504; 0.00369; 0.00485; 0.00435; 0.00523; 0.00263; 0.00429; 0.00453; 0.00319)$$

Finally, relative closeness to the ideal solution is calculated as per step 6 of the method. The market capitalization of the company's chosen is shown in Table 4.

Table 4: Market Capitalization and Ranking

Company Name	Market Capitalization (Rs. Cr.)	Rank
Ultratech Cement	78722.14	1
Shree Cement	38948.02	2
Ambuja Cement	30463.75	3
ACC	25345.06	4
Ramco Cement	8910.02	5
Dalmia Cement	6320.99	6
J.K. Cement	4580.23	7
Prism Cement	4364.1	8
JK Lakshmi Cement	3894.88	9
Birla Corp	3516.06	10

Spearman's correlation is found for the ranking prepared as per market capitalization and ranking as per TOPSIS method.

## 5. CONCLUSION

Cement sector contribution in India's growth is quite commendable. India is second largest producer of cement in the whole world. Due to current focus on infrastructural growth, cement industry is expected to be

one of the major beneficiaries. The overall performance of the firm would be major deciding factor of firm's future days.

The study shows that Shree Cement was the best performer among the chosen firms whereas J K cement has the lowest performance as per the TOPSIS method.

Table 5: Relative Closeness to Ideal Solution and Ranking

Company Name	C*	Rank
Ultratech	0.470994	4
Shree	0.534844	1
Ambuja	0.446985	6
ACC	0.51851	2
Ramco	0.438225	7
Dalmia	0.481319	3
JK	0.337701	10
Prism	0.424406	8
JK Lakshmi	0.457379	5
Birla	0.399755	9

The spearman's rank correlation coefficient between the ranking on the basis of TOPSIS method and ranking based on market capitalization is 0.376. This suggests lower association between both set of ranks.

In future studies, other multi criteria decision making methods can be used for similar evaluation with different weight calculation methods. TOPSIS can also be used for performance evaluation in other sectors.

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