

# Prediction of Bankruptcy of a Bank through Z- Score Model – A Case Study of Yes Bank

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## ABSTRACT

**Investors,  
Performance,  
Bankruptcy, Credit  
rating, Z-score,  
Business failure,  
Promoters,  
Banking, Long  
term debt  
programme,  
financial  
inclusiveness**

From about fifty years the Z score formula has been constantly used for prediction of Bankruptcy. The main reason of prediction is to evaluate the terms of credit and ensure safely to investors and lenders. Altman's Z score has been used as a tool to evaluate the credibility of the firms. This paper tries to evaluate the performance of Yes Bank by calculating the Z-score from 2014 till 2019 and thereby find out if bankruptcy could be predicted. It is found from the study that the Z- score formula alone fails to predict the bankruptcy in this case. The Yes Bank incorporated in the year 2003 was one of the leading private sector banks. Due to various internal reasons and unscientific lending practices the bank had to face major crisis.

## Introduction

The scenario of business today is very uncertain. It takes away the confidence of the investors. Perhaps to be sure of the longevity of the firm becomes the prime issue of concern by all the business houses. The viability of banks holds prime importance as it relates to financial investments, funding, capacity building and expansion by ploughing back profits. One of the top performing private banks that is Yes Bank went into unexpected distress, which was a shock to all the stakeholders. Z score has been used as a tool to evaluate the credibility of the firms. This paper tries to find out if the distress situation faced by Yes Bank could be predicted earlier assessed by Z-score model. The model is used by researchers and practitioners throughout the world. This has been a very

important parameter to both the lenders and investors whose decision is based on solvency estimates. The credit rating agencies also have played a major part in terms of credit rating. In modern day scenario one parameter alone is not enough to know the performance of a company.

## Objectives of the study

1. To calculate the z-score for Yes Bank from 2014-15 to 2018-19
2. To analyse the financial performance of Yes Bank for a period of 6 years
3. To predict the possibility of bankruptcy using z score formula

## Methodology of The Study

This paper uses only secondary data from various literature in order to give a background description and supporting description.



Secondary data for the purpose of analysis from [www.moneycontrol.com](http://www.moneycontrol.com), CMIE database and website of Reserve Bank of India. Data is also taken from the official websites of the Yes Bank. The basic ratios are formulated from details mentioned in published statements like balance sheet, cash flow statements, yearly details of banks, profit and loss statements obtained from the above sources. Internal parameters needed for the formula of Z score are also calculated from the ratios.

This research work uses financial data for last 6 years that is from 2014 to 2019.

- Credit Rating in India

In an ideal world, everyone would have sufficient money to take care of their needs. However, facing the reality, most of them have no other option but to take credit to meet our life goals, especially when they need large amount like buying car, home, etc. To make borrowing money from bank easier and safer, it is important to have a good credit history which is determined by credit score and credit rating.

- Importance of Credit Rating

For the money lenders it helps in better investment decision. No bank or money lending companies would like to give money to a risky customer. With credit rating, they get to know about the credit worthiness of an individual or company and also the risk factor attached with them. By evaluating the credit rating, they can make better investment decisions. High credit rating also means an assurance about the safety of the money and that it will be paid back with interest on time.

To discuss in the borrowers point of view, they will get loan approval easily. With high credit rating, the company will be seen as low or no risk customer. Therefore, banks will approve

your loan application easily. Every bank offers loan at a particular range of interest rates. One of the major factors that determine the rate of interest on the loan taken is the credit history. Higher the credit rating, lower will the rate of interest.

Every credit rating agency has their own system to evaluate the credit rating of the clients. The major factors are credit history, credit type, credit duration, credit utilization, credit exposure and many more. On a regular basis, these credit rating agencies collect credit information from partner banks and other financial institutions. Once the request for credit rating has been made, these agencies hunt for information and prepare a report based on such factors. Based on that report, they grade every individual or company and give them a credit rating. This rating is used by banks, financial institutions and investors to make a decision of investing money, buying bonds or giving loan or credit card. The better is the rating, more are the chances of getting money at payable interest rates.

- Credit Rating Agencies of India

#### CRISIL

Credit Rating Information Services of India Limited (CRISIL) is the first credit rating agency of India which was established in 1987. It calculates the credit worthiness of companies based on their strengths, market share, market reputation and the board. It also rates companies, banks and organizations, helping investors to take a better decision before investing in company's bonds. It offers 8 types of credit rating which are as follows:

- AAA, AA, A means good
- BBB, BB means average
- B, C, D means low

#### ICRA

Investment Information and Credit Rating

Agency of India (ICRA) was formed in 1991. Its headquarter is in Mumbai. It offers comprehensive ratings to corporates through a transparent rating system. Its rating system includes symbols which vary with the financial instruments.

#### CARE

Credit Analysis and Research Limited (CARE) offers a range of credit rating services in areas like bank loan, corporate governance, debt, recovery, financial sector etc. Its rating scale includes two categories – long term debt instruments and short-term debt ratings.

#### ONICRA

Onida Individual Credit Rating Agency of India (ONICRA) which established in 1993 offers credit assessment and credit scoring services to both individuals and businesses. It offers risk assessment reports to individuals, small and medium businesses and corporates.

#### SMERA

Small Medium Enterprises Rating Agency Of India Limited (SMERA) has two divisions one is SME Ratings and other is Bond Ratings. It was established in 2011 with a hub of financial professionals. It offers credit ratings in the following format:

- AAA, AA, A means Low Risk
- BBB, BB means Moderate Risk
- B, C means High Risk
- D means Defaulted

#### Brickwork Ratings India Private Limited

The headquarter of BRIP Ltd is in Bangalore. This credit rating agency is responsible to rate bank loans, municipal corporation, capital market instrument and small and medium enterprises. It also grades real estate investments, hospitals, NGOs, MFI, etc.

- Altman's Z-score model:

Amongst many credit rating methods Altman's Z-score is one. Altman developed the Z-score formula, which he published in 1968. The Z-score for predicting Bankruptcy is a multivariate formula for a measurement of the financial health of a company and a powerful diagnostic tool that forecasts the probability of a company entering bankruptcy within a 2year period. Studies measuring the effectiveness of the Z-score have shown that the model has 70%-80% reliability. The Z score analysis of Yes Bank is the main aspect studied in this paper.

In general analysis, the lower the z-score, the higher risk of bankruptcy a company has, vice versa. There are three formulas for different types of companies. The formula is used for banks is as follows.

Z-Score Bankruptcy Model:

$$Z = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$$

Zones of Discrimination:

$Z > 2.6$  - This "Safe" Zone

$1.1 < Z < 2.6$  - This is "Grey" Zone (Here bankruptcy cannot be predicted)

$Z < 1.1$  - This is Bankruptcy Zone

$X_1 = (\text{Current Assets} - \text{Current Liabilities}) / \text{Total Assets}$

$X_2 = \text{Retained Earnings} / \text{Total Assets}$

$X_3 = \text{Earnings before Interest and Taxes} / \text{Total Assets}$

$X_4 = \text{Book Value of Equity} / \text{Total Liabilities}$

- Limitations of Altman's Z-score model

The formula is not suited for many industries. Many regulated utilities showed up as having high bankruptcy risk.

Altman Z was not industry specific enough to my liking. For example, low or negative working capital doesn't give a satisfactory z-score but some industries can operate with zero or negative working capital. For example, hotel or a restaurant gets paid in cash, but their suppliers will generally give them net 30 on their payables and the inventory (food) turns over very quickly.

Altman Z-score model doesn't analyse is the financial sector also. In a bank what does "sales" mean? Financials usually are highly levered and their operating risks and exposures are not well disclosed.

## Literature Review

1) Chakravarthy, (1986) defends that z-score(Altman, 1968) is a "composite measure of profitability, cash flow, slack, and stock market factors. High Z scores indicate strong financial health while low scores indicate financial distress

2) Dimitras, Koksal, and Kale (2006) pointed out that after 30 years of research on this topic, he arrives at a conclusion that there is no generally accepted model for business failure prediction that has its base in a causal specification of underlying economic determinants. Due to the confusing variety and restrictive assumptions underlying these classic statistical models, there is a need to diversify into alternative methods. Most of the prior empirical studies of failure have concentrated almost exclusively on financial ratio data.

3) Ferrier et al., in 2002 says that Altman's Z – score formula has also been used to explore the possibility of bankruptcy in hospitals. The study using hospitals revealed that both discriminant analysis and logistic regression models are able to predict service organizations' success or failure, with the latter being more predictive in a

sample of 65 hospitals (Al-Sulaiti, & Almwajeh, 2007). Liquidity and profitability ratios had the highest contribution to the results of the Z-score, followed by productivity and efficiency.

4) In 2007, Kim studied the robustness of the Altman's Z-Score model under the assumption that it was no longer significant due to market factors. Kim found that the Z-Score seems to be a predictor of financial distress in firms one year prior to bankruptcy, but that the calculations needed to be used with caution because of the significance of some of the variables. Kim cautions that Z-Score predictions for periods longer than one year have lost their significance.

5) O'Leary (2001) analyses that prediction of bankruptcy is one of the most important business decision-making problems affecting the entire future of a business, failure results in a high cost to the all the stake holders like collaborators, society and the country as a whole. Over the last 35 years, the topic of prediction of failure of a company has been a major research domain in corporate finance. Academic researchers all over the world have been developing a number of corporate failure prediction models, based on various research on modeling techniques. Till today, a clear picture of the application of alternative methods in corporate failure prediction is still not arrived at. Researches have again and again proved that most business failure is caused by poor or inexperienced management styles, fraud, and rapid technological changes amongst other variables. Financial failure may take the form of bankruptcy, insolvency or restructuring.

Sharma and Mahajan in 1980 emphasize that not only do failure prediction models help determine the causes of business collapse, but that they can also be used to develop techniques to assist in avoiding future failures. They also noted that business failure tends are caused by ineffective or poor management, and errors in

or the implementation of, strategic plans. Business collapses can be avoided if corrective action is taken, and it is effective in treating the cause of the pending failure. However, if the corrective action is ineffective, failure is inevitable.

## Background of the Study

- Background of Yes Bank

Yes Bank Ltd was incorporated on 21st November 2003. The bank was found by Rana Kapoor. It obtained the certificate of commencement of business on 21st January 2004. Yes Bank Ltd is providing a range of banking and financial services. The Bank started operating in four segments that is Treasury, Corporate / Wholesale Banking, Retail Banking and Other Banking Operations. The Other Banking Operations segment includes para banking activities such as third-party product distribution and merchant banking.

In June 2005 the bank came out with public issue and the shares of the bank were listed on the stock exchanges. In December 2005 Yes Bank bagged Corporate Dossier award from Economic Times. In the year 2006, Yes Bank received Financial Express Awards for India's Best Banks. In April 2007 Yes Bank made a tie-up with the Agriculture Insurance Company of India (AIC). Yes Bank was ranked as the No 1 Emerging Markets Sustainable Bank of the Year - Asia at the FT/IFC Washington Sustainable Banking Awards 2008 in London. Yes Bank was ranked as the No 1 Bank in the Business Today - KPMG Best Banks Annual Survey 2008. On 15th September 2014 the Bank announced that it has received ratings upgrade from credit rating agency ICRA for its various long term debt programmes. The ratings also factor in the highly successful recent equity mobilization of USD 500 million by Yes Bank that further strengthens its capitalization profile.

In the year 2014 Yes Bank announced that it has received ratings upgrade from credit rating agency CARE for its lower Tier II, upper Tier II and perpetual bonds. After this the bank successfully raised Rs 4906.65 crore from issue of 3.27 crore shares at the issue price of Rs 1500 per share.

The Board of Directors of the bank approved a sub-division of equity shares from 1 equity share of Rs 10 each into 5 equity shares of Rs 2 each in the year 2017. On 21st November 2017 Yes Bank announced that it has raised USD 400 million through two syndicated loan transactions in Taiwan and Japan comprising USD 250 million from Taiwanese banks and JPY 16.5 billion from Japan. On 23rd November 2017 Yes Bank announced that it has been included in the MSCI All Country World Index (ACWI) - ESG Leaders Index and MSCI ACWI SRI Index. This makes the bank the first and only Indian bank to be part of the three global ESG benchmark indices - MSCI ESG/SRI DJSI and FTSE4 Good in 2017. In the end of 2017 Yes Bank made its entry in the 30-share S&P BSE Sensex. On 19th December 2017 Yes Bank announced that expansion of renewable energy power generation across India will be supported by a new USD 400 million joint initiative backed by the European Investment Bank and Yes Bank. In the beginning of 2018 Yes Bank signed a solar energy co-financing Letters of Intent (LoI) with Tata Power Delhi Distribution Limited, Hero Future Energy, Greenko Group, Amplus Solar, and Jakson Group for their solar projects in India.

- Evolution of private banks in India

In the last two decades, the Reserve Bank of India licensed 12 banks in the private sector. This happened in two phases. Ten banks were given license on the basis of guidelines issued in the month of January 1993. The guidelines were revised in January 2001 based on the experience

and feedback gained from the functioning of the bank for which license was already issued. Later fresh applications were invited. The applications received after invitation comprised of a High Level Advisory Committee constituted by the RBI, and two more licences were issued. The Union Finance Minister had made an announcement in the budget speech for 2010-11 that the RBI was considering to issue some additional banking licences to private sector players. After the announcement in the budget presentation, the RBI put out a Discussion Paper on its website on August 11, 2010 inviting feedback from the stakeholders. This attracted good number of comments from the general public, consultants, existing banks, industrial, business houses, NBFCs, Micro Finance Institutions etc. The summary of these comments and discussions was published on the RBI's website by the end of 2010.

The draft guidelines on 'Licensing of New Banks in the Private Sector' was framed taking into consideration the experience gained from the functioning of these banks and also based on the feedback and suggestions received in response which was on the RBI website. Once again the draft guidelines were placed on the RBI's website in the month of August, 2011 for feedback and suggestions. Accordingly, the RBI came out with an overall policy discussion paper on banking structure in India within two months.

By the year ending March 2009, there were 27

public sector banks, 7 new private sector banks, 15 old private sector banks, 31 foreign banks, 86 Regional Rural Banks, 4 Local Area Banks, 1,721 urban co-operative banks, 31 state co-operative banks and 371 district central co-operative banks in the Indian banking system.

The Indian financial system has done a good job in terms of resource mobilization, geographical and functional reach, financial viability, profitability, competitiveness amongst vast segments of the population. The RBI is considering to provide licences to a limited number of new banks. A larger number of banks would lead to greater competition, and thereby reduce the cost of service and improve the quality of service. Above all, it would promote financial inclusion, and ultimately support inclusive economic growth, which is a key focus of development. 10 new banks were set up in the private sector after the 1993 guidelines and 2 new banks after the 2001 revised guidelines. The experience of the RBI has been that banks promoted by individuals, though banking professionals, either failed or merged with other banks or had muted growth. Only those banks which had adequate experience in broad financial sector, financial resources, trustworthy people, strong and competent managerial support could withstand the rigorous demands of promoting and managing a bank successfully.

### Analysis and Interpretation (Numbers in Millions)

$X_1 = \text{WORKING CAPITAL} / \text{TOTAL ASSETS}$

Year	working capital	total assets	X1
2013-14	812.82	1090.15	0.745603
2014-15	1025.0	1361.70	0.752982
2015-16	1250.1	1652.63	0.756468
2016-17	1642.4	2150.60	0.763715
2017-18	2256.6	3124.45	0.722251
2018-19	2536.9	3808.26	0.666176

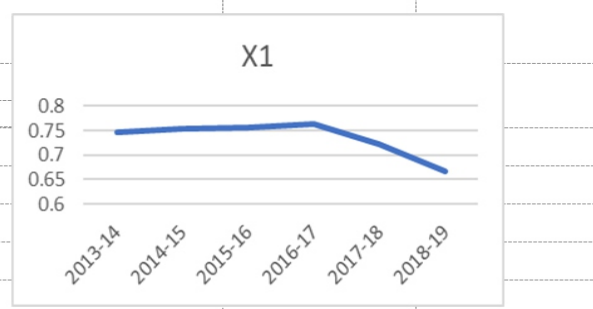


Table and chart 1 : Showing ratio  $X_1$  for the period 2013-4 to 2018-19

This ratio measure the net liquid asset relative to the total assets. The working capital to total assets ratio of the bank has been very high during The study period which is a good aspect

for a bank. It is observed from the above chart that after 2017 onwards it has started to decline because of the disproportionate increase of working capital and total assets.

### $X_2 = \text{RETAINED WARNINGS} / \text{TOTAL ASSETS}$

Year	retained earnings	total assets	X2
2013-14	67.611	1090.2	0.06202
2014-15	112.622	1361.7	0.082707
2015-16	133.661	1652.6	0.080878
2016-17	215.976	2150.6	0.100426
2017-18	252.977	3124.5	0.080967
2018-19	264.412	3808.3	0.069431

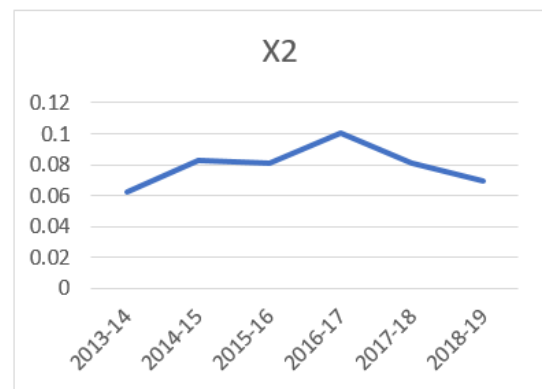


Table and chart 2: Showing ratio  $X_2$  for the period 2013-4 to 2018-19

It measures the financial leverage of the company. The line chart of the ratio between retained earnings and total assets shows a

fluctuating trend during the study period. The retained earnings have increased over the years. This could be because of the necessity of capital.

### $X_3 = \text{EBIT} / \text{TOTAL ASSETS}$

Year	EBIT	total assets	X3
2013-14	26.880	1090.2	0.024657
2014-15	32.496	1361.7	0.023864
2015-16	43.025	1652.6	0.026034
2016-17	58.375	2150.6	0.027144
2017-18	-9.685	3124.5	-0.0031
2018-19	-28.561	3808.3	-0.0075

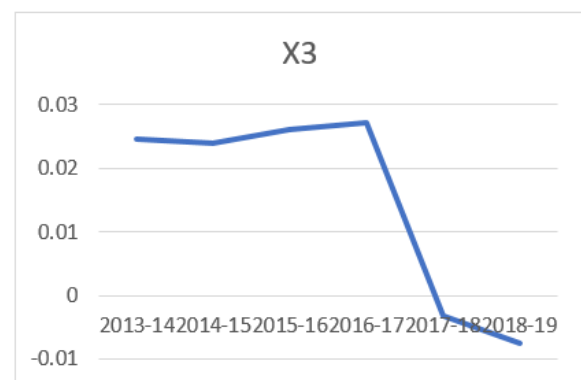


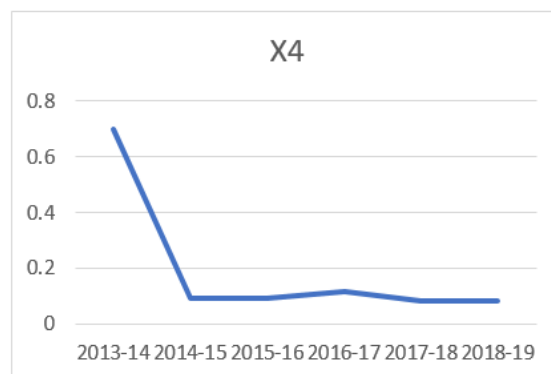
Table and chart 3: Showing ratio  $X_3$  for the period 2013-4 to 2018-19

The ratio between EBIT and Total assets has steeply decreased from 2017. This is because of the decrease in operating profit from the financial year 2017-18 onwards. This shows some suspicion in the operations of the bank.

Till then the profit was in a continuously increasing direction. This could be because of the unscientific lending practice of the bank which made it fall in the successive year.

$$X_4 = \text{MARKET VALUE OF EQUITY} / \text{BOOK VALUE OF LIABILITIES}$$

Year	Value of equity	total liabilities	X <sub>4</sub>
2013-14	712.17	1018.9	0.698932
2014-15	116.80	1244.9	0.093822
2015-16	137.87	1514.7	0.091017
2016-17	220.54	1930.0	0.114266
2017-18	220.54	2650.9	0.083193
2018-19	269.04	3274.8	0.082155

Table and chart 4: Showing ratio X<sub>4</sub> for the period 2013-4 to 2018-19

The value of equity was very high before 2014. It dropped all of a sudden in 2014-15 hence forth was able to sustain slowly till the financial year

2018-19. This never showed any signs of the bad times ahead for the bank. The rest is now history.

$$Z\text{-SCORE} = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$$

Year	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	Z score
2013-14	0.74560316	0.06201952	0.024657	0.698932	5.992913754
2014-15	0.752982141	0.08270725	0.023864	0.093822	5.468070077
2015-16	0.756468303	0.08087755	0.026034	0.091017	5.496611131
2016-17	0.76371459	0.1004258	0.027144	0.114266	5.639740724
2017-18	0.722250625	0.0809667	-0.0031	0.083193	5.068436543
2018-19	0.66617632	0.06943113	-0.0075	0.082155	4.632324944

Table 5: Showing ratio Z-score value for the period 2013-4 to 2018-19

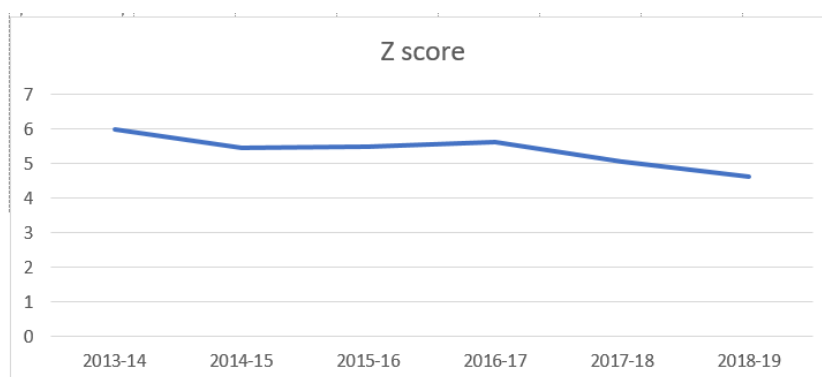


Chart 5: Showing Z-score value for the period 2013-4 to 2018-19



The z score for a bank above 2.6 shows a good sign. Even though the score was continuously dropping during the study period, it never dropped below 2.6. This shows no signs of bankruptcy. Out of the 6 bankrupt companies tested during developing the model only 1 of

success was achieved. Yes Bank z score remained high up to the previous year of its going into bankruptcy. A very risky condition for an investor as well as other stakeholders to depend on.

## One Sample T-Test

One Sample T-Test

		stat	df	p	Mean difference	95% Confidence Interval	
						Lower	Upper
A	Student's t	27.9	5.00	< .001	5.38	4.89	5.88
	Wilcoxon W	21.0		0.031	5.47	4.63	5.99

Descriptives

	N	Mean	Median	SD	SE
A	6	5.38	5.48	0.473	0.193

The mean of the z score was found to be 5.38 and standard deviation is 0.473. This shows that the bank had maintained the z score above 2.6 which shows good performance. The z score of the

The mean of the z score was found to be 5.38 and standard deviation is 0.473. This shows that the bank had maintained the z score above 2.6 which shows good performance. The z score of the bank failed to predict the movement of the bank towards bankruptcy. t-test and Wilcoxon test were performed to get the mean difference of 5.38. The test was performed at 95% confidence interval and found that the p value is less than 0.001 which shows very high significance level.

A Business Today report says that of around Rs 35,000 crore of stressed loans, most of the lending's were done in post-2008 period. The bank gave loans to companies which were literally struggling in their businesses. These companies included the Anil Ambani Group of Companies, the Essel Group, the Dewan

Housing Finance Corporation Ltd (DHFL) and Infrastructure Leasing and Financial Services (IL&FS). Of these DHFL and IL&FS have collapsed and taken over by the government for financial restructuring. By the time dispute between the promoters settled, the bank had already started heading towards distress. But nothing was depicted in the balance sheet. The bank had the strongest growth in loans to potentially stressed companies. The UBS downgraded Yes Bank's stock to sell as the company was heading to doom. Instead of plugging the loopholes, Rana Kapoor-headed bank moved the Securities and Exchange Board of India (SEBI) against the UBS. Following the collapse of IL&FS in 2018, Yes Bank had no means to recover. But the problem with the bank was that it was not ready to admit its problems and under reported its stressed loans. This is the

reason why z-score couldn't predict any danger.

### Suggestions

The study reveals as already mentioned in the paper that z-score is not very effective in case of financial sector. Therefore there is scope for scholars to conduct further research in this area. The frauds can usually be detected only in case of honest auditing and transparency. The stakeholders need to be more vigilant with regards to the performance of the company. For this the RBI also need to bring out stringent guidelines in order to safeguard the interest and confidence of the investors.

### Conclusion

The Z-score failed to predict the banks movement towards distress even in the previous year. The actual reason for the banks performance was the internal fight between the promoters also the aggressive lending policy of the bank.

With the intervention of the RBI, it is now known, that the Yes Bank has been passing through a tough period for a long time. In August 2018, the RBI asked the then chief executive Rana Kapoor to quit the bank by 31st January 2019 when it emerged that he could be the real problem of banking governance and source of bad loan practices. After a brief intermediary period, the RBI appointed Ravneet Gill as the chief executive of the bank. Ravneet Gill later disclosed that there had been large under-reported stressed assets in Yes Bank. As a result, the Yes Bank reported its maiden loss in March 2019 quarter.

The bank's co-founder Rana Kapoor sold his entire stake in the bank in November 2019, when the Yes Bank had turned completely unbankable. Rana Kapoor is now in the custody of the Enforcement Directorate (ED) on charges of

money laundering in connection with a case, registered by the CBI, in the Yes Bank scam. The case is about an alleged bribe of Rs 600 crore by the DHFL. Since none of these were reflected in the balance sheets till 2018, z-score model failed to predict the bankruptcy. This model is effective only in case there is 100% transparency in accounting methods. It cannot identify frauds.

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