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PREDICTING THE BANKRUPTCY OF CEMENT COMPANIES IN BANGLADESH: A STUDY ON DHAKA STOCK EXCHANGE

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ABSTRACT

The financial status of a company can be measured and predicted using a variety of tools, techniques, and models like ratio analysis, vertical and horizontal analysis, etc. The objective of this study is to identify the bankruptcy position of Bangladeshi-listed cement companies. The Altman Z-Score model has been used here to assess the intensity of insolvency of Bangladeshi cement businesses with listings on Dhaka Stock Exchange (DSE) considering financial information from 2018 to 2021 using Altman Z-Score model. The data has been analyzed using Statistical Package for Social Sciences (version 28.0.1.1) and also Microsoft excel. DSE currently lists seven (07) cement companies. According to the research, Heidelberg Cement Limited and Lafarge Holcim Bangladesh Limited are in the secure region having the maximum Z value of 33.47 and the minimum Z value is 3.17. Confidence Cement Limited, Meghna Cement Limited and Crown Cement Limited in 2021 are in the grey region having the maximum Z value of 2.71 and the minimum Z value of 1.82. Aramit Cement Limited, Crown Cement Limited, and Premier Cement Mills Limited are in the bankrupt region having the Z value of less than 1.80. These three companies must outperform in sales with the improvement in operational costs to overcome bankruptcy. We found a positive correlation between all of the five independent variables and the dependent variable (Z Score).

Contribution/Originality: This study is one of the very few studies which have investigated the bankruptcy measurement of cement companies listed in DSE. This study contributes in the existing literature by examining the possibility of bankruptcy which will help investors to think about their current and future investments in cement companies of Bangladesh.

1. INTRODUCTION

The top 10 companies in the country currently control around 81% of the entire cement market, and there are currently 37 operational cement mills in the country. Among them, seven companies are listed on the Dhaka Stock Exchange (DSE). Another analysis by Industrial Development Leasing Company (IDLC) claims that during the past 20 years, as Bangladesh's economy has grown, the yearly per capita cement consumption has climbed from 45 to 200 kg. Real estate firms consume 30% of overall consumption, while people consume 25% of it. The public sector accounts for 45% of total consumption (Cement Industry of Bangladesh: Challenges and Future

Opportunities, 2021). Increase in per capita cement consumption will also led the industry become boom subject to some abnormal situation faced like Covid-19 pandemic. Profit decreases of most of the business due to Covid-19 pandemic all over the world (Hossain, Nesa, Dowla, & Akter, 2021). Like other industry profit maximization is the main objective of cement industry also. Generally, this objective may not be fulfilled due to lack of sound financial condition as well as operational inefficiencies. There are various factors affecting financial performance of any organization.

Financial instability has become one of the major topics discussed in corporate world particularly in corporate finance. And it is certainly not a sudden event. Companies become bankrupt due to poor corporate governance and their inefficiency in controlling the fixed cost as well as downfall in the revenue. Inappropriate strategy and poor financial policy may push companies to become bankrupt. The stock markets of Bangladesh have listed many industries among which cement industry is a major one. Due to the ongoing development projects and the increase of per capita income of the people tends to develop their life style that helps industry to operate in full capacity.

Early warning signs eventually result in bankruptcy and liquidation (Wijaya & Anantadjaya, 2014). Researchers in accounting, finance, banking, and credit risk management use the multivariate approach to failure prediction on a global scale. Odibi, Basit, and Hassan (2015) indicates in their study that businesses in financial crisis or on the verge of bankruptcy are more similar businesses that are unable to pay their creditors. They also demonstrated that the likelihood of a company going bankrupt increases if its fixed costs are extremely high, its revenues are sensitive to the state of the economy, or its assets cannot be liquidated.

Cement industry is one of the most important industries contributing to our national economy. This industry is directly related to the country's development. Many people are directly or indirectly involved in this industry. Many investors are investing in cement industry as the raising sector in Bangladesh. But they are anxious about losing the investment and want to know the actual risks in this industry. Investors always desire high return and the certainty of getting back their actual investments by taking low risks (Hossain, 2020). Many studies are found in the literatures about predicting bankruptcy and financial failure of different industries but a very few studies found focusing the cement industry using Altman Z-Score model in Bangladesh. The policy makers and the investors will get excellent inputs in decision making from this study.

2. LITERATURE REVIEW

There are various research works carried out on financial performance and bankruptcy prediction from different aspect. These studies used reveal different variables as the factors of financial performance analysis. The same has been found in the study of Al-Kassar and Soileau (2014) that Financial management and top management of the companies benefit from the examination of financial performance by paying more attention to key ratios. Considering the results of research conducted by Zhang and Li (2006) it was also found that company owners usually have a significant effect on company performance. Another study by Wattoo (2022) on ownership structure revealed that financial structure (equity financing and debt financing) has significantly positive effect on financial structure in overall Pakistani Financial Industry. The other determining factors of financial performance are firm's size and liquidity ratio that significantly affecting the financial performance in this sector. The empirical study by Erin, Bamigboye, and Arumona (2020) It is clear that having a competent Chief Risk Officer (CRO), a board risk committee that functions in a proper manner, and the presence of independent directors will all significantly boost a company's performance in the current financial situation. As well as empirical research by García (2022) demonstrates a favorable correlation between financial performance and business sustainability. There is also a strong positive relationship between corporate social responsibility practices and the financial performance of financial institutions (Muchiri & Erdei-gally, 2019). Correlation and multiple regression analysis from the study of Kablay and Gumbo (2021) It has been demonstrated that interest income on loans has a major impact on banks' Return on Assets and Return on Equity whereas effective management of fund to control cost and increase the

profit in future (Saranya & Sridevi, 2019). Another rigorous study on banking companies of both Pakistan and India shows that financial performance is positively impacted by the intellectual capital (Mondal & Ghosh, 2012). Pagaddut (2021) researched on Philippine micro, small and medium enterprises to determine the influence on financial performance and those financial ratios—specifically, the debt ratio, asset turnover, and gross profit margin—have a major impact on that performance. Other similar studies done by Rettobjaan (2020) showed that bankruptcy is significantly impacted negatively by liquidity, profitability, and age. The debt arrangement significantly reduces the likelihood of bankruptcy. While size, activity ratio, and solvency have little impact on bankruptcy. It was discovered that declining working capital and jeopardizing the liquidity position were frequent factors influencing the stability of the majority of the sample companies. After testing hypotheses, it became obvious that there was no appreciable difference in the companies' working capital to total assets ratios during the study period (Gopalakrishnan, Gupta, Raja, Reddy, & Subbarao, 2019). The Z-score and all five independent factors under non-failed companies have a significant link, according to Pearson's correlation test, but only three of the five independent variables under failed companies have a significant relationship with the dependent variable (Odibi et al., 2015).

A study shows that companies experiencing financial distress have negative numbers in working capital, earnings before interest and tax, or on retained earnings (Matturungan, Purwanto, & Irwanto, 2017). The research conducted by Afjal and Das (2020) on financial performance and bankruptcy prediction indicate that the study plays a crucial role in the policy decisions made by its numerous internal or external users. The study result of Kadarningsih, Oktavia, Falah, and Sari (2021) demonstrates that the financial hardship of manufacturing companies is significantly influenced by profitability and leverage. However, the financial crisis of manufacturing enterprises is unaffected by liquidity or operating capacity. The comparative analysis of z-score results demonstrates that, on average, Saudi Arabia's Islamic banking sector outperformed the rest of the sample, as evidenced by the first and second places that Saudi banks held on the list of z-score bankruptcy rankings. The outcomes also demonstrate that the association between the top five Islamic banking countries and bankruptcy is determined to be substantial based on performance metrics including liquidity, profitability, and insolvency (Jan & Marimuthu, 2015). Ogachi, Ndege, Gaturu, and Zoltan (2020) discovered in their analysis that the most important factors to use for predicting bankruptcy in the companies listed in the National Stock Exchange of India Limited were inventory turnover, asset turnover, debt equity ratio, debtor's turnover, total asset, debt ratio, and working capital ratio. There are various ways to prevent bankruptcy, including increasing sales income with a more effective sales staff, reducing operational waste, and increasing productivity to lower operating costs. The leadership team must present clear objectives and a tactical plan for how to exit the bankruptcy zone as the final and most crucial step (Fitriani, Hasan, & Indrapriyatna, 2019). he previous performance shown in a company's financial statements may not be useful in projecting the future, which means that the accounting-ratio-based models need to be periodically refreshed (Mensah, 1984). Hillegeist, Keating, Cram, and Lundstedt (2004) claim that because accounting data is constructed to depict a company's financial state in accordance with the "going-concern" principle, its predictive power for bankruptcy is likely to be restricted. While the model was initially developed from samples of publicly traded manufacturing companies, Edward I. Altman introduced the Altman Z-score for discriminate analysis to predict bankruptcy or financial strength or financial distress; it is also widely used in private manufacturing, non-manufacturing, and service companies (Altman, Iwanicz-Drozdowska, Laitinen, & Suvas, 2017). Voda, Dobrotă, Ţîrcă, Dumitraşcu, and Dobrotă (2021) demonstrates in their research that, in contrast to other studies that only looked at one potential scenario, the Z score model helped to the development of a bankruptcy forecasting model as well as to insolvency. The result of the study conducted by Al-Manaseer and Al-Oshaibat (2018) revealed a high level of predictability for the Z-score model, and the results suggest that Z-Score model might be a useful signal for many consumers of financial statements, including financial managers, auditors, lenders, and investors, to make the right decisions in the event of financial failure.

3. METHODOLGY OF THE STUDY

3.1. Sample Selection

For this study, seven (07) samples have been considered which are currently enlisted on the Dhaka Stock Exchange (DSE) and represent 100% of total population. The data used in this study was gathered over a four-year period from secondary sources (the company's annual reports) (2018 to 2021).

3.2. Data Analysis

The Altman Z score model is thought to be the most appropriate and accurate of the bankruptcy prediction models. Supitriyani, Siahaan, Astuti, Putri, and Susanti (2021) found 85.75% accuracy of Altman model used on the companies listed on the Indonesia Stock Exchange which was better than the Springate model with 73% accuracy in the same study. Another study Kukreja, Gupta, Sarea, and Kumaraswamy (2020) indicates that the Altman Z-score model is more predictable than the Beneish M-score model in fraud detection. Beside Altman Z Score model, Pearson's correlation analysis has been performed for identifying the significance of relationship between the variables. However, to meet the model's needs, a few ratios were constructed using a ratio analysis, and Microsoft Excel was used to examine the data that was acquired. The model is a multivariate discriminate analysis (MDA), which computes the values required for precise forecasting using the financial information.

The model is described below:

Z Score = 1.2A + 1.4B + 3.3C + 0.6D + 1E

Where,

A= Working Capital/Total Assets (WC/TA)

B=Retained Earnings/ Total Assets (RE/TA)

C=Earnings Before Interest and Taxes/Total Assets (EBIT/TA)

D=Market Value of Equity/Total Liabilities (MVe/TL)

E=Total Sales/Total Assets (TS/TA)

The Altman Z Score model classifies the companies according to the financial position into three categories. Table 1 exhibits the bankruptcy measurement criteria according to the Altman Z score model.

Table 1. Bankruptcy measurement criteria.

Safe Zone	Grey Zone	Distress Zone
Z>2.99	1.81<Z<2.99	Z<1.81

4. ANALYSIS AND DISCUSSION

There are 5 variables that make up the Altman Z score, and these 5 variables are taken from the Aramit Cement Limited, Confidence Cement Limited, Crown Cement Limited, Heidelberg Cement Bangladesh Limited, LafargeHolcim Bangladesh Limited, Meghna Cement Mills Limited, and Premier Cement Mills Limited financial statements from 2018 to 2021. The values of the Z score indicators can be seen in Table 2 to 8.

Table 2. Value of ARAMIT Z score indicators.

ARAMIT				
Variables	**2021**	**2020**	**2019**	**2018**
Working Capital/Total Assets	(0.12)	(0.17)	(0.16)	(0.04)
Retained Earnings/Total Assets	(0.11)	(0.14)	(0.12)	(0.08)
Earnings Before Interest and Taxes/Total Assets	0.21	0.12	0.14	0.13
Market Value of Equity/Total Liabilities	0.14	0.05	0.06	0.10
Total Sales/Total Assets	0.29	0.30	0.39	0.42

The working capital to total assets ratio reveals the company's liquidity status. According to the aforementioned data, all of the sampled companies—with the exception of LafargeHolcim Bangladesh Limited—have a negative or declining ratio. During the research period, the working capital to total assets of the company fluctuates from 0.04 to 0.17; the value of A shows a growing trend from 2018 to 20 and a declining tendency in 2021. It demonstrates that, with the exception of 2021, the company's short-term solvency has increased. It displays a satisfactory outcome (0.15<A<0.30) for 2019 and 2020. It has been observed throughout the study period, low mobilization of retained earnings with the ratio of retained profits to total assets varied between 0.08 and 0.14. A satisfactory positive demonstration of the result ranges from 0.12 to 0.21 derived from earnings before interest and taxes to total assets ratio shows that the company's earnings are commensurate with its total assets. The study leads to the conclusion that Aramit Cement Limited relies less on equity and more on debt. The result of other ratios such as total liabilities to market value of equity ranges from 0.05 to 0.14, total sales to total assets ratio 0.29 to 0.42 during the study period. This result helps to understand that the company's sales are modest when compared to the total assets it has. The company's solvency condition is not good overall.

Table 3. Value of CONFIDENCE Z score indicators.

Confidence				
Variable	**2021**	**2020**	**2019**	**2018**
Working Capital/Total Assets	(0.10)	(0.09)	(0.10)	(0.08)
Retained Earnings/Total Assets	0.43	0.37	0.34	0.34
Earnings Before Interest and Taxes/Total Assets	0.49	0.30	0.27	0.21
Market Value of Equity/Total Liabilities	1.10	0.85	1.28	1.24
Total Sales/Total Assets	0.40	0.40	0.53	0.48

The working capital to total assets ratio for the company ranges negatively from -0.08 to -0.10, indicating that current liabilities exceed current assets and that the ratio is almost 10% of total assets on average. It shows how inadequately the business's ability to stay solvent in the short run. Throughout the study period, the ratio of retained earnings to total assets fluctuated between 0.34 and 0.43, showing a moderate mobilization of retained profits. The positive and satisfactory ratio of EBIT to total assets, which ranges from 0.21 to 0.49, demonstrates that the company's earnings are in a satisfactory to excellent condition when compared to total assets. The analysis leads to the conclusion that Confidence Cement Limited relies more on equity than debt, with an exception in 2020. The ratio of total liabilities to market value of equity ranges from 0.85 to 1.28. The ratio of total sales to total assets varied from 0.40 to 0.53 during the study period which shows that the revenue of the company lower than the total assets it has invested. The company's solvency position is generally considered to be average.

Table 4. Value of CROWN Z score indicators.

CROWN				
Variable	**2021**	**2020**	**2019**	**2018**
Working Capital/Total Assets	0.03	0.01	0.06	0.09
Retained Earnings/Total Assets	0.21	0.14	0.15	0.15
Earnings Before Interest and Taxes/Total Assets	0.31	0.17	0.24	0.20
Market Value of Equity/Total Liabilities	0.69	0.32	0.42	0.38
Total Sales/Total Assets	0.96	0.73	0.76	0.64

Inefficiencies observed in the firm's working capital mobilization, as seen by the working capital to total assets ratio, which ranges from 0.01 to 0.09. The ratio of retained earnings to total assets shows that the retained earnings mobilization is also low having the ratio fluctuation from 0.14 to 0.21. The positive and satisfactory range of 0.17 to 0.31 in the ratio of EBIT to total assets demonstrates the company's profitability. According to the analysis, Crown Cement Limited is less dependent on equity than it is on debt, with a range of 0.32 to 0.69 for the market value of equity to total liabilities. There are different sales to total assets ratios.

Table 5. Value of HEIDELBERG Z score indicators.

HEIDELBERG				
Variable	**2021**	**2020**	**2019**	**2018**
Working Capital/Total Assets	(0.13)	(0.13)	(0.11)	0.12
Retained Earnings/Total Assets	0.46	0.41	0.37	0.57
Earnings Before Interest and Taxes/Total Assets	0.26	0.15	0.07	0.41
Market Value of Equity/Total Liabilities	16.88	9.73	9.11	31.01
Total Sales/Total Assets	1.55	1.15	1.18	1.36

Working capital as a percentage of total assets ranges from -0.13 to 0.12, which shows that the corporation, with the exception of 2020, does not invest much in current assets. The ratio of retained earnings to total assets, which ranged from 0.37 to 0.57 over the study period, shows that the mobilization of retained profits is in an excellent to moderate position. The company's earnings are average in position, as seen by the positive and highly variable ratio of EBIT to total assets, which ranged from 0.07 to 0.41. Conforming to the analysis, Heidelberg Cement Bangladesh Limited is more dependent on equity than debt, with an MV of equity to total liabilities ratio that ranges from 9.11 to 31.01. Indicating that the company's sales are larger than the total assets it has invested, the sales to total assets ratio ranged from 1.15 to 1.5 during the study period.

Table 6. Value of LAFARGEHOLCIM Z score indicators.

LAFARGEHOLCIM				
Variable	**2021**	**2020**	**2019**	**2018**
Working Capital/Total Assets	0.08	(0.02)	(0.04)	0.07
Retained Earnings/Total Assets	0.28	0.18	0.13	0.15
Earnings Before Interest and Taxes/Total Assets	0.55	0.35	0.28	0.22
Market Value of Equity/Total Liabilities	5.19	4.22	2.30	4.04
Total Sales/Total Assets	0.78	0.70	0.50	0.57

Working capital to total assets of LafargeHolcim Bangladesh Limited ranges from -0.04 to 0.08, indicating an increase in current liabilities from 2018 to 2019 and 2020. The ratios went from being negative to beginning to be positive as a result. The ratio of retained profits to total assets, which ranged from 0.13 to 0.28 over the study period, shows a rising trend and demonstrates effective retained earnings mobilization. The fact that the ratio of EBIT to total assets is positive, growing steadily year over year, ranging from 0.22 to 0.55, indicates that the company's earnings are rising.

Given that the ratio of MV of equity to total liabilities ranges from 2.30 to 5.19, the firm's MV of equity to total liabilities shows that LafargeHolcim Bangladesh Limited is progressively more dependent on equity than debt. During the research period, the ratio of sales to total assets fluctuated between 0.50 and 0.78, showing that the company's revenues were lower than the total assets it had invested.

Table 7. Value of MEGHNA Z score indicators.

MEGHNA				
Variable	**2021**	**2020**	**2019**	**2018**
Working Capital/Total Assets	(0.10)	(0.09)	(0.15)	0.08
Retained Earnings/Total Assets	0.05	0.05	0.06	0.06
Earnings Before Interest and Taxes/Total Assets	0.11	0.16	0.18	0.17
Market Value of Equity/Total Liabilities	1.08	1.19	1.49	1.59
Total Sales/Total Assets	0.74	0.75	0.95	0.80

Table 8. Value of PREMIER Z score indicators.

PREMIER				
Variable	**2021**	**2020**	**2019**	**2018**
Working Capital/Total Assets	(0.30)	(0.28)	(0.10)	(0.17)
Retained Earnings/Total Assets	0.18	0.19	0.21	0.24
Earnings Before Interest and Taxes/Total Assets	0.17	0.15	0.21	0.23
Market Value of Equity/Total Liabilities	0.28	0.24	0.35	0.61
Total Sales/Total Assets	0.48	0.49	0.64	0.75

Table 9. Value of coefficients and Z score.

Z Score of ARAMIT						
Year	**1.2A**	**1.4B**	**3.3C**	**0.6D**	**1E**	**Z Score**
2021	(0.12)	(0.11)	0.21	0.14	0.29	0.41
2020	(0.17)	(0.14)	0.12	0.05	0.30	0.17
2019	(0.16)	(0.12)	0.14	0.06	0.39	0.30
2018	(0.04)	(0.08)	0.13	0.10	0.42	0.53
Z Score of CONFIDENCE						
Year	1.2A	1.4B	3.3C	0.6D	1E	Z Score
2021	(0.10)	0.43	0.49	1.10	0.40	2.33
2020	(0.09)	0.37	0.30	0.85	0.40	1.82
2019	(0.10)	0.34	0.27	1.28	0.53	2.32
2018	(0.08)	0.34	0.21	1.24	0.48	2.19
Z Score of CROWN						
Year	1.2A	1.4B	3.3C	.6D	1E	Z Score
2021	0.03	0.21	0.31	0.69	0.96	2.21
2020	0.01	0.14	0.17	0.32	0.73	1.36
2019	0.06	0.15	0.24	0.42	0.76	1.63
2018	0.09	0.15	0.20	0.38	0.64	1.45
Z Score of HEIDELBERG						
Year	1.2A	1.4B	3.3C	.6D	1E	Z Score
2021	(0.13)	0.46	0.26	16.88	1.55	19.02
2020	(0.13)	0.41	0.15	9.73	1.15	11.31
2019	(0.11)	0.37	0.07	9.11	1.18	10.62
2018	0.12	0.57	0.41	31.01	1.36	33.47
Z Score of LAFARGEHOLCIM						
Year	1.2A	1.4B	3.3C	.6D	1E	Z Score
2021	0.08	0.28	0.55	5.19	0.78	6.89
2020	(0.02)	0.18	0.35	4.22	0.70	5.43
2019	(0.04)	0.13	0.28	2.30	0.50	3.17
2018	0.07	0.15	0.22	4.04	0.57	5.05
Z Score of MEGHNA						
Year	1.2A	1.4B	3.3C	.6D	1E	Z Score
2021	(0.10)	0.05	0.11	1.08	0.74	1.88
2020	(0.09)	0.05	0.16	1.19	0.75	2.06
2019	(0.15)	0.06	0.18	1.49	0.95	2.53
2018	0.08	0.06	0.17	1.59	0.80	2.71
Z Score of PREMIER						
Year	1.2A	1.4B	3.3C	0.6D	1E	Z Score
2021	(0.30)	0.18	0.17	0.28	0.48	0.80
2020	(0.28)	0.19	0.15	0.24	0.49	0.80
2019	(0.10)	0.21	0.21	0.35	0.64	1.31
2018	(0.17)	0.24	0.23	0.61	0.75	1.66

It has been noted from the study that Meghna Cement Mills Limited's current liabilities are increasing, which will result in a negative working capital to total asset ratio that will range from -0.15 to 0.08. But the exception noted in 2018. The mobilization of retained earnings is not satisfactory and a negative trend observed having the ratio range from 0.05 to 0.06 over the study period. With the exception of 2019, when it varied from 0.11 to 0.18, the ratio of earnings before interest and taxes to total assets is positive, declining steadily year over year, indicating that the company's earnings are declining. Given that the ratio of MV of equity to total liabilities ranges from 1.08

to 1.59, the firm's MV of equity to total liabilities shows that LafargeHolcim Bangladesh Limited is less dependent on equity than debt year over year. The sales to total assets ratio fluctuated between 0.95 and 0.74 during the study period, showing that the company's sales aren't much lower than the total assets it has spent.

Between 2018 and 2021, Premier Cement Limited will have more current liabilities than current assets, which will result in a negative working capital to total asset ratio that ranges from -0.10 to -0.30. The ratio of retained earnings to total assets, which ranged from 0.18 to 0.24 during the study period, shows a declining trend and poor retention earnings mobilization. With the exception of 2021, when it increased significantly and ranged from 0.15 to 0.23, the ratio of EBIT to total assets is positive and declining steadily year over year, indicating that the company's earnings are declining. Considering that the ratio of MV of equity to total liabilities ranges from 0.24 to 0.61, the MV of equity to total liabilities of the firm shows that LafargeHolcim Bangladesh Limited is less dependent on equity than debt year over year. Throughout the research period, the sales-to-total-assets ratio fluctuated between 0.48 and 0.75, showing that the company's sales were lower than the total assets it had invested.

Table 10. Z Value and firm's classification.

Company	Year	Z Value	Zone
Aramit	2021	0.41	Distress Zone
	2020	0.17	Distress Zone
	2019	0.30	Distress Zone
	2018	0.53	Distress Zone
Confidence	2021	2.33	Grey Zone
	2020	1.82	Grey Zone
	2019	2.32	Grey Zone
	2018	2.19	Grey Zone
Crown	2021	2.21	Grey Zone
	2020	1.36	Distress Zone
	2019	1.63	Distress Zone
	2018	1.45	Distress Zone
Heidelberg	2021	19.02	Safe Zone
	2020	11.31	Safe Zone
	2019	10.62	Safe Zone
	2018	33.47	Safe Zone
Lafargeholcim	2021	6.89	Safe Zone
	2020	5.43	Safe Zone
	2019	3.17	Safe Zone
	2018	5.05	Safe Zone
Meghna	2021	1.88	Grey Zone
	2020	2.06	Grey Zone
	2019	2.53	Grey Zone
	2018	2.71	Grey Zone
Premier	2021	0.80	Distress Zone
	2020	0.80	Distress Zone
	2019	1.31	Distress Zone
	2018	1.66	Distress Zone

Based on the Table 9 & 10, In the period from 2018 to 2021, Aramit Cement Limited's financial performance is in the distress or bankrupt. This is evident from the Z value, which is Z1.8, which is less than 1.8. The company has to improve its financial performance to avoid bankruptcy by increasing its earning through increase in sales and also incest more on current assets. In the period from 2018 to 2021, Confidence Cement Limited's financial performance is also dubious. The Z value of the company is in between 1.80 to 3.00 or 1.8<Z<3.00. The company may move to safe area by utilizing more of its assets to generate more sales as well as earning and also outperform in asset mobilization. In the years 2018, 2019, and 2020, Crown Cement Limited's financial performance has been poor. This is evident from Z's value, which is less than 1.80. The company management revises its financial policy

to improve its financial performance to get rid of distress situation of 2018-2020. As a result, the financial performance improved in 2021 with a Z value of 2.21 and reached to grey position. It is expected that the way the company increase its Z value it will reach to safe zone in near future. The financial performance of Heidelberg Cement Bangladesh Limited from 2018 to 2021 is in a comfortable range. The value of Z above 3.00 proves this. But there are still matter of concern regarding the financial performance of 2019 and 2020 where it can be observed that the Z value is decreasing compare to 2018 and 2021. The company should continue to maintain the same financial performance to avoid the chances of bankruptcy. LafargeHolcim Bangladesh Limited's financial performance from 2013 to 2017 has been balanced. This is indicated by the value of Z over 3.00. The increasing trend is observed year over year. The company must excel its financial performance to avoid the bankruptcy which was supposed to happen in 2019. Meghna Cement Limited's financial performance during the period of 2018 to 2021 is likewise dubious. The Z value of the company is in between 1.80 to 3.00 or 1.8<Z<3.00. There is a decreasing trend observed in the value of Z year over year. The company must improve its financial performance to avoid bankruptcy to be happened in near future by mobilizing its assets and increasing the investment in current assets as well as increase its earning through increase of sales. Premier Cement Mills Limited's financial performance from 2018 to 2021 falls into the category of hardship or insolvency. This is evident from the Z value, which is Z1.8, which is less than 1.8. The company must outperform in its operational activities to increase its asset mobilization, sales and earnings to improve its financial performance to avoid bankruptcy. It has to focus on increase of investment in current assets compare to its current liabilities.

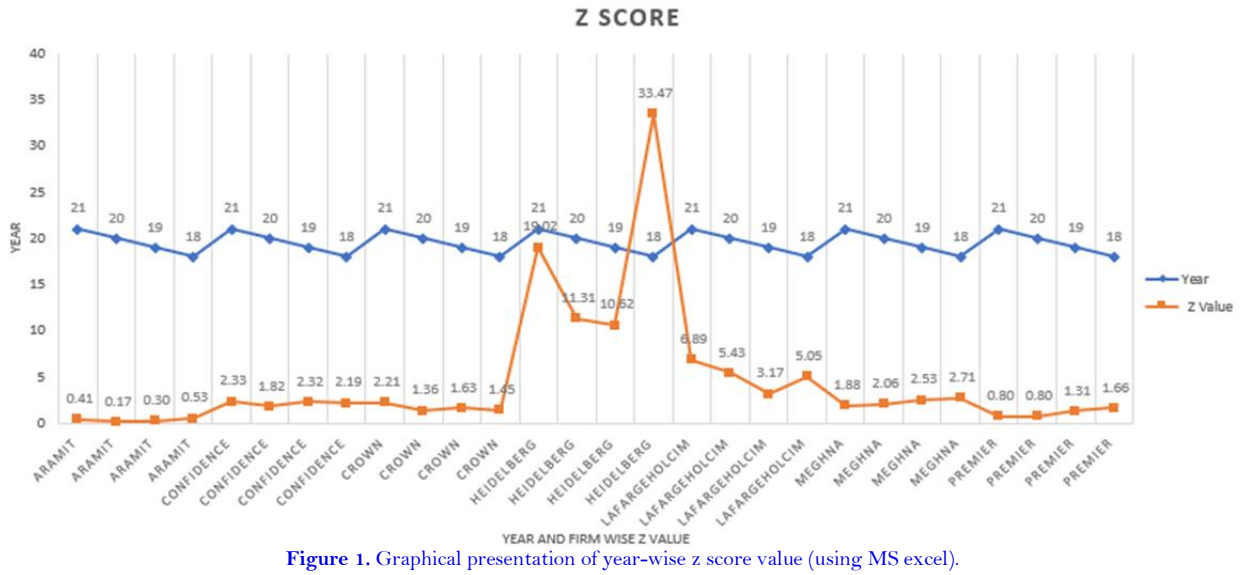

Figure 1. Graphical presentation of year-wise z score value (using MS excel).

Comparing HEIDELBERG to other cement businesses listed on the Dhaka Stock Exchange, Figure 1 indicates that it is the healthiest company overall. The graph shows that HEIDELBERG has the highest Z score, 33.47, as can be seen. The significant swings in the company's finances indicate that HEIDELBERG is only marginally stable when managing corporate finances. Because it is in a secure area, LAFARGEHOLCIM is a business that is also considered to be healthy. This is because the company's Z scores are all rising and are all above 3.0. From the table above, it can be inferred that the LAFARGEHOLCIM's financial situation declined in 2019, but that management responded rapidly the following year. LAFARGEHOLCIM's financial performance increased dramatically once more. CONFIDENCE and MEGHNA have a Z value that ranges from 1.82 to 2.71, placing them in the grey area. To get to the safe zone, these two businesses must strengthen their financial management and outperform in raising the value of Z. With the exception of CROWN's position in 2021, which has a Z value of 2.21, ARAMIT, CROWN, and PREMIER are classified as unhealthy or distressed if their curves fall below the Z value

of 1.80. These businesses must right away enhance the current strategy in order for them to succeed right away and stop growing financially in the years to come. This is so because the company's Z score is below 1.8 for virtually the whole time. If the Z number is less than 1.8, the company is insolvent (depressed zone). The corporation needs to make major changes to its financial plan to avoid falling into bankruptcy the next year, which would be bad for business.

4.1. Correlation Analysis

Table 11 illustrates the correlation analysis performed using the Statistical Package for Social Sciences to show the strength of linear relationship among the variables of the distressed companies.

Table 11. Correlation matrix of the distressed companies.

	WC_TA	RE_TA	EBIT_TA	MVe_TL	TS_TA	Z Score
WC_TA	1					
RE_TA	-0.003	1				
EBIT_TA	0.307	0.659*	1			
MVe_TL	0.233	0.856**	0.827**	1		
TS_TA	0.464	0.814**	0.674*	0.886**	1	
Z Score	0.478	0.841**	0.793**	0.941**	0.972**	1

Note: **. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Table 12 illustrates the correlation analysis performed using the Statistical Package for Social Sciences to show the strength of linear relationship among the variables of the non-distressed companies.

Table 12. Correlation matrix of the non-distressed companies.

	WC_TA	RE_TA	EBIT_TA	MVe_TL	TS_TA	Z Score
WC_TA	1					
RE_TA	-0.031	1				
EBIT_TA	0.473	0.375	1			
MVe_TL	0.284	0.662**	0.195	1		
TS_TA	0.021	0.361	-0.162	0.755**	1	
Z Score	0.288	0.669**	0.207	1.000**	0.763**	1

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

Table 13 shows and interprets the degree of correlation among the variables for both distressed (Table 11) and non-distressed (Table 12) companies. The result has been generated from the Statistical Package for Social Sciences software.

Table 13. Interpretation of correlation result.

Factors	R (distressed companies)	Relationship	r (non-distressed companies)	Relationship
A (WC_TA)	0.478	Low positive	0.288	Negligible positive
B (RE_TA)	0.841	High positive	0.669	Moderate positive
C (EBIT_TA)	0.793	High positive	0.207	Negligible positive
D (MVe_TL)	0.941	Very high positive	1	Very high positive
E (TS_TA)	0.972	Very high positive	0.763	High positive

4.1.1. Relationship between WC/TA and Z-Score

Contrary to what it shows for non-distressed companies with a correlation value of r=.288, working capital to total assets indicates a very negligible association with the z score for distressed companies with a correlation score

of r=.478. In conclusion, there is a direct correlation between working capital to total assets and business failure. Similar studies by Odibi et al. (2015) also shows a positive correlations between the variables.

4.1.2. Relationship between RE/TA and Z-Score

With a correlation score of r=.841 for distressed companies and r=.669 for non-troubled companies, retained earnings to total assets has a strongly positive link with the z score for distressed companies. In conclusion, there is a direct link between retained earnings to total assets and business failure.

4.1.3. Relationship between EBIT/TA and Z-Score

With correlation scores of r=.793 and r=.207, respectively, earnings before interest and tax/total assets indicates a strong positive association with the z score for the distressed companies and a negligibly positive association with the z score for the non-distressed companies. The failure of the company has been found to have a positive association.

4.1.4. Relationship between MVe/TL and Z-Score

For both distressed and non-distressed enterprises, the market value of equity to total liabilities has a very strongly positive association with the z score, with correlation values of r=.941 and r=1.00, respectively. The higher levels of the independent variables (WC/TA, RE/TA, EBIT/TA, MVe/TL, and TS/TA) are said to raise the dependent variable, according to the positive correlation between the variables (z score).

4.1.5. Relationship between TS/TA and the Z-Score

With correlation values of r=.972 and r=.763, the total sales to total assets explain a very highly positive relationship with the z score for the troubled companies and a very positive relationship for the non-distressed enterprises. It denotes a favorable correlation between the z score and sales/total assets.

The Pearson correlation test reveals a significant relationship between three independent variables (RE TA, EBIT TA, MVe TL, and TS TA) and the dependent variable (Z-score) at the 0.01 level for non-distressed companies (P value: 0.003, 0.001, and 0.001), while four independent variables (RE TA, MVe TL, and TS TA) have a significant relationship with the dependent variable for distressed companies (P value: 0.00e 1, 0.004, <0.001, and <0.001).

5. CONCLUSION

Financial management plays a positive role in the maximization of a company's profit and wealth. This study will not only contribute to the exposure of liquidity, profitability, and solvency but also increase the knowledge of investors, creditors, policy makers and other stakeholders regarding their involvement with the industry. The companies that are in a distressed position and grey area may move to a safe zone by implementing a proper financial recovery plan along with the improvement of their financial performance. However, the users of this research output are suggested to consider the prevailing economic and market condition of the respective country and any unprecedented cause as well.

The Altman Z score model used in this investigation for the evaluation of variables and their importance may alter depending on modifications made to the underlying data set. But the potential investors are recommended to use this model as an assessment tool for the prediction of company performance. Apart from the variables considered, other factors cannot be quantified but may have an impact on the company financial performance.

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REFERENCES

Afjal, M., & Das, S. (2020). Strategic financial performance evaluation and bankruptcy prediction of Indian petroleum industry. *Solid State Technology*, *63*(6), 4263-4270.

Al-Kassar, T. A., & Soileau, J. S. (2014). Financial performance evaluation and bankruptcy prediction (failure). *Arab Economic and Business Journal*, *9*(2), 147-155.Available at: https://doi.org/10.1016/j.aebj.2014.05.010.

Al-Manaseer, S., & Al-Oshaibat, S. (2018). Validity of altman z-score model to predict financial failure: Evidence from Jordan. *International Journal of Economics and Finance*, *10*(8), 181-181.Available at: https://doi.org/10.5539/ijef.v10n8p181.

Altman, E. I., Iwanicz-Drozdowska, M., Laitinen, E. K., & Suvas, A. (2017). Financial distress prediction in an international context: A review and empirical analysis of Altman's z-score model. *Journal of International Financial Management & Accounting*, *28*(2), 131-171.Available at: https://doi.org/10.1111/jifm.12053.

Cement Industry of Bangladesh: Challenges and Future Opportunities. (2021). Cement industry of Bangladesh: Challenges and future opportunities. Retrieved from: https://businessinspection.com.bd/cement-industry-of-bangladesh/.

Erin, O., Bamigboye, O., & Arumona, J. (2020). Risk governance and financial performance: An empirical analysis. *Verslas Teorija ir Praktika/Business Theory and Practice*, *21*(2), 758-768.Available at: https://doi.org/10.3846/btp.2020.10850.

Fitriani, A., Hasan, A., & Indrapriyatna, A. S. (2019). Bankruptcy prediction of listed cement company in Indonesian stock exchanges using altman z-score model. *Spectrum Industry*, *17*(2), 1-177.Available at: https://doi.org/10.12928/si.v17i2.13961.

García, M. L. S. (2022). Business sustainability and financial performance. *Administration Notebooks*, *38*(72), e4010835-e4010835.Available at: https://doi.org/10.25100/cdea.v38i72.10835.

Gopalakrishnan, M. M., Gupta, A., Raja, M., Reddy, R. V., & Subbarao, A. N. (2019). Bankruptcy prediction for steel industry in India using altman z score model. *International Journal of Production Technology and Management*, *10*(1), 87-102.Available at: https://doi.org/10.34218/ijptm.10.1.2019.009.

Hillegeist, S. A., Keating, E. K., Cram, D. P., & Lundstedt, K. G. (2004). Assessing the probability of bankruptcy. *Review of Accounting Studies*, *9*(1), 5-34.Available at: https://doi.org/10.1023/b:rast.0000013627.90884.b7.

Hossain, T. (2020). Determinants of profitability: A study on manufacturing companies listed on the Dhaka stock exchange. *Asian Economic and Financial Review*, *10*(12), 1496-1508.Available at: https://doi.org/10.18488/journal.aefr.2020.1012.1496.1508.

Hossain, T., Nesa, T., Dowla, M. S. U., & Akter, F. (2021). The impact of covid-19 pandemic on the stock market performance: A study on Dhaka stock exchange. *International Journal of Business Economics and Management*, *8*(5), 390-408.Available at: https://doi.org/10.18488/journal.62.2021.85.390.408.

Jan, A., & Marimuthu, M. (2015). Altman model and bankruptcy profile of Islamic banking industry: A comparative analysis on financial performance. *International Journal of Business and Management*, *10*(7), 110–119.Available at: https://doi.org/10.5539/ijbm.v10n7p110.

Kablay, H., & Gumbo, V. (2021). Financial performance of banks in Botswana. *Journal of Mathematical Finance*, *11*(3), 386-397.Available at: https://doi.org/10.4236/jmf.2021.113022.

Kadarningsih, A., Oktavia, V., Falah, T. R. F., & Sari, Y. S. (2021). Profitability as determining factor to anticipate company bankruptcy. *Applied Economics Studies*, *39*(12), 1-12.Available at: https://doi.org/10.25115/eea.v39i12.6171.

Kukreja, G., Gupta, S. M., Sarea, A. M., & Kumaraswamy, S. (2020). Beneish m-score and altman z-score as a catalyst for corporate fraud detection. *Journal of Investment Compliance*, *21*(4), 231–241.Available at: https://doi.org/10.1108/joic-09-2020-0022.

Matturungan, N. H., Purwanto, B., & Irwanto, A. K. (2017). Manufacturing company bankruptcy prediction in Indonesia with altman z-score model. *Management Application Journal*, *15*(1), 18-24.Available at: https://doi.org/10.18202/jam23026332.15.1.03.

Mensah, Y. (1984). An examination of the stationarity of multivariate bankruptcy prediction models-a methodological study. *Journal of Accounting Research*, *22*(1), 380-395.Available at: https://doi.org/10.2307/2490719.

Mondal, A., & Ghosh, S. K. (2012). Intellectual capital and financial performance. *Journal of Intellectual Capital*, *13*(4), 515–530.Available at: https://doi.org/10.3389/fpsyg.2022.967820.

Muchiri, M. K., & Erdei-gally, S. (2019). Effect of environmental CSR activities on the financial performance of financial institutions in Kirinyaga county. *Research Journal of Finance and Accounting*, 1–23.Available at: https://doi.org/10.7176/rjfa/10-5-07.

Odibi, I., Basit, A., & Hassan, Z. (2015). Bankruptcy prediction using altman z-score model: A case of public listed manufacturing companies in Malaysia. *International Journal of Accounting and Business Management*, *3*(2), 178-186.Available at: https://doi.org/10.24924/ijabm/2015.11/v3.iss2/178.186.

Ogachi, D., Ndege, R., Gaturu, P., & Zoltan, Z. (2020). Corporate bankruptcy prediction model a special focus on listed companies in Kenya. *Journal of Risk and Financial Management*, *13*(3).Available at: https://doi.org/10.3390/jrfm13030047.

Pagaddut, J. G. (2021). The financial factors affecting the financial performance of philippine msmes. *Universal Journal of Accounting and Finance*, *9*(6), 1524–1532.Available at: https://doi.org/10.13189/ujaf.2021.090629.

Rettobjaan, V. F. C. (2020). Analysis of financial ratios for predicting bankruptcy in SMEs listed on PEFINDO25. *Journal of Management and Business*, *19*(2), 15–22.Available at: https://doi.org/10.24123/jmb.v19i2.466.

Saranya, C., & Sridevi, D. V. (2019). Financial performance of it sector companies in India. *The International Journal of Analytical and Experimental Modal Analysis*, *11*(861), 861–877.

Supitriyani, S., Siahaan, Y., Astuti, A., Putri, J. A., & Susanti, E. (2021). Analysis of financial distress in measuring bankruptcy before and after the Covid-19 pandemic. *Journal of Governance Risk Management Compliance and Sustainability*, *1*(2), 53-60.Available at: https://doi.org/10.31098/jgrcs.v1i2.719.

Voda, A. D., Dobrotă, G., Ţîrcă, D. M., Dumitraşcu, D. D., & Dobrotă, D. (2021). Corporate bankruptcy and insolvency prediction model. *Technological and Economic Development of Economy*, *27*(5), 1039-1056.Available at: https://doi.org/10.3846/tede.2021.15106.

Wattoo, A. (2022). Financial structure and firm 's financial performance : Empirical financial structure and firm 's financial performance : Empirical evidence of financial sector of pakistan.Available at: https://doi.org/10.5281/zenodo.6801113.

Wijaya, S. V., & Anantadjaya, S. P. (2014). Bankruptcy prediction model: An industrial study in Indonesian publicly-listed firms during 1999-2010. *RIBER: Review of Integrative Business & Economics Research*, *3*(1), 13-41.

Zhang, Y., & Li, X. (2006). Ownership structure and corporate diversification. *Business and Politics*, *8*(1), 1-19.Available at: https://doi.org/10.22495/cocv3i3p5.