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Analysis of financial performance of selected Indian cement companies: An empirical study

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Abstract
During the last few decades Indian cement industry witness its unprecedented growth in cement production. At present India registered 8% share of the global installed capacity and occupied 2nd place in the world in cement production. Growing demand of cement, inflow of FDI in cement production, adoption of modern technology compliance with government policy Indian cement industry observed an overwhelming boom in cement production. In this paper it has been attempted to analyse the financial performance in respect of three parameters liquidity, efficiency of resource management and profitability of 15 Indian cement companies randomly selected form the companies listed in NSE. For this purpose, all secondary data are collected from Capital Line Databasefor the period of 2014 to 2023. 5 financial ratios of each parameter of have been used as criteria to from a matrix for analysis the financial performance. Descriptive statistics such as mean and S.D. have used to determine the consistent performance of the companies and TOPSIS (Technique for order preference by similarity to ideal solution) with entropy weighted method is used to determine performance rank precisely in respect of their liquidity, efficiency of resource management and ranked the overall performance of the selected companies. Spearman's rank correlation revealed that there exists positive and significance rank correlation between liquidity and profitability, liquidity and overall performance, profitability and overall performance but there are positive but insignificant rank correlation between liquidity and efficiency of resource management, profitability and efficiency of resource management, efficiency of resource management and overall performance during the study period.

Keywords: TOPSIS, entropy, liquidity ratio, efficiency ratio

Introduction

India is the 2nd largest and registered almost 8% share of the global installed capacity of cement production in the world. Growing demand of cement, inflow of FDI in cement production, adoption of moder technology compliance with government policy Indian cement industry observed an overwhelming boom in cement production and regarded as one of the most attractive sector for investment. Many scholars attempted to measure the financial performance of Indian cement companies on the basis of liquidity, efficiency of assets management and profitability. Different financial ratios have been used as a criterion to measure the financial health of the company. Statistical tools like mean, standard deviation, correlation, regression analysis, ANOVA etc. have been used. Ratio analysis also helps to identify the financial health of the companies. But, it becomes complex and cumbersome to handle the result of different ratios at a time and also unable to identify a specific position of the companies. Moreover, it also failed to identify the relative importance of the different ratios which are used to measure the financial health of the companies.

In this context multicriteria-decision-making-method (MCDM) throw some light to solve this problem. TOPSIS, VIKOR, MOORA, MARCOS, COCOSO, PROMETHEE, COMET, COPRAS etc. are some of the important MCDM out of which oneof noteworthy technique is TOPSIS (Technique for order preference by similarity to ideal solution). Hwang and Yoon (1981) developed the TOPSIS and this method consists of compare a set of alternatives by identifying weight of each criterion, normalizing scores of each criterion and evaluating the geometric distance between each alternative and the ideal alternative (Fahami et.al. 2019) [3]. Determination of weight of each criterion is very important to solve TOPSIS. Though equal weight may be attribute to each criterion but it depends on the personal judgement of the researcher. Entropy, CRITIC, FANMA, PCA, CILOS, MEREC etc. are some important objective methods to determine weight (Kizielewicz B.S. 2023). In entropy method, the criteria weights are derived from information gathered in each criterion through mathematical model without any intervention of the decision maker (Odu, 2019). Moreover, entropy method can be applicable for all MCDM (Wu et.al. 2022). Entropy measures the uncertainty or randomness in a set of information. The high entropy provides greater information, capture complex relationships, identify relevant features etc. it also helps to identify the most valuable data to be collect from the data set (Vallarino,2023). In order to get more accuracy, TOPSIS with entropy method has been adopted for evaluation of financial performance.

Survey of literature: The following literature have been surveyed for the study purpose:

- (Balakrishnan & Deepak Kumar, 2021) [2] Conducted the financial performance analysis of selected Indian cement companies to measure the financial performance in respect of their profitability, liquidity and effective position of the industry. 5 Indian cement companies were selected and all the data were collected from company's annual report and Balance Sheet and also from money control.com. For the period of 10 years (2012 to 2021). Liquidity Ratio, Profitability Ratio, Solvency Ratio, Capital Structure Ratio were used to measure the performance and analytical data represented by table. It was found Altra Tech cement

was the top and India cement was the least performing company among the five companies during the study period.

- (Aitha & M.mekala, 2024) [1] Analysed the financial performance of selected cement companies during the period of 2016 to 2020 to analyse the profitability, liquidity and solvency position of cement companies over the period of study. All the data were secondary data and collected from secondary sources like annual reports of the companies, journals and internet. 3 cement companies such as Ultra Tech Cement Ltd., The Ramco Cement Ltd. and India Cement Ltd. were selected for this study and different ratios like EPS, gross profit ratio, net profit ratio, operating profit ratio, current ratio and liquid ratio were considered for financial performance analysis. It was found that Ultra Tech Cement Ltd. was the good performer in terms of profitability and liquidity out of the selected cement companies during the period of study.
- (Kumar, Devika, & Indhu, 2020) [8] Analysed the turnover position of 3 selected cement companies to determine the turnover position and trends of financial position of the selected cement companies in Tamil Nadu during the period of 2003 to 2012. The study was based on secondary data, collected from annual reports of the respective companies. Inventory turnover ratio, Fixed Asset Turnover ratio and Debtors Turnover ratio has been considered as tools to measure the efficiency and trend analysis was used to determine the trend of financial position. The Madras Cement Company and India Cement Company were found satisfactory in the inventory position, the fixed asset turnover ratio of KCP Cement Company was found favourable. All the companies showed increasing trend in financial position during the period of study.
- (Ghosal, 2020) [4] in this paper the author highlighted the history and progress of cement industry in India and the present position of cement industry of India in respect of world. Secondary data were used and collected form Annual Survey of Industries, India Development Foundation (IDF), different websites, journals and articles. The period of the study was 2011-12 to 2015-16. It was concluded that Indian cement industry possessed the first palace to reducing carbon emission and outperforming other competitors in the world by employing more advance technology, use alternative fuel in generating power, use the by-product of other industries in cement production.
- (Hemalatha & Kmalavalli, 2018) [5] Evaluated the profitability of selected cement companies in India during the period from 2005 to 2015. Data were collected form secondary sources like Capitaline Plus database and sample size of the study was 15 cement companies. Financial ratios such as gross profit ratio, net profit ratio, operating profit ratio, return on assets and return on equity and statistical tools such as mean, coefficient of variation, correlation and multiple regression were used for analytical purpose. Correlation analysis revealed that, there exist positive relationship between gross profit ratio, net profit ratio, operating profit ratio and also with the return on equity. All the companies were performed satisfactorily during the study period.
- Observed the profitability management with reference to cement industry in India, for this purpose they analysed the profitability and capital utilization of Bharathi Cement Corporation Limited for the period of 2015 to 2019. All the data were secondary data and collected from annual reports of the company. Financial ratio like Net Profit Ratio, Operating Ratio, Return on Investment, Operating Margin and Return on Assets were considered for analytical purpose. Net Profit Ratio is indicating positive benefit in the year 2018-19 and Net Profitability Ratio and Operating Ratio were good but profit to Total Assets ratio was not satisfactory during the period.
- (Kumar R., 2016) [7] Evaluated the financial performance of some major cement companies in India under the TOPSIS method. 10 cement companies were selected from the list of NSE for the period of 2011 to 2015. All secondary data were collected from website of the companies. Financial ratios, TOPSIS analysis method were followed for evaluation purposes. Average weight was assigned for each criterion of TOPSIS analysis. 5 years ratios average of 16 financial ratios were considered for the evaluation of financial performance. Spearmen rank correlation was also used to check for any association between the two rankings obtained by TOPSIS and market capitalization. There was low association between the rank determined by TOPSIS and the rank on the basis of capitalization.
- (Judith, 2022) [6] Attempted to compare the role of weight in multi-criteria-decision-method for this purpose a comparison was made between subjective and objective weight method. In this respect the author considered a case study in networking field in which 9 alternatives were considered along with 5 criteria where weight was determined by subjective method to solve one of the MCDM method TOPSIS. When the same weight was determined by entropy method that differ the result found in the case study. It was concluded that weight of criteria determined by objective weight method totally derived from the information matrix through mathematical calculation but in subject weight method weight is determined on the basis of experience and personal consideration of decision makers which effect the result of MCDM.

Research Gap: Reviewing the related literature most of the studies conducted to measure the liquidity of cement companies, few of them related with measuring the trend of profitability. Some scholars attempted to evaluate the financial efficiency of selected cement companies.

Attempt to measure the overall financial performance of Indian cement companies on the basis parameters like liquidity, efficiency of resource management and profitability taken altogether have yet not been conducted. Therefore, in order to bridge the gap an attempt has been made in our study to evaluate the overall financial performance of selected listed Indian cement companies on the basis of random sampling technique by using TOPSIS integrated with Entropy method. Entropy method has been selected to calculate weight in order to make mathematical accuracy and avoid personal bias. Use of TOPSIS method to analyse the financial performance is very much new in this field.

Objective of the study: The main objective of our study is to determine the overall financial performance of the selected Indian cement companies. For this purpose, the sub-objectives are:

1. To assess the liquidity of selected cement companies under study.
2. To evaluate the efficiency of resource management of the cement companies under the study.
3. To examine the profitability of the cement companies under study.

Methodology

1. **Sample design:** There are 37 large cement companies listed in NSE out of which 15 cement companies have been selected for the study.

2. **Period of the study:** The period of the study is 2014 to 2023.

3. **Collection of data:** The data for the study are collected from the various secondary sources such as Capital Line Database, IBEF, CIS, internet, e-books, companies' annual financial reports, articles, National and International research books, books etc.

4. **Data analysis: Data are analysed under descriptive statistics method and TOPSIS integrated with entropy method. Under descriptive statistics method** statistical tools like mean and standard deviation (S.D.) are used to measure the central tendency and consistency of performance. TOPSIS method has been applied to ascertain more explicit performance rank by considering all ratios simultaneously in respect of each parameter. In case of examining the liquidity of the companies under the study, 5 liquidity ratios like Cash Flow to Net Income Ratio (CFNIR), Interest Coverage Ratio (ICR), Current Liability Coverage Ratio (CLCR), Current Ratio (CR) and Liquidity Ratio (LR) have been used.

In order to evaluating the efficiency of resource management the selected companies under the study, ratios like Inventory Turnover Ratio (ITR), Debtors Turnover Ratio (DTR), Working Capital Turnover Ratio (WCTR), Total Assets Turnover Ratio (TATR) and Capital Employed Turnover Ratio (CETR) have been used.
While analyzing the profitability, 5 profitability ratios like Gross Profit Ratio (GPR), Net Profit Ratio (NPR), Operating Profit Ratio (OPR), Operating Ratio (OR) and Return on Capital Employed (ROCE) have been
Finally, in order to determine of the overall financial performance of the companies under the study. TOPSIS rank of liquidity, efficiency of resource management and profitability have been used to determine overall performance.

5. **Calculation of TOPSIS with entropy weight:** This method consists of following steps in order to reach the final solution: -

Step –1: Formation of decision matrix $(X_{ij})_{m\times n}$

Here, Decision matrix is consisting of 33 (listed companies) alternatives companies (m) and 5 criteria or financial ratios (n). The score of each alternative with respect to each criterion is given as X_{ij} and then the matrix is formed as below-

$$(X_{ij})_{m\times n}=\begin{bmatrix} X_{11} & X_{12}\cdots. & X_{1n} \\ X_{21} & X_{22} & X_{2n} \\ \vdots & \vdots & \vdots \\ X_{m1} & X_{m2} & X_{mn} \end{bmatrix}$$

Step 2: Normalize the decision matrix:

$$r_{ij} = \frac{X_{ij}}{\sqrt{\sum_{i=1}^{m} X_{ij}^2}} \quad i = 1, 2,\ldots\ldots, m;\ j= 1,2,\ldots\ldots, n$$

$$R = (X_{ij})_{m\times n} = \begin{bmatrix} r_{11} & r_{12}\cdots. & r_{1n} \\ r_{21} & r_{22} & r_{2n} \\ \vdots & \vdots & \vdots \\ r_{m1} & r_{m2} & r_{mn} \end{bmatrix}$$

Step 3: Calculation of weighted normalized matrix.

$$V_{ij}=\begin{bmatrix} \boldsymbol{w_1 r_{11}} & \boldsymbol{w_2 r_{12}}\cdots. & \boldsymbol{w_n r_{1n}} \\ \boldsymbol{w_1 r_{21}} & \boldsymbol{w_2 r_{22}} & \boldsymbol{w_n r_{2n}} \\ \vdots & \vdots & \vdots \\ \boldsymbol{w_{m1} r_{m1}} & \boldsymbol{w_{m2} r_{m2}} & \boldsymbol{w_n r_{mn}} \end{bmatrix}$$

Where, $V_{ij} = W_j r_{ij}$ i = 1, 2,…., m; j= 1, 2,……., n

Here, W_j is the weight of the j th criteria or attribute, calculated by entropy method.The entropy method for determining the relative importance of criteria is calculated by using material data for each criterion, the entropy of the set of normalized outcomes of the jth criterion is calculated by given formula:

$$n_{ij} = \frac{X_{ij}}{\sum_{i=1}^{m} Xij} \quad i = 1, 2,\ldots\ldots, m;\ j= 1,2,\ldots\ldots, n$$

Where, X_{ij} is the element of decision matrix. (As formed in step – 1)
m = No. of alternatives (here, companies)

Thus, value of e_j can be determined. Where, e_j is the information entropy value for jth criteria.

Next step is to find out the degree of diversity (d_j) possessed by each criterion and is evaluated as

$$d_j = 1 - e_j, \; j = 1,2,3\ldots..,n;$$

And the last step is to determine the weight value (w_j) of each criterion which is given by

$$w_j = \frac{d_j}{\sum_{i=1}^{m} d_j}$$

Step 4: Determination of the positive or best ideal solution and negative or worse ideal solution.

Positive ideal solution (V_j^+) is the best performance of eachmatrix column or criteria of the weighted normalization Decision matrix and negative ideal solution (V_j^-) is the worst performance of each matrix column or criteria of the weighted normalization Decision matrix.

Step 5: Calculation of the Euclidean distance form ideal best.

It determines the closest position to positive ideal solution. The distances to the positive ideal solution of each alternative are calculated by the Euclidean distance approach, using the values in the weighted normalization matrix and the values in the positive ideal solution clusters.

Step 6: Calculation of the Euclidean distance form ideal worse.

It is the farthest position to negative ideal solution. The distances to the negative ideal solution of each alternative are calculated by the Euclidean distance approach, using the values in the weighted normalization matrix and the values in the negative ideal solution clusters.

Step 7: Calculation of performance score or the correspondence closeness coefficient of the i[th] alternatives.

$$C_i = \frac{S_i^-}{(s_i^+ + S_I^-)}; \qquad 0 \le C_i \le 1$$

Ci = the closeness coefficient of each alternative

Step 8: Rank of the Companies.

Ranking of alternatives is determined by comparing values of C_i. The highest relative closeness value is the ideal alternative and considered as the best alternative in terms of the related multi-criteria decision-making problem and ranked 1.

Analysis

Table 1: Mean and S.D. of liquidity ratios of 15 selected listed Indian cement companies during the period of 2014 to 2023

Companies Name	CFNIR		CLCR		CICR		CR		LR	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
ACC Ltd.	1.31	1.01	0.39	0.22	29.17	11.24	1.25	0.40	1.02	0.45
Ambuja Ltd.	1.28	0.42	0.46	0.13	23.02	5.75	1.40	0.16	1.13	0.17
Andhra Ltd.	-0.68	0.44	0.20	0.13	5.35	17.36	0.45	0.57	0.35	0.47
Anjani Ltd.	1.46	2.44	0.23	0.14	39.54	68.68	1.64	0.78	1.15	0.66
Birla Ltd.	2.58	0.96	0.64	0.20	2.88	0.93	2.00	0.75	1.14	0.49
Burnpur Ltd.	2.13	5.85	1.07	1.57	-138.32	303.76	1.61	1.31	0.97	0.96
Decan Ltd.	2.85	3.51	1.52	0.97	9.06	5.53	3.62	1.21	2.37	0.68
Dalmia (Bharat) Ltd.	3.75	11.33	0.91	0.32	2.40	1.71	1.80	0.76	1.39	0.68
Star Ltd.	1.28	0.78	0.71	0.67	11.90	8.49	2.54	0.68	2.20	0.71
Ultratech Ltd.	1.81	0.35	0.72	0.13	9.42	3.44	1.02	0.13	0.64	0.14
Barak Valley Ltd.	0.15	10.71	0.37	0.24	1.98	0.44	1.50	0.40	1.13	0.29
Gujarat Sidhee Ltd.	-0.53	2.32	0.18	0.15	8.74	11.82	1.17	0.32	0.70	0.27
Heidelberg Ltd.	2.43	2.52	0.46	0.12	6.01	3.69	1.15	0.22	0.91	0.24
India Cement Ltd.	4.25	7.86	0.39	0.21	1.88	0.75	1.27	0.28	0.84	0.29
JK Cement Ltd.	2.80	1.08	0.83	0.24	4.05	1.50	1.77	0.20	1.17	0.19

Table No. 1 shows the mean and standard deviation (S.D.) of different liquidity ratios of 15 selected listed Indian cement companies during the period of 2014 to 2023. Further, above table reflects a fluctuating trend of mean and S.D. of all selected liquidity ratios throughout the study period. The higher S.D. indicates high inconsistency; contrary low S.D. indicates consistency in liquidity performance during the study period.
It is recognised that, Ambuja Cement Ltd. is the best consistent performers in respect of CFNIR and LR. Heidelberg Cement India Ltd. showed consistency in CLCR, Barak Valley Cement Ltd. exhibited consistency in CICR and in respect of CR UltraTech Cement Ltd. demonstrated good consistency. Conversely, with regard to CFNIR Dalmia Cement (Bharat) Ltd. showed poor performance, Burnpur Cement Ltd. regarded as worst performers in respect of CLCR, CICR, CR and LR during the study period.

Table 2: Mean and S.D. of efficiency ratios of 15 selected listed Indian cement companies during the period of 2014 to 2023

Companies Name	ITR		DTR		WCTR		TATR		CETR	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
ACC Ltd.	11.27	2.24	25.32	5.03	12.56	26.10	1.16	0.23	1.92	0.59
Ambuja t Ltd.	6.49	2.43	20.09	10.54	5.55	3.50	0.49	0.23	0.69	0.35
Andhra Ltd.	11.47	6.99	537.15	1582.66	-0.13	2.48	0.26	0.12	0.90	1.79
Anjani Ltd.	11.58	2.81	17.73	4.44	6.11	9.72	1.14	0.32	1.66	0.88
Birla Ltd.	6.93	0.82	29.01	6.92	8.93	5.27	1.00	0.07	1.23	0.12
Burnpur Ltd.	6.24	5.02	1512.79	2962.64	-4.34	5.29	0.48	0.30	0.57	0.37
Decan Ltd.	9.04	1.82	34.78	19.22	4.33	2.07	1.00	0.18	1.13	0.19
Dalmia (Bharat) Ltd.	11.04	1.65	15.19	3.17	17.51	47.69	0.56	0.10	0.65	0.13
Star Ltd.	17.96	4.00	12.56	6.55	5.26	4.54	1.54	0.43	2.17	0.82
Ultratech Ltd.	10.02	0.96	18.30	1.64	12.93	53.85	0.80	0.10	1.02	0.16
Barak Valley Ltd.	12.02	4.19	10.56	2.37	-369.67	1124.89	0.97	0.14	1.39	0.31
Gujarat Sidhee Ltd.	8.43	1.40	34.38	8.16	10.27	22.22	1.64	0.53	3.00	1.71
Heidelberg Ltd.	12.01	2.55	80.92	26.70	1.77	23.85	0.76	0.10	1.05	0.16
India Cement Ltd.	7.01	0.69	8.08	1.54	1.10	28.95	0.62	0.12	0.76	0.16
JK Cement Ltd.	8.29	1.71	23.65	2.03	7.24	2.22	0.87	0.11	1.06	0.15

Table No. 2 presents the mean and standard deviation (S.D.) of different efficiency ratios of 15 selected listed Indian cement companies during the period of 2014 to 2023. Table also depicts a fluctuating trend of mean and S.D. of allselected efficiency ratios throughout the study period. It is revealed that in term of ITR, DTR India Cement Ltd. exhibited most consistent performance. Decan Cement Ltd. showed consistent performance in respect of WCTR. Birla Cement Ltd. exhibited good consistency in respect of TATR and CETR. Contrary, with regard to ITR and CETR Andhra Cement Ltd. identified as most inconsistent performers. Burnpur Cement Ltd. exhibited poor consistency in respect of DTR. Barak Valley Cement Ltd. exhibited inconsistent performance in WCTR and with respect of TATR Gujarat Sidhee Cement Ltd. recognised as most poor performers.

Table 3: Mean and S.D. of profitability ratios of 15 selected listed Indian cement companies during the period of 2014 to 2023

Companies Name	GPR		NPR		OPR		OR		ROCE	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
ACC Ltd.	14.56	2.59	8.08	2.38	15.17	2.59	80.74	2.99	17.71	8.62
Ambuja t Ltd.	21.69	2.28	12.82	2.10	22.46	2.24	76.59	2.26	6.77	2.71
Andhra Ltd.	-15748.71	47253.92	-20529.63	61503.63	-2745.11	8349.00	-59.66	121.73	-59.66	121.71
Anjani Ltd.	14.58	10.39	6.68	7.64	19.34	8.00	79.07	8.53	8.13	8.70
Birla Ltd.	9.52	2.65	4.89	2.28	12.65	2.82	87.55	2.84	3.20	1.48
Burnpur Ltd.	-39.20	46.71	-44.21	34.12	-14.69	37.09	99.96	9.41	-16.74	14.15
Decan Ltd.	14.58	4.69	7.80	3.71	16.85	3.53	83.30	4.10	9.20	4.29
Dalmia (Bharat) Ltd.	17.10	5.14	3.65	4.15	25.16	6.06	72.75	5.59	2.34	2.90
Star Ltd.	12.57	4.59	7.76	5.02	14.93	4.03	84.13	4.32	17.73	11.15
Ultratech Ltd.	18.88	2.59	10.17	2.47	21.54	2.57	77.78	2.76	10.20	2.78
Barak Valley Ltd.	5.38	2.24	1.15	1.98	11.03	2.28	88.52	2.16	2.25	2.59
Gujarat Sidhee Ltd.	4.77	6.24	1.90	4.84	5.59	6.19	94.71	6.23	3.97	9.22
Heidelberg Ltd.	14.92	6.87	6.62	5.27	19.35	5.33	82.34	6.95	7.49	5.99
India Cement Ltd.	6.08	4.34	0.83	2.68	12.81	5.18	87.29	6.46	0.63	2.09
JK Cement Ltd.	13.08	3.49	6.15	2.05	18.02	2.75	80.07	3.73	7.26	3.08

Table No. 3 depicts the mean and standard deviation (S.D.) of different profitability ratios of 15 selected listed Indian cement companies during the period of 2014 to 2023.Further, above table showed a fluctuating trend of mean and S.D. of all profitability ratios throughout the study period. It is depicted that Ambuja Cement Ltd. showed high performance in term of GPR, NPR, OPR. And ROCE. Dalmia (Bharat) Cement Ltd. identified as good performer in term of OR. On the other hand, Andhra Cement Ltd. exhibited very poor performance in respect of GPR, NPR, OPR, OR and ROCE during the study period.

Table 4: Liquidity Position of selected listed Indian cement companies under TOPSIS method

Companies name	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	Total	Composite rank
ACC Ltd.	4	1	2	2	7	5	4	2	1	3	31	1
Ambuja Ltd.	3	3	4	5	9	8	5	3	2	2	44	2
Andhra Ltd.	1	15	15	14	14	13	14	15	15	10	126	15
Anjani Ltd.	15	13	1	1	8	10	12	10	13	13	96	12
Birla Ltd.	9	12	12	8	5	7	10	7	9	7	86	8
Burnpur Ltd.	10	14	14	13	15	15	1	6	5	5	98	13
Deccan Ltd.	11	2	3	7	11	1	3	1	4	4	47	3
Dalmia(Bharat) Ltd.	8	11	7	3	1	3	15	5	7	14	74	6
Star Ltd.	2	4	5	4	4	2	11	9	10	9	60	4

Ultratech Ltd.	5	8	8	10	6	9	6	4	6	6	68	5
Barak Valley Ltd.	7	10	13	11	2	12	2	14	8	15	94	9
Gujarat Sidhee Ltd.	13	6	11	12	13	14	13	13	14	1	110	14
Heildelberg Ltd.	12	5	9	9	12	6	7	12	11	12	95	11
India Cement Ltd.	14	7	10	15	3	11	9	11	3	11	94	9
JK Cement Ltd.	6	9	6	6	10	4	8	8	12	8	77	7

Table No.4 shows the liquidity position of selected 15 listed Indian cement companies during the period of 2014 to 2023 determined by TOPSIS method. It depicts year wise rank of liquidity of the companies during the period of study and low aggregate of rank considered as best performer. ACC Ltd. was the very consistent performer in term of liquidity during the period of study and hold No. 1 rank. Ambuja Cement Ltd. was the next best consistent performer and ranked 2nd, Decan Cement Ltd. showed the little fluctuation in liquidity performance and ranked 3rd. On the other hand, Andhra Cement Ltd.; Gujarat Sidhee Cement Ltd, Burnpur Cemet Ltd. were exhibited very poor performance during the period of study and ranked 15th, 14th and 13threspectively out of the selected listed Indian cement companies.

Table 5: Efficiency of resource management position of selected listed Indian cement companies under TOPSIS method

Companies Name	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	Total	Composite Rank
ACC Ltd.	7	6	6	9	8	4	6	2	5	14	67	4
Ambuja Ltd.	11	11	12	12	15	8	9	9	3	4	94	12
Andhra Ltd.	12	2	13	14	12	10	12	12	14	15	116	15
Anjani Ltd.	10	13	11	10	11	2	8	6	8	6	85	9
Birla Ltd.	8	3	5	4	9	5	5	5	2	7	53	2
Burnpur Ltd.	1	1	14	7	2	11	13	14	15	13	91	10
Deccan Ltd.	6	12	9	13	4	7	3	1	9	12	76	6
Dalmia(Bharat) Ltd.	3	15	2	6	10	6	11	10	10	8	81	7
Star Ltd.	5	8	10	11	13	9	10	13	13	11	103	14
Ultratech Ltd.	13	14	15	1	6	13	4	8	7	1	82	8
Barak Valley Ltd.	14	9	8	3	5	15	14	11	12	10	101	13
Gujarat Sidhee Ltd.	4	5	1	15	3	12	2	4	4	5	55	3
Heildelberg Ltd.	2	4	4	2	1	14	1	3	1	2	34	1
India Cement Ltd.	15	10	3	5	14	1	15	15	11	3	92	11
JK Cement Ltd.	9	7	7	8	7	3	7	7	6	9	70	5

Table No. 5 exhibits the efficiency rank of selected 15 listed Indian cement companies for the period of 2014 to 2014. It also reveals the year wise efficiency rank determined by TOPSIS method during the period of study. It is observed that, except in 2018 Heildelberg Cement Indian Ltd. exhibited very consistent performance in term of efficiency and hold 1st position. The other mentionable good performers in respect of efficiency during the period were Birla Cement Ltd. registered 2nd position, Gujarat Sidhee Cement Ltd. hold 3rdposition during the period of study. On the other hand, in respect of poor efficiency performance some of the mentionable poor performers were Andhra Cement Ltd. hold 15th position; Star Cement Ltd. registered 14th position and Barak Valley Cement Ltd. ranked 13th position out of the selected 15 listed cement companies.

Table 6: Profitability position of selected listed Indian cement companies under TOPSIS method

Companies Name	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	Total	Composite Rank
ACC Ltd.	8	4	9	6	4	2	5	5	3	4	50	3
Ambuja Ltd.	3	7	6	1	2	7	3	1	2	1	33	1
Andhra Ltd.	1	15	15	14	15	14	14	15	15	15	133	14
Anjani Ltd.	13	11	1	3	9	5	1	3	5	14	65	7
Birla Ltd.	12	12	8	10	10	12	7	6	6	6	89	10
Burnpur Ltd.	15	14	14	15	14	15	15	14	13	7	136	15
Deccan Ltd.	6	2	2	9	5	8	4	4	10	8	58	5
Dalmia(Bharat) Ltd.	9	9	3	4	13	9	12	9	9	9	86	9
Star Ltd.	2	1	10	7	1	1	6	7	4	11	50	3
Ultratech Ltd.	4	6	5	5	8	6	2	2	1	2	41	2
Barak Valley Ltd.	10	10	12	11	11	10	11	13	11	10	109	12
Gujarat Sidhee Ltd.	11	8	11	13	7	13	13	12	14	3	105	11
Heildelberg Ltd.	7	3	4	2	3	3	9	11	8	13	63	6
India Cement Ltd.	14	13	13	12	12	11	10	8	12	12	117	13
JK Cement Ltd.	5	5	7	8	6	4	8	10	7	5	65	7

Table No. 6 presents the profitability position of selected 15 listed Indian cement companies for the period of 2014 to 2023 determined by TOPSIS method. It also shows year wise rank of the selected listed companies during the period of study. It is observed that, Ambuja Cement Ltd. registered the 1st position in term of liquidity, except in 2018, 2021 and 2022 its performance rank remained very consistent and lies between 1 to 3. Ultratech Cement Ltd. again demonstrated a very remarkable liquidity performance and ranked 2nd position. The aggregate rank score of ACC Cement Ltd. and

Star Cement Ltd. was remained identical and both companies hold 3rd position. Conversely, Burnpur Cement Ltd. showed very devastating performance and hold 15th position, Andhra Cement Ltd. ranked 14th and India Cement Ltd. ranked 13th position. All these companies exhibited consistently poor profitability performance during the period of study.

Table 7: Overall Performance Position under TOPSIS method

Companies Name	Liquidity Rank	Profitability Rank	Efficiency Rank	Composite Rank	Overall Performance Rank
ACC Ltd.	1	3	4	8	1
Ambuja Ltd.	2	1	12	15	3
Andhra Ltd.	15	14	15	44	15
Anjani Ltd.	12	7	9	28	10
Birla Ltd.	8	10	2	20	7
Burnpur Ltd.	13	15	10	38	14
Decan Ltd.	3	5	6	14	2
Dalmia (Bharat) Ltd.	6	9	7	22	9
Star Ltd.	4	3	14	21	8
Ultratech Ltd.	5	2	8	15	3
Barak Valley Ltd.	9	12	13	34	13
Gujarat Sidhee Ltd.	14	11	3	28	10
Heidelberg Ltd.	11	6	1	18	5
India Cement Ltd.	9	13	11	33	12
JK Cement Ltd.	7	7	5	19	6

Table No. 7 presents the overall performance of the selected 15 listed Indian cement companies for the period of 2014 to 2023. Overall performance is the aggregate rank of liquidity, profitability and efficiency determined by TOPSIS method. The low aggregate or sum total denotes better performance and high aggregate denotes worse performance position during the period of study. It is observed that the ACC Cement Ltd. registered the 1st position in respect of overall performance since its liquidity, profitability and efficiency rank was remarkably good. The other mentionable good performers in respect of overall performance are Decan Cement Ltd. registered the 2ndposition; the sum total of Ambuja Cement Ltd. and Ultratech Cement Ltd. is same therefore both of the companies hold an identical 3rd rank out of the selected listed Indian cement companies. As far as poor performance is concerned, Andhra Cement Ltd. ranked 15th position; Burnpur Cement Ltd. registered 14th position and Barak Valley Cement Ltd. occupied 13th position in term of overall performance out of the selected listed 15 Indian cement companies.

Table 8: Spearman's Rank Correlations

		Liquidity	Profitability	Efficiency	Overall Performance
Liquidity	Correlation Coefficient	1	0.800**	0.068	0.816**
	Sig. (2-tailed)	.	0.00034	0.80994	0.00020
	N	15	15	15	15
Profitability	Correlation Coefficient	0.800**	1	0.16810	0.875**
	Sig. (2-tailed)	0.00034	.	0.54910	0.00002
	N	15	15	15	15
Efficiency	Correlation Coefficient	0.06790	0.16810	1	0.50800
	Sig. (2-tailed)	0.80994	0.54913		0.05317
	N	15	15	15	15
Overall Performance	Correlation Coefficient	0.816**	0.875**	0.50800	1
	Sig. (2-tailed)	0.00020	0.00002	0.05317	.
	N	15	15	15	15

**Correlation is significant at the 0.01 level (2-tailed)

Table No. 8exhibits the Spearman's Rho Rank correlation between liquidity, profitability, efficiency and overall performance of selected listed 15 Indian cement companies during the period of 2014 to 2023. It is observed that there exists a strong positive rank correlation between liquidity and profitability, liquidity and overall performance, profitability and overall performance at 1% level of significanceduring the study period.

Further, there found positivebut insignificant rank correlation between liquidity and efficiency of resource management, also between the profitability and efficiency of resource management throughout the study period.

Conclusion

From the above discussion it is observed that, the performances of the companies are fluctuated during the study period. Under descriptive statistics method it is found that, Ambuja Cement Ltd., Heidelberg Cement Ltd., Ultratech Ltd. are most consistent performers, On the other hand, Andhra Cement Ltd., Burnpur Cement Ltd. are the most inconsistent performers throughout the study period.

However, TOPSIS method showed the explicit performance rank of the companies during the study period. In respect of liquidity Ambuja Cement Ltd. ranked 1st and Burnpur Cement Ltd. ranked the 15th position.

With respect to the efficiency of resource management Heidelberg Cement Indian Ltd. secured the 1st and Andhra Cement Ltd. hold 15th position.

In the perspective of profitability Ambuja Cement Ltd. registered the 1st position and Burnpur Cement Ltd. secured the 15th position out of the selected listed Indian cement companies throughout the study period. Further, considering the performance of all dimensions ACC Cement Ltd. registered the 1st position in respect

of overall performance. Andhra Cement Ltd. ranked 15th position in overall performance during the study period.

Moreover, Spearman's Rank correlation revealed the existence of a strong positive and significance rank correlation between liquidity and profitability, liquidity and overall performance, profitability and overall performance. Further, there found positive but insignificant rank correlation between liquidity and efficiency of resource management, also between the profitability and efficiency of resource management throughout the study period.

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