

Assessing Financial Soundness of Ceramics Industry in Bangladesh: An Analysis with Altman Z-score Model

Md. Rafiqul Islam¹ A.N.M. Asaduzzaman Fakir²

¹Graduate Student, Department of Accounting & Information Systems,
Jagannath University, Dhaka-1100, Bangladesh, Email: b170201018@ais.jnu.ac.bd

²Associate Professor, Department of Accounting & Information Systems,
Jagannath University, Dhaka-1100, Bangladesh, Email: asaduzzamanfakir@ais.jnu.ac.bd

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Abstract:

This study's goal is to evaluate the financial resilience of Bangladesh's ceramics industry using the Altman Z-Score model. The nation's economy heavily depends on the ceramics industry, which also creates jobs and contributes to industrial output. Rapid expansion in both home and international markets makes the financial stability of the sector essential to the stability of the economy as a whole. Using a quantitative methodology, this study examines information from the fiscal years 2020–21 annual reports of five listed ceramics companies. For the first time in this industry context, the Altman Z-Score model reveals a significant portion of companies falling into the "Distress" zone, indicating a heightened risk of financial challenges. The results have real-world ramifications for investors, legislators, and stakeholders. They can be used to improve financial plans and encourage the expansion of sustainable industries. By addressing a significant void in the assessment of financial resilience within Bangladesh's ceramics industry, the study adds to the body of literature.

1. Introduction

The ceramics industry in Bangladesh is a growing sector, and its prospects for growth in the domestic and global markets suggest that it has the potential to become one of the most major producers of foreign currency to the country (Al Masum, 2012). The ceramics industry in Bangladesh is generally thriving. Because of the substantial impact it has on industrial production capacity and employment prospects, this sector is crucial to Bangladesh's economic growth.

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Because the ceramics industry spans the industries of producing, structures and interior design, the stability and expansion of the country's economy as a whole depend largely on the financial health of ceramics businesses. In the face of dynamic market conditions, economic uncertainties, and global challenges, assessing the financial resilience of this industry is now a crucial demand.

The term "ceramics" refers to the production of any item from a non-metallic mineral that has been significantly chilled and hardened. Industrial ceramics consist of all solid materials utilized in industry that do not fall under the category of organic or metallic. Glass, earthenware, porcelain, whiteware, porcelain enamels, bone china, stoneware, terracotta and brick tiles, refractories, cement, lime, and gypsum, as well as specific abrasives, are significant ceramic products. (C_0071.htm) (Forkan & Ahmed, 2011).

Bangladesh is now seen as an emerging actor on the international economic scene as a result of the country's recent technological advancement and economic expansion. It is therefore crucial to assess the financial stability of important industries. The ceramics sector is a microcosm of the larger economic environment because of the complex interactions between local demand, export dynamics, and responsiveness to global market trends.

The Bangladeshi ceramics industry has grown since 1958. In 2023, there are 65 conventional ceramic industry. These firms produce heavy clay, tiles, sanitaryware, and tableware. The domestic ceramic consumption was \$660 million in 2017-18. Sanitary, tiling, and tableware are 89%, 77%, and 96% of the local companies. This industry has grown 20% locally and 26% internationally in 15 years. The Manufacturing capacity has doubled in five years. Ceramics employ 48,000 employees directly and 500,000 indirectly (Ceramics industry, 2023).

Bangladesh exports ceramics over 50 countries, including Australia, UK, US, Italy, Spain, Norway, France, and the Netherlands. According to the Export Promotion Bureau, FY2018–19 ceramics export revenues rose to USD 70 million from USD 52 million in FY2017-18. Bangladesh's seventh largest export is ceramics, but it could become third in five years. The EU demand and US-China trade tensions boost up these exports (Ceramics industry, 2023).

Now it's high time to analyze and evaluate the financial resilience of Ceramics Industry in Bangladesh. However, no analysis of this nature has ever been conducted on the ceramic industry. In an effort to fill out this literature gap, the present study employs the Altman Z-score model to evaluate the financial stability of this ceramics sector.

The primary objective of this study is to present an in-depth evaluation of the ceramics industries' financial resiliency in Bangladesh. This extensive analysis of the financial health of a company is conducted through the utilization of performance measures and key financial indicators. The Altman Z-Score model shall be utilized to assess the likelihood of insolvency and financial hardship for

ceramics industry firms. Furthermore, the research endeavors to ascertain and examine elements that contribute to financial resilience, establishing connections between operational strategies and financial well-being. Moreover, The research aims to assess the ceramics sector's financial stability in the face of economic problems, market changes, and global uncertainty.

The results of this study have significance to a diverse range of individuals and groups, such as scholars, investors, lawmakers, industry experts, and financial organizations. Companies operating in the ceramics and tiles industry might utilize the discoveries to enhance their financial plans and maximize operational savings. Government entities can use the insights to formulate policies supporting industry growth and sustainability. Investors and financial institutions gain valuable information to assess the risk profile of ceramics companies, aiding in decision-making and risk management. Additionally, the research contributes to the academic understanding of financial resilience, industry dynamics, and economic development in emerging markets.

2. Review of Literature

Edward I. Altman (1968) was the first person to initially develop the Altman Z-score for the purpose of discriminate analysis in order to predict bankruptcy, financial strength, or financial distress. Although the model was initially developed from samples of publicly traded manufacturing companies, it is also widely used in private manufacturing, non-manufacturing, and service companies. It is based on five financial ratios that are weighted by coefficients, and the original Altman Z-score was developed. Estimating the coefficients required first locating a group of companies that had filed for bankruptcy and then gathering a sample of companies that had survived the bankruptcy process. The sample was matched by industry and approximate size (assets), and the matching process was repeated. The Altman Z-score is a highly effective instrument that can be employed to forecast credit risk and the likelihood of a company whether or not going to the bankruptcy, also known as corporate defaults. The investors can be able to use the Altman Z-score, which is based on a business's financial strength, to decide whether to purchase or sell the shares of that company. (Ali et al., 2016).

A study used the Altman Z-score methodology to evaluate Bangladesh's textile industry's financial health. The results show that the textile sector of Bangladesh does not have sufficient overall financial soundness (Ali et al., 2016). Another study was conducted by Parvin (2013) using Altman's z-score model, to forecast the financial health of Bangladesh's banking sector. It is found that state-owned banks are in better financial health than their counterparts. Using the Z-score model, a study was carried out to evaluate the tannery industry's basic financial health. The survey reveals that while Apex Tannery and Bata Shoe are both

financially healthy, three firms are not performing well financially (Mahbuba, 2015). Another research was conducted to examine the financial stability of Bangladesh's footwear sector using Altman's z-score. The analysis concludes that, in general, the footwear market is safe (Jahan & Zaman, 2017). Using the Z-score model, a study was carried out to evaluate the cement industry's basic financial health. According to the survey, three companies are not in a strong condition, whereas Heidelberg Cement and Confidence Cement are both financially stable (Mizan et al., 2017). A study was done to figure out how risky Bangladesh's pharmaceutical business would be by using the Altman Z score model. The report says that the pharmaceutical sector faces a high risk of going bankrupt (Nayem, 2022). Using Altman's Z-Score Model, a study was done to find out how sick a group of Bangladeshi textile manufacturers were. The findings demonstrate that throughout the examined period, the sample clothing factories' illness symptoms have changed. Sickness is caused by things like inadequate oversight of working capital, bad use of current assets, not using resources enough, idle capacity, and low production levels (Sina et al., 2020). A study was done using Altman's Z-Score Model to give a full picture of the general insurance market in Bangladesh's financial health. It was discovered that 95 percent of the chosen businesses obtained a safe but not exceedingly excellent calculated result for the Altman Z score model. The year is 2022). These studies demonstrate that the Altman Z score model is a popular gauge of the companies' overall financial health. Once more, a study on the performance evaluation of particular ceramic companies in Bangladesh was carried out. According to the survey, the chosen companies' financial soundness has been trending upward (Al Masum, 2012). A study used Altman's Z-score to analyze Bangladeshi industries' credit strength. This analysis concluded that 20% and 40% of chosen ceramic and tannery enterprises are financially stable and safe for investors. 28.57%, 40%, and 25% of cement, ceramic, and paper and printing enterprises are in the grey zone, indicating a high risk of bankruptcy within two years. In the distress zone, 71.43%, 40%, 75%, 60%, and 100% of cement, ceramic, paper & printing, tannery, and jute enterprises have poor financial situations. Only 20% of selected industries are safe (Al Amin, 2023). Another study calculated Altman's Z score and compared debt's impact on Bangladeshi listed MNCs and indigenous enterprises. On average, one local enterprise was in the grey zone and 13 were safe (Rahman, 2021). An environmental and energy research indicated that the ceramics industry faces issues in manufacturing, raw material extraction, waste disposal, and landfilling (Del Rio, 2022). Mahmood et al. (2013) examined the elements influencing the ceramics revolution and its anticipated future. The Bangladeshi ceramic industry's competitive environment was analysed using Porter's Five Forces model. The five-force analysis shows that competing forces have a moderate to weak impact (Jahan, N. 2010). A study examined Bangladeshi tableware ceramics firms' marketing methods for international

expansion. To compete worldwide, corporations use diverse segmentation and targeting tactics (Forkan et al., 2011). A study sought to identify ceramic company profitability factors. The investigation demonstrated that liquidity, business size, sales growth, capital intensity, and management efficiency positively affect profitability (Sharma, 2022). Another study examined Bangladeshi ceramic businesses' operational performance and profitability. Fixed asset turnover, return on equity, and return on asset positively affect profitability (Azim et al., 2015). A study examined Bangladeshi customers' impressions of prominent ceramic producers through ceramic tableware. The survey indicated that Shinepukur leads the market, followed by Monno and others (Forkan, 2010). Risk-adjusted performance of Bangladesh's cement, ceramic, tannery, and IT industries was studied. It's clear that ceramics company MONNOCERA, tannery company SAMATALETH, and IT company DAFODILCOM perform well (Wadud, 2017). While many studies have shown the financial endurance of Bangladesh's textile, apparel, pharmaceutical, tannery, footwear, and other industries, none have examined the country's burgeoning ceramics industry. This study addresses this literature gap.

3. Methods

This study is quantitative in nature. The study has been conducted mainly based on the data from annual reports of publicly traded ceramic companies in Bangladesh. The ceramic industry in Bangladesh is now a growing sector. And, to judge the financial resilience of this sector is now a demand of time. That's why the researcher decided to focus on the ceramic sector in this study.

3.1 Sample Size

The study has been carried out using quantitative data. The researcher has chosen five (5) listed ceramics companies from the Dhaka Stock Exchange Limited (DSE) for this study. The secondary data for the years 2020–21 was taken from these companies' annual reports. The companies are:

Table 1: List of the Companies

Full Name	Short Name
Fu-Wang Ceramic Industries Ltd.	FUWANGCER
Monno Ceramic Industries Ltd.	MONNOCERA
RAK Ceramics Bangladesh Limited	RAKCERAMIC
Shinepukur Ceramics Limited	SPCERAMICS
Standard Ceramic Industries Ltd.	STANCERAM

3.2 Model Specification and Estimation

In this study, the Altman Z-score for publicly traded manufacturing companies is utilized. Edward Altman developed this Z-score as a financial metric in the late 1960s. It is used to predict whether a company will go bankrupt (Altman, et al.

2017). The Z-score is calculated using a variety of financial ratios and other criteria available in a company's financial statements (Manousaridis, 2017). The Z-score is calculated using the following formula (only for manufacturing industries):

$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1.0X_5$$

Whereas,

X_1 → Working Capital / Total Assets.

X_2 → Retained Earnings / Total Assets.

X_3 → Earnings before Interest and Taxes / Total Assets.

X_4 → Market Value of Equity / Book Value of Total Liabilities.

X_5 → Sales / Total Assets.

Z → Overall Index

A single Z-score is generated from the evaluation of these ratios by the Z-score model. Here is the manner in which the Z-score is understood:

- 1) Z-score > 2.99: The company is considered secured, and bankruptcy is unlikely.
- 2) $1.81 < Z\text{-score} < 2.99$: The company is in the grey zone, indicating that cautions are needed.
- 3) Z-score < 1.81: The company is considered distressed, and there is a higher likelihood of bankruptcy. (Altman, et al. 2017).

3.3 Data Analysis Techniques

The researcher addressed many kinds of data analysis techniques in this section. The values of Z-score model have been measured by the researcher using Excel and SPSS. Additionally, the researcher has employed a variety of tests and tools, such as descriptive statistical methods, to evaluate the models' effectiveness.

4. Results

The researcher has discussed data analysis and their interpretations in this section. Using the Altman Z-score model, the researcher has chosen five companies for the 2020–21 period.

The company's creditworthiness and stability are assessed using financial ratios known as the Altman Z-Score model (Winarso, E., & Edison, T. A. 2019). These models are widely used by analysts, investors, and creditors to evaluate the risk of bankruptcy or additional financial difficulties (Lorenzo, et al. 2020). Let's examine each of the model's values and the corresponding measurements:

Table 2: Financial data of the Companies

Name of the Company	Sales	EBIT	Total Asset	Total Liabilities	Retained Earnings	Working Capital	Market Value of Equity
FUWANGCER	767107572	159812194	3168951950	1574081643	156117025	604,184,935	1594870307
MONNOCERA	706770914	79962470	3236996210	1072585960	18869182	187,282,914	2164410250
RAKCERAMIC	6851136685	1164492804	14007657968	6507128782	1747192779	4,308,543,080	7500529186
SPCERAMICS	1393558406	133434598	6557016861	2054756163	-13345041	-408,193,090	4502260698
STANCERAM	325335999	13974469	312093096	249284384	-42654643	-81,979,038	62808712

Source: Annual Report of the companies

Table 3. Related ratios of the Z-score model of the companies

Name of the Company	Working Capital/Total Asset	Retained Earnings/Total Asset	EBIT/ Total Asset	Market Value of Equity/Total Liabilities	Sales/ Total Asset
FUWANGCER	0.191	0.049	0.050	1.013	0.242
MONNOCERA	0.058	0.006	0.025	2.018	0.218
RAKCERAMIC	0.308	0.125	0.083	1.153	0.489
SPCERAMICS	-0.062	-0.002	0.020	2.191	0.213
STANCERAM	-0.263	-0.137	0.045	0.252	1.042
Average	0.046	0.008	0.045	1.325	0.441

4.1 Liquidity Analysis (X_1): Table 4 displays the highest liquidity ratio achieved by RAK Ceramics Bangladesh Limited, which stands at 0.308. This indicates that the company's liquid asset represents 0.308 Tk out of its total asset Tk. 1. The liquidity position of other ceramic companies, such as Fu-Wang Ceramic Industries Ltd. and Monno Ceramic Industries Ltd., is significantly lower than that of RAK Ceramics Bangladesh Limited. Again, Both Standard Ceramic Industries Ltd. and Shinepukur Ceramics Limited, are experiencing a negative liquidity situation. These businesses are now suffering from more current debt than current assets. These ceramic companies are unaware of their liquidity, despite the industry average liquidity ratio of 0.046. Thus, it may be concluded that Bangladesh's ceramics sector is now run inefficiently.

Table 4: Working capital to total assets (X_1)

Name of the Company	Working Capital/Total Asset
FUWANGCER	0.191
MONNOCERA	0.058
RAKCERAMIC	0.308
SPCERAMICS	-0.062
STANCERAM	-0.263
Average	0.046

4.2 Profitability Analysis (X_2): Table 5 reveals that RAK Ceramics Bangladesh Limited has the highest profitability ratio, with a value of 0.125. It indicates that RAK Ceramics Bangladesh Limited is being handled well and is able to cover expenses and other pertinent costs incurred over the course of the time. Additionally, it has been discovered that Standard Ceramic Industries Ltd. has the lowest profitability ratio, coming in at -0.137. This indicates that Standard Ceramic Industries Ltd. is not able to efficiently retain earnings in relation to its spending and other relevant charges. Again, table 5 demonstrates that the industry average profitability ratio is positive at 0.008. It implies that the ceramics industry can assess the profitability ratio to produce cash flows, earnings, and profits based on a criterion, usually the amount of money invested.

Table 5: Retained earnings to total assets (X_2)

Name of the Company	Retained Earnings/ Total Asset
FUWANGCER	0.049
MONNOCERA	0.006
RAKCERAMIC	0.125
SPCERAMICS	-0.002
STANCERAM	-0.137
Average	0.008

4.3 Efficiency Analysis (X_3): According to Table 6, each company's Efficiency ratio is positive. As a result, the industry average is similarly positive. RAK Ceramics Bangladesh Limited, on the other hand, has the highest Efficiency ratio of 0.083. It suggests RAK Ceramics Bangladesh Limited managed its assets and liabilities more successfully than others. Shinepukur Ceramics Limited received the lowest profitability ratio, 0.020, indicating that the company couldn't manage well to improve its profitability.

Table 6: Earnings before interest and taxes (EBIT) to total assets (X_3)

Name of the Company	EBIT/ Total Asset
FUWANGCER	0.050
MONNOCERA	0.025
RAKCERAMIC	0.083
SPCERAMICS	0.020
STANCERAM	0.045
Average	0.045

4.4 Analysis of Volatility Ratio (X_4): Table 7 shows that Shinepukur Ceramics Limited has the highest MVE/TL ratio of 2.191. This means that the company's market value of equity is 2.191 times greater than its debt. Shinepukur Ceramics Limited is in better shape than the other Ceramics companies in Bangladesh

because of this. The MVE/TL ratio, on the other hand, shows that the market value of equity in Standard Ceramic Industries Ltd. businesses is very low compared to their total debt. As we saw before, the average MVE/TL ratio for this business is 1.325. This means that the market value of equity is 1.325 times greater than the market value of liabilities.

Table 7: Market value of equity to book value of total liabilities (X₄)

Name of the Company	Market Value of Equity/Total Liabilities
FUWANGCER	1.013
MONNOCERA	2.018
RAKCERAMIC	1.153
SPCERAMICS	2.191
STANCERAM	0.252
Average	1.325

4.5 Analysis of Total Asset Turnover (X₅): Table 8 shows that Standard Ceramic Industries Ltd. has a greater assets turnover ratio than the other ceramic enterprises. It suggests that these businesses are more efficient at creating sales or money by utilizing their assets. It may also suggest that this company has a lower profit margin. Fu-Wang Ceramic Industries Ltd., Monno Ceramic Industries Ltd., and Shinepukur Ceramics Limited had the lowest total assets since their assets turnover ratio was less than the industry average of 0.441. This means that these businesses are less efficient at generating sales or revenue from their assets. It may also signify that those companies may have a higher profit margin.

Table 8: Sales to total assets (X₅)

Name of the Company	Sales/ Total Asset
FUWANGCER	0.242
MONNOCERA	0.218
RAKCERAMIC	0.489
SPCERAMICS	0.213
STANCERAM	1.042
Average	0.441

4.6 Comparative Analysis of Financial Soundness through Z- Score Model:

The Z score model predicts whether a company will go bankrupt or not in the coming years. Altman provided the following values for discovering Zones of Discrimination for this assessment. $Z > 2.99$ - "Safe" Zones, $1.81 < Z < 2.99$ - "Grey" Zones, $Z < 1.81$ - "Distress" Zones, and we have begun the investigation to determine whether the ceramic sector in Bangladesh is financially sound or not. Table 9 and Figure 1 will help in this attempt. Table 9 shows that the Fu-

Wang Ceramic Industries Ltd., Monno Ceramic Industries Ltd., Shinepukur Ceramics Limited, and Standard Ceramic Industries Ltd. enterprises are in the "Distress" zone, indicating that they are likely to go bankrupt in the near future. And because RAK Ceramics Bangladesh Limited is in the "grey" zone, there is a good chance that this company would go bankrupt. According to Figure 2, 80% of businesses in the ceramics sector have fallen into the "distress" zone, meaning that 80% of these businesses have a high likelihood of experiencing bankruptcy in the future. Furthermore, the 20% of businesses in the ceramics sector that are now in the "grey" zone suggests that 20% of these businesses have a good probability of going bankrupt.

Table 9: Analysis of financial soundness

Name of the Company	$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1.0X_5$				Remarks
	Z-score	Classification			
		$Z < 1.81$	$1.81 < Z < 2.99$	$Z > 2.99$	
FUWANGCER	1.314	√			Distress
MONNOCERA	1.588	√			Distress
RAKCERAMIC	1.998		√		Grey Zone
SPCERAMICS	1.517	√			Distress
STANCERAM	0.835	√			Distress
Average	1.450	√			Distress

But based on the average Z-score for the industry, the ceramics industry is in the "Distress" zone, which means there is a high probability that the industry will go bankrupt in the next few years.

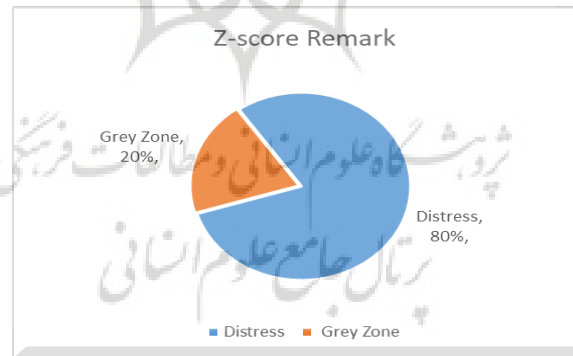


Figure 1: Comparative position of financial soundness

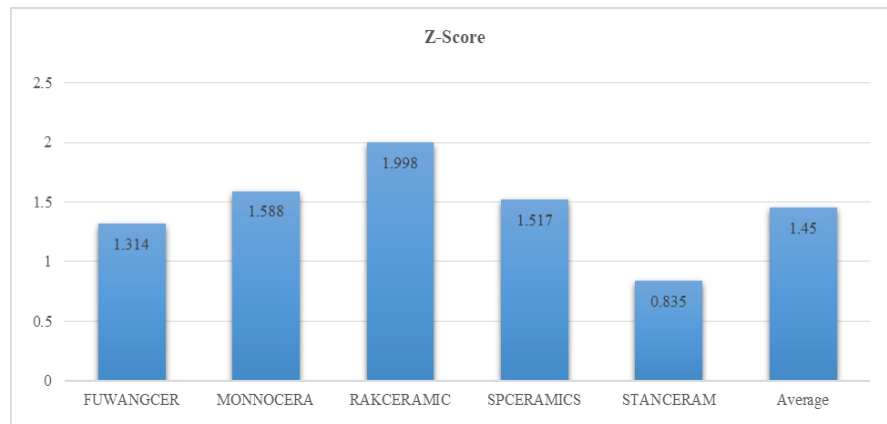


Figure 2: Comparative position of Z-Score Comment

5. Limitations and Suggestions

There are certain limitations to this study, which used the Altman Z-Score model to assess the financial resilience of Bangladesh's ceramics industry. The sample size, which is restricted to five Dhaka Stock Exchange-listed businesses, might not adequately represent the diversity of the whole ceramics industry. The results depend on the financial data in the annual reports being accurate; inconsistencies could make the analysis less valuable. Additionally, the study uses data from the 2020–21 fiscal year; given how quickly the economy is growing, a longer time frame could provide a more dynamic forecast. Even though the Altman Z-Score model is a popular tool, depending just on it could leave out some aspects of financial resilience.

To provide a more comprehensive understanding, future research could benefit from a more extensive industry-wide analysis that includes both listed and non-listed companies, a longitudinal study that spans several years, and the integration of qualitative components like industry expert interviews. Enhancing the insights offered by this study could involve investigating the influence of extraneous factors and performing comparative evaluations with other sectors. In summary, although this study provides a preliminary investigation into the financial resilience of Bangladesh's ceramics industry, addressing these limitations in subsequent research endeavours will enhance the depth and nuance of the analysis.

6. Conclusions

This study uses the Altman Z-Score model to examine Bangladesh's ceramics industry's financial resiliency. The ceramics sector has helped Bangladesh's economy thrive in local and export markets during the past decade. This research fills an important gap by introducing the ceramics sector to the Altman Z-Score model, a reliable indicator of financial health. The findings of this study, albeit within the scope of a limited sample size, indicate that a significant portion of the ceramic's companies analyzed fall within the "Distress" zone, suggesting a high probability of financial challenges in the future. It is important to recognize the study's shortcomings, which include its small sample size and dependence on particular financial model. These limitations, however, also point to the path that more research should take to close these knowledge gaps and offer a more thorough comprehension of the sector's financial processes. Numerous stakeholders, including academics, investors, lawmakers, business experts, and financial institutions, find the study to be significant. The knowledge obtained from this research can help direct investment decisions, aid in the development of government policies, support businesses in making strategic decisions, and advance academic research on financial resilience in emerging markets, all of which are important given the continued importance of the ceramics sector to Bangladesh's economy. Essentially, this study establishes the groundwork for subsequent inquiries into the fiscal well-being of Bangladesh's ceramics sector, promoting a broader and more comprehensive methodology to decipher the intricacies and possible avenues for enduring expansion in this flourishing sector.

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