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FORECASTING BANKRUPTCY OF SELECTED CEMENT SECTOR COMPANIES BY APPLYING ALTMAN'S Z-SCORE APPROACH

INTRODUCTION

The cement sector plays a crucial role in the country's development and economic growth. It is one of the most prominent industries that significantly contribute to the nation's infrastructure development and construction activities. Cement, a fundamental building material, is used to create the foundation for various types of structures, including residential buildings, commercial complexes, roads, bridges, and other infrastructural projects. India's cement industry has witnessed substantial growth over the years, fuelled by factors such as rapid urbanization, population expansion, and government initiatives to boost infrastructure development. The sector has evolved from a few manufacturers in the early stages of the country's independence to a vast and competitive market with numerous players. In recent years, the cement industry has seen significant capacity expansions and technological advancements, enabling the production of a wide range of cement varieties to meet diverse construction requirements. Companies have also focused on developing environmentally friendly and energy-efficient manufacturing processes to align with sustainability goals.

The demand for cement in India remains steady, driven by both government-funded and private-sector construction projects. Government initiatives like "Housing for All," "Smart Cities Mission," and infrastructure development schemes have bolstered the sector's growth prospects.

India's cement industry is characterized by the presence of large, established players, as well as smaller regional manufacturers. Key cement-producing regions in India include North, South, East, and West zones, each with its unique demand drivers and consumption patterns. While the sector offers opportunities for growth and investment, it also faces challenges such as fluctuating raw material costs, rising energy prices, and environmental concerns. To maintain competitiveness and sustainability, companies in the cement sector continue to invest in modernizing their plants, optimizing logistics, and adopting eco-friendly practices.

Overall, the cement sector in India is a critical driver of economic development, providing employment opportunities and supporting the country's infrastructure needs. As India progresses on its

path of growth and urbanization, 23 the demand for cement is expected to remain robust, presenting potential opportunities and challenges for investors and industry players alike.

India's cement industry is on par with China's production levels but faces tough competition. China's technological advancements and vast economy pose challenges, prompting India's cement sector to improve its finances and technology. Keeping a close watch on local industry trends in production and demand is essential. This ongoing analysis of strengths and weaknesses will guide the industry towards better financial stability and technological upgrades in the long run. Reviewing financial documents will reveal 10 a company's current and future market position. This research empowers businesses to adjust their strategies for long-term success.

For any business, maximizing profits is a primary objective, necessitating a strong financial foundation. Financial statements serve as critical tools to evaluate a company's financial health, offering essential insights into its performance and condition. Understanding and overseeing these financial activities are crucial for maintaining control and awareness of the company's standing. Analyzing a company's finances provides valuable indications of its stability and future prosperity. 25 A comprehensive financial assessment unveils insights into potential success or failure, highlighting both achievements and setbacks. Ultimately, by enhancing the connections within financial statements, financial analysis plays a pivotal role in achieving our company's objectives.

Edward Altman developed the 22 "Z" score model; using this model, he predicted that 1968 would be a financially disappointing year. At first, it was shown that the Altman Z Score could accurately predict bankruptcy two years in advance, with an accuracy of 72%. Prof. Altman 3 from New York University looked at 66 companies, of which 50% had previously declared bankruptcy between 1946 and 1965. He analyzed them using 22 indicators, classifying them into five groups according to their fluidity, dissolvability, impact, productivity, and mobility. As time progressed, so did the accuracy of 1 the Altman Z Score. 14 From 1969-1975, 1976-1995, and 1996-1995, a total of 86, 110, and 120 companies were researched. Altman's Z-score accuracy ranged between 82% and 94%.

Strategy 3 analyst (Graham Secker, 2009) used a system known as the "Z Score" to assess a group of European companies. More than two-thirds of the time, he discovered, the firms with the worst financial statements underperformed the market.

LITERATURE REVIEW

☐ N.VenkataRamana, S.Md.Azash and K.Ramakrishnaiah studied FINANCIAL PERFORMANCE AND PREDICTING THE RISK OF BANKRUPTCY: A CASE OF SELECTED CEMENT COMPANIES IN INDIA- INTERNATIONAL JOURNAL OF PUBLIC ADMINISTRATION AND MANAGEMENT RESEARCH: Bankruptcy occurs when a company's liabilities surpass its assets, often due to factors such as undercapitalization, inadequate cash management, inefficient utilization of resources, and overall ineffective management. 13 Predicting bankruptcy is crucial for implementing corrective measures and ensuring better financial planning, profitability, liquidity, and solvency efficiency within the firm. This study aims to assess the financial performance and predict the risk of bankruptcy for selected cement companies spanning from 2001 to 2010. Various financial ratios, including Liquidity Ratios, Working Capital Ratios, Solvency Ratios, and Altman Z-Score Analysis, were calculated to diagnose potential issues leading to bankruptcy. The findings indicate unsatisfactory 24 liquidity, working capital turnover efficiency, and solvency positions for the chosen cement companies. 2 The Z-Score analysis identifies KCP Ltd and Kesoram Industries Ltd as having poor financial performance, while Dalmia Bharat Ltd is on the brink of bankruptcy.

☐ A.N.K Mizan, Md. Mahabbat Hossain, "Financial Soundness of Cement Industry of Bangladesh: An Empirical" Investigation Using Z-score"-CABE Case House: Various techniques are available for assessing the financial health of a business firm, but Altman's Z-score has demonstrated reliability across different contexts. The Bangladesh cement industry is unique in that it produces a surplus of cement compared to local demand, despite lacking local raw materials. This 2 study aims to evaluate the fundamental financial health of the industry using the Z-score model, considering all listed cement firms. Data for the analysis was gathered from annual reports and other sources. The findings indicate that 21 Heidelberg Cement and Confidence Cement are financially sound, while the remaining three firms are not in a favorable position. The study's insights can be valuable for managers in making financial decisions, stockholders in choosing investment options, and others with interests in the country's cement manufacturers.

☐ Ishioma Odibi, Abdul Basit and Zubair Hassan, "BANKRUPTCY PREDICTION USING ALTMAN Z-SCORE MODEL: A CASE OF PUBLIC LISTED MANUFACTURING COMPANIES IN MALAYSIA"- International Journal of Accounting & Business Management: Over the years, there has been considerable focus on developing models to predict corporate bankruptcy and addressing the challenges associated with foreseeing failure in corporate firms. The prediction of corporate failure holds significant importance in the field of finance, with numerous researchers proposing various prediction models. Among these models, the multiple discriminant analysis stands out as particularly effective, consistently yielding high levels of accuracy. This study, conducted on 34 publicly listed manufacturing companies in Malaysia from 2010 to 2014, specifically targeted companies under the PN17 classification. Healthy companies were selected through a paired sample t-test using a random stratified sampling method. Initially, the primary objectives were to assess the reliability and correlation of Altman's Z-score model with corporate failure and to determine if all failing companies were listed under PN17 on the Kuala Lumpur Stock Exchange (KLSE), now known as Bursa Malaysia. Contrary to expectations, findings revealed that not all failed companies were listed under PN17 on Bursa Malaysia. Moreover, most PN17 companies were in the safe zone in the fifth year, with only one exception. The study demonstrated significant relationships between four out of five financial ratios and the prediction of corporate failure under the Z-score model. Regression analysis further indicated the model's strong fit, with a significance level of 0.000 and accuracy levels of 86% and 99.6%.

☐ Arifia Fitriani* , Alizar Hasan and Ahmad Syafruddin Indrapriyatna, have studied " BANKRUPTCY PREDICTION OF LISTED CEMENT COMPANY IN INDONESIAN STOCK EXCHANGES USING ALTMAN Z-SCORE MODEL"- SPEKTRUM INDUSTRI: This paper focuses on assessing the likelihood of bankruptcy for listed cement companies on the Indonesian Stock Exchange using Altman Z-score as a key tool. The study spans the years 2013 to 2017 and examines four companies: PT Semen A, PT Semen B, PT Semen C, and PT Semen D. The research reveals that PT Semen A, PT Semen B, and PT Semen C are deemed financially secure, as indicated

by their Z-scores falling within a safe range (ranging from 3.542 to 15.822). However, PT Semen D is identified as being in the danger zone with a Z-score below 1.8, signaling a risk of bankruptcy. The findings emphasize the urgent need for all companies, especially PT Semen D, to enhance their performance promptly. Strategies to avert bankruptcy include boosting sales revenue, optimizing operational costs, and minimizing waste during operations.

□ Anwar, Muh. Ichwan Musa, Anwar Ramli, Armita Puspita K and Romansyah Sahabuddin, have studied "Analysis Of Financial Distress Using The Altman Z-Score And Taffler Methods In Cement Subsector Manufacturing Companies Listed On The Indonesia Stock Exchange For The Period 2018-2021"- International Journal of Economic, Business, Accounting, Agriculture Management and Sharia Administration: This study investigates the potential for financial distress among cement manufacturing companies listed on the Indonesia Stock Exchange during the period from 2018 to 2021. The Altman Z-Score and Taffler models were employed as equation models to assess financial health. The research employed the documentation method for data collection, falling under the category of quantitative descriptive research. The analysis results varied depending on the model used. Notably, INTP consistently demonstrated a healthy financial condition (safe area) according to both the Altman Z-Score and Taffler models from 2018 to 2021. Similarly, SMBR was identified as healthy according to the Altman Z-Score model in 2018 and the Taffler model in 2018-2021. On the other hand, companies such as SMGR (2018-2020), WSBP (2018-2019), WTON (2018), and SMBR (2020-2021) fell into a gray area position according to the Altman Z-Score model. In the Taffler model, companies like SMGR (2019-2021), SMCB (2019-2020), WSBP (2021), and SMBR (2018 and 2021) were also in a gray area position. Notably, SMGR (2021), SMCB (2018-2021), WSBP (2019-2020), WTON (2019-2021), and SMBR (2019) were classified as being in a bankrupt position based on the Altman Z-Score model. In the Taffler model, companies such as SMCB (2018 and 2021), WSBP (2020), and SMBR (2019-2020) were identified as being in a bankrupt position. This analysis provides insights into the financial health and distress potential of the examined cement manufacturing companies during the specified period.

2 OBJECTIVE OF THE STUDY

This study intends to estimate likelihood of Bankruptcy of selected Cement Industry companies by applying Altman's Z-Score Model

ALTMAN Z-SCORE MODEL:

ALTMAN'S Z-SCORE FORMULA FOR MANUFACTURING FIRMS

$X1$ = Working Capital / Total Assets

$X2$ = 15 Retained Earnings / Total Assets

$X3$ = Earnings Before Interest and Taxes / Total Assets

$X4$ = Market Value of Equity / Total Liabilities

$X5$ = Sales / Total Assets

Z score bankruptcy model:

$Z = 1.2X1 + 1.4X2 + 3.3X3 + 0.6X4 + .999X5$

Zones of Discrimination:

20 Z > 2.99 - "Safe" Zone

1.81 < Z < 2.99 - "Gray" Zone

Z < 1.81 - "Distress" Zone

METHODOLOGY

DATA COLLECTION & RESEARCH SAMPLE

The study depends on the secondary source & annual reports (financial statements) are collected from the websites of respective organizations. The time frame of data being collected is set for past 5 years i.e. from 2018 to 2023. Study covers the sample size of 5 companies which are listed in Indian stock exchanges. The companies are selected based on their market capitalisation. And it also considers the assets & liabilities of companies while selecting the sample

Below shown are the companies which are selected and why they are selected for the study for the period of 5 years.

☐ Ultratech Cement: UltraTech Cement Limited is the cement flagship company of the Aditya Birla Group, a huge organization specializing in various building solutions. With a value of USD 7.9 billion, UltraTech is the biggest producer of grey cement and ready-mix concrete (RMC) in India. It's also a major player in India's white cement market. Ultratech cement has the highest market capitalisation (2,83,577.90 Cr.) and highest Net Sales (61,326.50 Cr.) in all over cement industry and being the biggest Cement producer in India it has the asset worth Rs. 86,900.99 which no other company has in this sector. That's why we selected Ultratech Cement for our analysis.

☐ Ambuja Cement: Ambuja Cements Limited, a part of the diversified Adani Group, is among India's leading cement companies, renowned for its hassle-free, homebuilding solutions. It is the second highest market capitalisation company in cement sector with Rs.1,05,715.75 Cr. And Total Asset worth Rs. 35,904.13 which is the second highest in the sector. It has relatively low Debt compared to the top most cement companies which is Rs. 975.12 cr.

☐ Shree Cement: Shree is the third largest cement group in India with market capitalisation is Rs. 96,975.85 and with domestic cement capacity of 46.4MT as of FY23. In the past 4 years, it has diversified itself from being 100% North player to the player with capacities now in Rajasthan,

Uttarakhand, Bihar, Chhattisgarh, Haryana, Uttar Pradesh, Karnataka and Odisha. Shree cement has the highest EPS of Rs.368.1 which is highest 12 in the cement sector and it is in top 3 in term of net profit which is Rs. 1,328.13cr.

 ACC: 4 ACC Limited (ACC) is a leading player in the Indian building materials space, with a Pan-India manufacturing and marketing presence. With 17 cement manufacturing units, 85 ready mix concrete plants, a vast distribution network of 56,000 dealers & retailers and a countrywide spread of sales offices, it contributes tremendously to the landscape of the country. It has the market capitalisation of Rs. 43,776.97 and Net Sales worth Rs. 22,209.97 which is the second highest in the sector.

 J.K. Cement: J.K. Cement Limited is an affiliate of the industrial conglomerate J.K. Organisation, The Company 8 is the third largest white cement manufacturer in the world with 1.20 MTPA capacity, including 0.6 MTPA white cement plant at Fujairah, U.A.E. Besides, it is the second largest producer of wall putty in India with installed capacity of 0.7 MTPA. J.K. Cement is sixth in market capitalisation in all over cement sector with Rs. 31,232.21 cr and fifth in Total sales of Rs. 8,998.60.

 Ramco Cement: Ramco 5 Cements is the dominant player in South India with cement capacity of 19.4MT spread across Tamil Nadu, Andhra Pradesh, Odisha and West Bengal. In terms of sales, South contributes ~71% of sales while East contribute 24% which is served via grinding units in WB (2MT) and AP (2MT). The market capitalisation of Ramco Cement is Rs. 23,350.41cr with Total sales of Rs. 8,135.27 cr, Ramco cement stands second in term of Debt which is Rs. 30.91cr.

 Dalmia Cement: Dalmia Cement is a reputed name 12 in cement industry, having a cement capacity of 41 MT at present. The market capitalisation of Dalmia cement is Rs. 43,163.15cr which is fifth in

the 16 sector and the total asset is worth Rs. 7,947.00cr, the Debt of Dalmia cement is Rs. 29.49cr which is fourth highest in the cement industry.

DATA ALALYSIS & FINDINGS

ULTRATECH CEMENT:

Particulars

2018

2019

2020

2021

2022

2023

X1

-0.00094715

-0.04159416

-0.028096

0.03139731

-0.03179996

-0.02942313

X2

0.09341752

0.07182734

0.0749168

0.07627399

0.0960747

0.09898896

X3

0.07519144

0.06397145

0.08236

0.102893

0.10497235

0.08460572

X4

3.52717851

2.56719672

2.3315408

4.63044784

5.70701722

5.94596451

X5

0.53439899

0.53442884

0.5274004

0.51331548

0.61683423

0.68212795

Z SCORE

3.02795141

2.3359635

2.2687532

3.77507813

4.48318111

4.63150022

AMBUJA CEMENT:

Particulars	X1	X2	X3
2018	0.1074588	0.0948573	0.0767615
2019	0.1306221	0.1306221	0.0857255
2020	0.0892338	0.0988396	0.0970645
2021	0.1281769	0.1441405	0.1118826
2023	0.14956461	0.1519234	0.04561375

X4

4.589444

3.7586643

4.6518361

5.8982611

5.59859343

X5

0.697387

0.674514

0.606582

0.631493

0.60007954

Z SCORE

3.9654197

3.5515494

3.962846

4.8946399

4.5013312

SHREE CEMENT:

Particulars

2018

2019

2020

2021

2022

2023

X1

0.1805019

0.1673421

0.194456

0.174045

0.159329

0.084902

X2

0.2201838

0.2525733

0.227049

0.29414

0.327856

0.331191

X3

0.1039086

0.0853202

0.096531

0.13025

0.10658

0.046688

X4

9.035044

11.290789

9.440708

17.53015

13.89983

12.33965

X5

0.6494066

0.8103408

0.645221

0.630301

0.632011

0.677921

Z SCORE

6.9375415

8.4199733

7.178767

12.19824

9.973182

8.800653

ACC CEMENT:

Particulars

2018

2019

2020

2021

2023

X1

0.123212

0.165520

0.200238

0.207332

0.127247

X2

0.417422

0.450125

0.487139

0.497725

0.501292

X3

0.089992

0.105412

0.094299

0.113951

0.029345

X4

5.129520

4.857260

5.525315

6.185679

4.890467

X5

0.901689

0.895374

0.741025

0.751676

0.865646

Z

5.0077152

4.9854937

5.2889408

5.7839849

4.7504051

J.K. CEMENT:

Particulars

2018

2019

2020

2021

2022

2023

X1

0.060742

0.061949

0.047984

0.124164

0.074915

0.059573

X2

0.114989

0.115789

0.129975

0.177493

0.188892

0.175299

X3

0.086166

0.079968

0.108344

0.124847

0.099969

0.06456

X4

1.584609

1.417996

1.306114

3.632811

2.641357

2.6133

X5

0.770293

0.698775

0.671354

0.669177

0.700766

0.731664

Z SCORE

2.23851

2.049212

2.051433

3.657677

2.969122

2.828866

RAMCO CEMENT:

Particulars

2018

2019

2020

2021

2022

2023

X1

-0.07329

-0.08375

-0.07506

-0.08385

-0.08172

-0.0823

X2

0.030212

0.026977

0.02213

0.021537

0.017884

0.014123

X3

0.114239

0.090754

0.081999

0.104824

0.067473

0.046566

X4

5.584958

4.733936

2.357023

4.136701

2.777892

2.313938

X5

0.617208

0.629263

0.531869

0.461898

0.448165

0.551725

Z SCORE

4.298903

3.705756

2.157054

3.218911

2.264085

2.01421

DALMIA CEMENT:

Particulars

2018

2019

2020

2021

2022

2023

X1

0.1042467

0.0594995

0.040569

0.0561201

0.1100076

0.1131425

X2

0.0723727

0.0897848

0.1039372

0.1599673

0.2025652

0.2228791

X3

0.0501547

0.0314539

0.0276367

0.0685963

0.0478469

0.0395803

X4

0

1.9309517

0.9197969

3.2269243

3.0753797

3.7657741

X5

0.4137527

0.4617782

0.4633586

0.4586698

0.4537815

0.5300865

Z SCORE

0.8052673

1.9207833

1.3001695

2.912032

2.8720508

3.3674377

Z VALUE & FIRM'S CLASSIFICATION:

Company

Year

Z Value

Zone

UltraTechCement

2018

3.02795141

SAFE

2019

2.3359635

GREY

2020

2.2687532

GREY

2021

		Z Value	Zone
		3.77507813	SAFE
	2022	4.48318111	SAFE
	2023	4.63150022	SAFE
	Overall Zone	3.420404595	SAFE

Company	Year	Z Value	Zone
Ambuja Cements	2018	3.9654197	SAFE
	2019	3.5515494	

	Year	Z Value	Zone
SAFE	2020	3.962846	SAFE
SAFE	2021	4.8946399	SAFE
SAFE	2023	4.5013312	SAFE
	Overall Zone	4.17515724	SAFE

Company	Year	Z Value	Zone
Shree Cements	2018	6.9375415	SAFE

|

2019

8.4199733

SAFE

|

2020

7.178767

SAFE

|

2021

12.19824

SAFE

|

2022

9.973182

SAFE

|

2023

8.800653

SAFE

Overall Zone

|

8.918059467

SAFE

Company

Year	Z Value	Zone	ACC
2018	5.0077152	SAFE	
2019	4.9854937	SAFE	
2020	5.2889408	SAFE	
2021	5.7839849	SAFE	
2023	4.7504051	SAFE	
Overall Zone	5.16330794	SAFE	

Company	Year	Z Value	Zone
J. K. Cement	2018	2.23851	GREY
	2019	2.049212	GREY
	2020	2.051433	GREY
	2021	3.657677	SAFE
	2022	2.969122	

GREY		
2023	2.828866	GREY
Overall Zone		
2.63247	GREY	

Company	Year	Z Value	Zone
Ramco Cements	2018	4.298903	SAFE
	2019	3.705756	SAFE
	2020	2.157054	

GREY

Year	Z Value	Zone
2021	3.218911	SAFE
2022	2.264085	GREY
2023	2.01421	GREY
Overall Zone	2.943153167	GREY

Company	Year	Z Value	Zone
Dalmia Bharat	2018	0.8052673	DISTRESS

2019

1.9207833

GREY

2020

1.3001695

DISTRESS

2021

2.912032

GREY

2022

2.8720508

GREY

2023

3.3674377

SAFE

Overall Zone

2.1962901

GREY

INTERPRETATION/ CONCLUSION

Here is the overall interpretation for the Z Score values provided:

Safe Zone (Low Risk of Bankruptcy):

▢ Ultratech Cement: Z Score of 3.420404595

▢ Ambuja Cement: Z Score of 4.17515724

▢ Shree Cement: Z Score of 8.918059467

▢ ACC Cement: Z Score of 5.16330794

Grey Zone (Moderate Risk of Bankruptcy):

▢ J.K. Cement: Z Score of 2.63247

▢ Ramco Cement: Z Score of 2.943153167

▢ Dalmia Cement: Z Score of 2.1962901

Companies in the safe zone (Ultratech Cement, Ambuja Cement, Shree Cement, ACC Cement) are considered financially stable with a low risk of bankruptcy.

Companies in the grey zone (J.K. Cement, Ramco Cement, Dalmia Cement) have a moderate level of financial risk and may require closer monitoring.

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