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# The Possibility of Financial Distress and its Determinants: Evidence from the Banking Sector of Bangladesh

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**Abstract**

The banking sector of Bangladesh has shown poor performance for over a decade now. The non-performing loans increased over the years. This prompts the question of whether the banks are capable of maintaining financial stability and continue as a going concern. This is further fueled by the number of financial scandals which took place over the years, such as the Hallmark scandal, irregularities in Islami Bank Bangladesh Ltd., BASIC Bank Limited etc. that further highlights the signs of possible financial distress. These incidents call for an investigation of bank-specific determinants that might have a significant effect in leading a bank towards bankruptcy. This study has used the data of 30 listed commercial banks in Bangladesh, from the year 2014 to 2020. The bankruptcy risk is measured using the Altman Z-score, which has been extensively used as a suitable bankruptcy risk measurement tool. Statistical analysis has been conducted, using random-effects regression model and correlation, to test the relationship and impact of bank-specific factors. Capital adequacy ratio has shown significantly positive impact on the bankruptcy risk, while age has shown significantly negative impact on bankruptcy risk. Non-performing loan has also shown negative relationship with Z-score, which is contrary to the conventional belief.

**Keywords:** Capital Adequacy ratio, Altman Z-score, Bank-specific determinants, Bankruptcy risk.

## 1. Introduction

Specialized financial institutions also known as the banks are in the core of any economic system. If we take the economic system as an individual then banks are the heart of that economy (Mostofa, 2016). In Bangladesh, the banks play an important and huge role in the development of the economy. Currently there are sixty plus banks in the country, both private and public. Even though it has been a great journey for banks, still financial distress is not an unfamiliar phenomenon. It is also loosely translated as the bank

failure or bankruptcy. Financial distress is that situation of the bank where the liabilities of the company exceed the assets. This can happen due to many reasons, including inefficient financial management, inefficiency in other management, under-capitalization, insufficiency of liquidity, sales decline, scarce of resources and adverse market situation (Panigrahi, 2019). The other reasons for banks facing financial distress can be that they are unable to keep to the financial commitment, the high maintenance of fixed cost payment, the uncertainty of revenue and liquidity crisis (Khaliq, 2014). Sometimes it is tough to identify the exact reason behind the bank insolvency but some of the indicators can be used such as the operating losses, unstable return on assets (ROA), non-performing loans (NPLs), branch closing and unstable return on equity (ROE) etc.

In the start of the nineties, bank crises were visible and happening more in many countries described by (Mostofa, 2016). What is the situation of Bangladeshi banks now? To find the answer to this question, we have taken thirty listed banks of Dhaka Stock Exchange (DSE) in this paper of ours. The time length is taken for the past five years, for the better understanding of the financial distress. Even though the sources taken for this paper are very clear, that is the annual reports of the banks, the crucial part is the analysis of these data obtained and the technique aka the method pursued.

As for the quantitative measurement of financial performance, there are a plethora of tools but among all these tools, we have chosen Altman's Z-score. This model of Altman Z-score is proved to be relatively reliable and has a precision to accuracy, since it simultaneously does the multivariate analysis for the prediction of bankruptcy aka the financial distress (Khaddafi, 2017). The main focus of this study is to find financial distress in the banks of Bangladesh as well as understand the financial performance of the banks over the time. Hence, to reach this focus, the Altman model is chosen to get the best result. It is also highly utilitarian for our study as Altman Z-score works the prime when the financial statements are not manipulated (MacCarthy, 2017).

The issues of financial distress and bankruptcy can be diverse. But the shrinkage of assets can easily bring the goodwill of the bank down and the loss due to it can be a deadweight. As such it is always important to avoid taking liquidity risks as much as possible. In this paper, we have tried to find out the reasons behind the financial distress and for that different variable taken in the Altman Z-score model include capital adequacy ratio, age of the bank, non-performing loans etc. It is expected that this model would give an 80%-90% accuracy to the outcome of detecting financial distress of the banks.

**1.1 Objectives of the study:**

The purpose of this paper is to investigate the impact of bank specific factors on the bankruptcy risk of the banks, as measured by Altman Z-score. The specific objectives are as follows:

1. To measure the Z-score of the banks to check the possibility of bankruptcy.
2. To find the relationship between bankruptcy risk and the selected variables.
3. To test the impact of bank specific factors on the Z-score and if these impacts are statistically significant.

## 2. Literature review and hypothesis development

Bankruptcy is regarded as the end point of any organization, where liquidation is the subsequent action that eliminates the entity itself. Financial distress builds up over the years and can be easily misinterpreted by organizations unless specific factors are focused on. Forecasting risk is never an easy task, but rather an invaluable one, that can perhaps provide a way to redirect the path of an organization from bankruptcy to stability. (Abedin, Sen, & Islam, 2018) aimed to investigate the bank specific factors that eventually lead the banks into bankruptcy. The credit spur was used as a steppingstone for the ideation of that paper. The authors used a panel of 29 listed commercial banks of Bangladesh, using data from the period of 2005 to 2015. The Altman Z-score was used as the dependent variable. The reported findings showed that increase in capital adequacy ratio and efficiency in the banking sector protected banks from bankruptcy. The findings contributed to the existing literature, by complimenting previous findings by Laeven & Levine (2009) and Hillman (2014) where they portrayed the correlation between bank risk and several other factors including capital structure which is our concerned variable for this paper.

The Altman Z-score, developed by Altman (1968), has been used extensively as a measure of financial distress, which defines ranged values to determine the relative state of stability or distress of organizations. (Thai et al., 2014) focused on the Altman Z-score model using a Discriminant Analysis with a sample size of 30 companies from Malaysia. The ratio of working capital to total assets was recorded as the most significant variable which can be related to another study done by (Hillman, 2014) where financial ratios were used as indicators of bankruptcy risk for banks and asset size of the bank were prioritized to compare the results. From that point of view, we considered Asset turnover as an indicator of efficiency for banks but however, the relationship is complex and may be influenced by other factors, including leverage, market conditions, and managerial practices. Firms that effectively utilize their assets are better positioned to maintain financial stability, generate sufficient cash flows, and avoid bankruptcy was proven as a general fact from the study. Further studies by Desiyanti, Soedarmono, Chandra, & Kusnadi (2019), using 21 real estate and property companies listed in BEI, studied the effect of financial ratios on Altman Z-score. The findings showed that Return on equity and Working capital ratio have a significant positive impact on Z-score. To understand the financial distress issue beyond just quantitative factors, the findings of Ashari (2005) highlighted the lack of competency and capabilities of the management as factors leading to corporate bankruptcy. It also stated that corporations that have unbalanced capital with total debt owed by corporations are often in the risk of facing corporate bankruptcy. Since the financial distress dues over time and the effects only arises in long term we considered the age of the bank to better grasp the effect of financial structures of banks over time as studied previously by (Succuro & Mannarino, 2013).

Given the latest NPL ratio of Bangladesh after the pandemic period which well over crosses 10%, undoubtedly NPL ratio is an early indicator for the deterioration of a bank's financial health which was studied by (Fukda, Kasuya, & K., 2006) when bankruptcies peaked in Japan in early 2000s which mainly aroused because of the improper disposal of bad loans. The NPL ratio is suited for the banking sector of the Bangladesh since the ratios is rising steadily since the incorporation of the Banking Company Act 1993 and never have seen the downward trend. Our study focuses on incorporating these findings as a base for

developing and testing the relationship between CAR, efficiency, age of banks and non-performing loan and Z-score in Bangladeshi listed Banks. The following hypotheses have been derived in accordance with past findings to check the relationship between the study variables:

**$H_1$**: CAR has a significantly positive impact on bankruptcy.

**$H_2$**: Efficiency has a positive impact on bankruptcy.

**$H_3$**: Age of the banks has a positive impact on bankruptcy.

**$H_4$**: Non-performing loan has a negative relationship with bankruptcy.

## 3. Research Methodology

This part describes the research methodology for this study and sample selection, selection of the period, source of the data, research variables, data analysis technique and model development.

### 3.1 Sample Selection:

For this research, 30 listed banks from the Banking sector of Dhaka Stock Exchange (DSE) were selected.

### 3.2 Selection of the Period:

The study period is selected to be from the year 2014 to the year 2020. This period has been selected to ensure the latest 6-years data can be analyzed to understand the likelihood of financial distress in the banking sector of Bangladesh

### 3.3 Source of the Data:

This paper used secondary data. The required data was collected from the annual reports of the respective banks. All necessary quantitative data was successfully obtained from the annual reports. The theoretical background was developed by studying past research, obtained from various journals. The journals were collected from Google Scholar.

### 3.4 Techniques used for data analysis

To test our hypotheses a few statistical analyses have been employed on this paper. To check the relationship between our selected variables a Pearson Correlation test will be carried out followed by a fixed effect panel regression model and random effect panel regression to assess the significance. The acceptance of the models will be determined by Hausman Specification Test. Statistical software STATA has been used to analyze the data using correlation and fixed-effects and random-effects regression.

### 3.5 Research Models & Variables:

To accomplish the objectives of this paper, the Altman Z-score Altman (1968) was established as the dependent variable. The Altman Z-score for the companies has been calculated using the mentioned model:

$$\mathbf{Z_C = 6.56[\frac{WC}{TA}] + 3.26[\frac{RE}{TA}] + 6.72[\frac{EBIT}{TA}] + 1.05\ [\frac{MVE}{BTL}]\ (Equation\ -1)}$$

The Z-score has a pre-defined range which is used to differentiate between different levels of financial distress in a company. This paper adopts the range from the work of Abedin et al. (2018), and as per this paper, a $Z_C > 2.6$ represents Safe zone, while a score within the range of $1.1<Z_C<2.6$ represents Grey Zone, and finally a score of $Z_C < 1.1$ represents Distress Zone.

Here, Safe Zone means that the bank has no chance of entering into bankruptcy. Grey Zone means that the

bank has a possibility to head towards bankruptcy. The Distress Zone indicates that the bank is headed towards bankruptcy.

The regression model, as demonstrated below, has been developed and was used to assess the relationship between the selected variables and the Altman Z-score. Table describes the variables. The following general multiple regression model specification was used:

$$Z_{Cit} = \beta_0 + \beta_1 CAR_{it} + \beta_2 AGE_{it} + \beta_3 NPLR_{it} + \beta_4 EFF_{it} + E_{it} \textbf{ (Equation -2)}$$

Where: [ "i" represents the time period (2015,2016…….2020). CAR indicates Capital Adequacy Ratio, AGE represents Age, NPLR represents Non-performing Loan Ratio, EFF represents Efficiency]

**Table-1: Description of Variables**

| Abbreviated Name | Full name | Description of the variable | Predicted sign | Data source | References |
|---|---|---|---|---|---|
| $Z_C$ (Dependent) | Altman Z-score | Formula used to calculate the measure of Z-score. | | | |
| CAR | Capital Adequacy Ratio | How much capital bank has available, as a percentage of banks risk-weighted assets. | + | Annual Reports | (Laeven & Levine, 2009) (Abedin, Sen, & Islam, 2018) |
| AGE | Age of the bank | The time period from the inception of the bank till present date. | - | Annual Reports | (Succuro & Mannarino, 2013) |
| NPLR | Non-performing loan ratio | The amount of loan that is classified and has not been paid within due date. | - | Annual Reports | (Fukda, Kasuya, & K., 2006) |
| EFF | Efficiency | The Asset Turnover has been used as a proxy. | + | Annual Reports | (Hillman, 2014) |
| E | Random Error | | | | |
| $_{it}$ | Item ($_i$) for Period ($_t$) | | | | |

## 4. Theoretical Discussion

The banking sector plays a pivotal role in the sound working of an economy. This sector is often credited to be the driving force of economic development. This makes any issues related to financial distress that much more significant. Bangladesh is a developing nation. Currently, there are 61 scheduled banks in Bangladesh, with 32 listed banks in the Dhaka Stock Exchange. The Banking sector of Bangladesh has

seen a rise in participants over the years. However, the increasing amount of non-performing loans has been a source of constant worry in the country. The loan defaults, manipulation in the financial reporting practices, manipulation of financial performance has created a chronic disease in the financial sector of Bangladesh (Abedin, Sen, & Islam 2018). This increase in NPL is only one factor highlighting the increasing chances of heading towards bankruptcy. If the banks are separated based on their classification, as per Bangladesh Bank's annual financial stability report 2020, State-owned commercial banks displayed high levels of NPL consistently in the last 6 years. Even though the ratio decreased by 2.1% in 2020, it was still quite high. Bangladesh Bank has recommended bringing down the gross non-performing loan level to maintain financial stability. Gross NPL in 2020 was recorded to be BDT 882.8 billion (BB, Annual financial stability report-2020). Though the CRAR remain the same, the Tier-1 capital ratio, the core component of CRAR, of the banking sector declined marginally at end-December 2020 as the net income of the banking sector declined compared to previous year. Though decreased to 7.4 percent from 7.7 percent at end-December 2019. Especially the state-owned commercial banks and the specialized development banks showed a deteriorated capital position which was actually below the minimum regulatory standard. This information prompted the authors of this paper to investigate the likelihood of the banks heading to financial distress in the near future. The Altman Z-score, hence, has been used in accordance with past study to form the base of this study. The next page containing the table shows the year-by-year average Z-score and CAR for the study period-

**Table-2: Average Z-score and Average CAR**

| | Average Z-score | Average CAR |
|---|---|---|
| 2014 | 0.86 | 11.81 |
| 2015 | 0.78 | 11.96 |
| 2016 | 0.83 | 12.13 |
| 2017 | 0.84 | 12.31 |
| 2018 | 0.62 | 12.90 |
| 2019 | 0.44 | 13.64 |
| 2020 | 0.30 | 13.87 |

## 5. Findings and Analysis

### 5.1 Descriptive Statistics of the model variables

**Table-3: Descriptive Statistics**

| Name of variables | Mean | Standard Deviation |
|---|---|---|
| Altman Z-score | 0.6697677 | 3.459656 |
| CAR | 12.66438 | 23.37103 |
| EFF | 0.031617 | 0.026758 |
| AGE | 26.5 | 11.23616 |

| | | |
|---|---|---|
| NPLR | 9.97942 | 0.50580 |

The mean and standard deviation of the study variables has been calculated. The mean value of the Altman Z-score is obtained to be 0.6697677, with a deviation of 3.459656. The standard deviation is high. The average Z-score is less than 1.1, indicating that the banks are in the distress zone. The Capital adequacy ratio (CAR) has an observed mean value of 12.66438, with the highest variation among the variables. The variation in CAR is 23.37103. Efficiency has a mean value of 0.0316172 and a deviation of 0.0267588, which is the lowest variation recorded among the observed variables. The average age of the sample is 26.5 years, with a deviation of 11.23616. Non-performing loan ratio (NPLR) showed an average value of 9.979429 with a deviation of 0.5058014. It can be stated that 3 of the variables have shown very little deviation, which provides a good indicator that the data used in the study has very low number of anomalous values.

**5.2 Pearson Correlation:**

**Table-4: Correlation between the study variables**

| | z-score | CAR | EFF | AGE | NPLR |
|---|---|---|---|---|---|
| z-score | 1.0000 | | | | |
| CAR | 0.3225*** | 1.0000 | | | |
| EFF | -0.1520** | 0.0527 | 1.0000 | | |
| AGE | -0.1246* | -0.1515** | -0.0345 | 1.0000 | |
| NPLR | -0.0651 | 0.0236 | -0.0152 | -0.0811 | 1.0000 |

Note: *** significance at 1% level, ** significance at 5% level, * significance at 10% level

The Pearson correlation has been run to check for the direction of the relationship among the variables. Z-score has a positive correlation with Capital adequacy ratio (CAR) with coefficient of (0.3225) at 1% significance level. These variables are showing a positive relationship, as prior studies by Laeven & Levine (2009) recorded. Efficiency has shown a negative relationship with Z-score having a coefficient of (-0.1520), recording a negative correlation, at 5% significance level. Age showed a negative correlation (-0.1246) with Z-score, at 10% significance level that may conclude that the age of a bank is not related with the possibility of facing financial distress. Capital adequacy ratio has a positive relationship with the efficiency (0.0527) but it doesn't show any significance. But however, it demonstrates a negative relationship with age (-0.1515) at a 5% significance level which may indicate that a bank's operation time is not significantly related to its capital adequacy ratio. CAR has a positive relation with NPLR having a coefficient of (0.0236) with no significance level. Efficiency has negative correlation with both age (-0.0345) and NPLR (-0.0152) with no significance level. Bank's age also has a negative correlation with NPLR (-0.0811).

**5.3 Discussion:**

The analysis in this paper has been carried out on data set of 30 banks. If pooled regression is carried out, it will neglect the cross-section and time series nature of the data. Hence, to consider the heterogeneity

(individuality) that may exist among the 30 companies, Fixed effect and Random effect regression has been carried out, followed by a Hausman specification test to determine which model is appropriate for this study. The Hausman test has been run with the following hypothesis:

**$H_0$:** Random-effects model is appropriate.

**$H_1$:** Fixed-effects model is appropriate.

The following table presents the test results for the Hausman specification test:

**Table-5: Hausman specification test**

| | | | |
|---|---|---|---|
| | Test: | Ho: | difference in |
| | chi2(4) = | (b-B)'[(V_b-V_B)^(-1)](b-B) | |
| | = | 1.48 | |
| | Prob>chi2 = | **0.8300** | |

Evident from the table, the chi2 value is greater than 5% (0.8300). This means that we can accept the null hypothesis. Hence, Random-effects model is determined to be the appropriate model for this analysis.

**Table-6: Random-effects GLS regression**

| | | | |
|---|---|---|---|
| | | Number of Obs. | 210 |
| | | Wald chi2(4) | 16.03 |
| | | Prob>chi2 | 0.0030 |
| z-score | Coef. | P>\|z\| | |
| car | 0.0396436 | 0.022 | |
| efficiency | -5.476774 | 0.398 | |
| age | -0.0694192 | 0.017 | |
| Npl ratio | -0.35062 | 0.122 | |
| _cons | 6.008017 | 0.009 | |

From the Random-effect regression model, it is observed that the chi2 value is 0.003, which is less than 5 percent. So, we can say that this model is reasonably fit for our data. From the table, it is seen that capital adequacy ratio (CAR) has a positive and significant relationship with the Z score model. Hypothesis 1 stated that the capital adequacy ratio has a significantly positive impact on bankruptcy. So, hypothesis 1 is accepted. This finding is consistent with the findings of Laeven & Levine (2009) and Hillman (2014) found that CAR has a significant positive impact on the bankruptcy risk.

Hypothesis 2 stated that the efficiency has a positive relationship with Z-score. The results from the table shows a negative relationship between the efficiency and Z-score, which is not significant as shown by the p-value. So, hypothesis 2 is rejected. The finding is inconsistent with the findings of Abedin et al. (2018) and Hillman (2014).

Hypothesis 3 stated that there is a significant negative relationship between company age and bankruptcy risk as measured by Z-score. The result also shows that company age has a negative and significant

relationship with Z-score. This finding is complimenting the finding of Succuro & Mannarino (2013), in which the authors also found significant negative impact of company age on bankruptcy risk. So, hypothesis 3 is accepted. Based on the findings of this paper, increase in age leads to a decrease in Altman Z-score.

Hypothesis 4 stated that there is a statistically significant negative relationship between non-performing loan ratio and Z-score. The table shows a negative relationship between non-performing loan ration and Z-score. However, the relationship is not statistically significant, showing a significance level of 12.2% (p-value). So, hypothesis 4 is rejected. While NPL ratio is seen to have shown the expected negative relationship with bankruptcy risk, which aligns with the findings of Fukda, Kasuya, & K. (2006), the relationship is not found to be statistically significant in this paper.

## 6. Conclusion

This paper focused on the banking sector of Bangladesh. The theoretical background was developed to understand and implement the Altman Z-score model on this sector. Using data from 2014 to 2020, bank specific factors were analyzed to determine the possibility of financial distress in the banking sector. In the last decade, and indeed in the last 5 years, the banking sector of Bangladesh continued to report increasing figures of non-performing loans. This poses the serious question of whether the banks will be able to continue as a going concern and does these banks have a possibility of going bankrupt. Six years of Z-score was calculated for each of the 30 banks, and the average Z-score was determined to be 0.0788. Using statistical tools, Pearson correlation and Random-effects regression was run to determine the impact of Bank specific factors on the Z-score. Based on the findings of this paper, Capital adequacy ratio was seen to have statistically significant relationship with bankruptcy risk, consistent with the findings of Hillman (2014) & Laeven & Levine (2009). The purpose of maintaining a good CAR is to ensure that banks have enough capital on reserve to handle a certain number of losses, to avoid bankruptcy. The significant relationship between CAR and Z-score is a clear indication that banks need to pay special attention to maintain a high amount of CAR, which can help avoid heading towards bankruptcy. The average Z-score of the listed banks studied in this paper has been in the distress zone in all 6 years examined. This is a very bad indicator that the banks in Bangladesh are in grave danger of facing insolvency in the long run. Age of the banks has shown negative relationship with Z-score. NPL ratio has shown a negative relationship with Z-score. This means that the banks should try to maintain lower levels of non-performing loans. NPL is never a good sign, as it highlights many significant issues such as poor credit analysis by banks, poor follow up practices, as well as poor decision making in distributing loans. NPL has been a constant problem for the banking sector of Bangladesh, for more than a decade now. As per Bangladesh Bank Annual Financial stability report 2020, NPL ratios remained high in 2020, carrying on the high NPL trend from the past 6 years. For the depositors of the banks, it will be well-advised to consider the capital adequacy ratio, age, and non-performing loan ratio in mind before depositing their funds. Although non-performing loan is relatively high in all banks in Bangladesh, in the last quarter of 2020, the ratio did decline due to extensive policies and effort put in by Bangladesh Bank. The depositors

are likely to find the results of this study quite useful.

*6.1 Limitations and Future Scopes:*

Research work is often subject to certain limitations, which may somewhat change the possible outcomes obtained. This paper is no different to this view and as such, did face some limitations. The sample size selected from 2014 to 2020 can be further expanded to include more years, which can improve the precision of the obtained results. The authors of this paper used the latest 6 years of data, but this leaves room to expand the sample size. The main limitation was that this paper did not include the cash flow variables (Free cash flow, Operating cash flows) of the banks, which can be integrated into the study, to get more insight into what other factors affect the bankruptcy risk. A more insightful study can be carried out with the stated points. Management of banks can also find this literature useful.

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