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PREDICTION OF BANKRUPTCY AMONG PRIVATE AND PUBLIC BANKS IN INDIA

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ABSTRACT

Edward I. Altman is the mastermind behind the Z-score models to predict bankruptcy. It was in 1983 that Altman changed the univariate model to the Z-Score model with the support of Multiple-discriminant analysis (MDA). This research tests the financial ratios for the past 3 years of top 5 private and public sector banks in India, to predict bankruptcy with Altman's model. The study discovers banks to be pigeonholed to grey or distress zoned and further observed that private banks outweigh public banks.

Keywords: Private Sector Banks, Public Sector Banks, Altman's Z-score model, Bankruptcy Safe Zone, Grey Zone & Distress Zones.

1. INTRODUCTION

The potency of an organisation's credit is the key insight on its economic strength and long-term viability. It concerns stakeholders, if an organisation cannot fulfil its financial obligation and hence become prone to insolvency (economic times, n.d.). Being bankrupt is the situation wherein one faces obscurity in reimbursing what he owes, under the purview of law to a person and trades his property to disburse his debts. It can be insolvency of a person or an entity. Bankruptcy is the circumstance under which we may become bankrupt (Cambridge Dictionary, n.d.).

Economist have been trying to predict bankruptcy for years now. In a classic week, around 300 businesses have struggled at higher levels than ever since the 1930s. The mixture of competitive markets and heavy debt burdens is likely to contribute to yet more failures if a global economic crisis arises. The broken bench was predictable with the help of Altman's Z-score (Eidleman, 1995) which allows a company to measure its financial health and predict the possibility of obliteration.

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Business bankruptcy is of 3 types – liquidation, business reorganisation and personal bankruptcy (the balance mb, n.d.). The firm can find the category it belongs to, depending on the structure and failure and likewise decide on its recovery or ratification. (Atiya, 2001) states the purview of research is in determining the lending patterns. Examining a firm's insolvency will provide a reliable insight and the Z-Score is ruminated as an effective tool for the same (Mohammed, 2016).

Recent banking industry related news in India covers the failure of public sector banks and mergers of few banks to prevent the increase of NPAs (htt1) (htt2). Financial institution is the haven of people's wealth, and a financial collapse might have a worldwide impact on the economy (Chaudhary, 2011). The inception of digitisation makes it easy to decrypt into our nation's banking specifics, and hence its necessary to verify our investing decisions.

2. REVIEW OF LITERATURE

One of the major threats for any company is to go bankrupt, thereby perishing its existence. During the great recession of 2007-2009, many notable financial institutions around the world had gone bankrupt (wikipedia, n.d.), which gets us thinking about the parallels, if those firms could forecast their failure. (Alaminos, 2016) states the need for a global bankruptcy prediction model because of the escalated risk of companies going bankrupt due to economic changes worldwide and globalisation.

Evolution of bankruptcy models started in the 1930s with studies that focussed on treating ratio analysis for bankruptcy prediction. Up to the mid- 1960s, research was based on Univariate/single factor/ratio analysis. (Beaver, 1966) study was the most recognised univariate study conducted. (Kleinert, 2014) points out limitations a univariate model i.e. one variable cannot lead to a complete explanation to bankruptcy. Numerous tools and models were adopted to analyse the financial health of a company. It could be ratios or operating, investment and financial cash flows. (Dambolena, 1988) pointed out that adopting the net liquid component in the bankruptcy prediction model can help analysts foresee the company's liquidity. They can use net liquidity balance in their regular cash flow projections to revise their predictions regarding the firm's capital expansion or growth without affecting their liquidity. (Altman, 1988) published the first multi-variable study. The characteristics of bankrupt organisations were reviewed and verified by Altman to produce a bankruptcy prediction model. He adopted five economic and financial ratios as predictive variables in the Multiple- discriminant analysis (MDA). The study includes three sections to it. First, examination of corporate problems and downfalls. Discriminant analysis turned out to be the finest approach for the study. Second, finding the model and the sample using statistical methods. Third, the suggestion on the effects of the results and the approaches and applications of the model. A sample is a group of sixty-six

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manufacturing entities classified into companies that are bankrupt and not bankrupt. The model forecasts bankruptcy in ninety-six percent of the final sample. Since the model is easy and cost effective, researchers adopt it for decision making. Few other applications of the model are credit evaluation, external and internal decisions, and investments (Altman, 1988).

This model forecasts the probability of failure in public and private sector banks in India (Jodi L. Bellovary, 2007). The banks were chosen based on their company performance and popularity among customers. Similar studies were organised on corporate firms exploiting the Z-score model. Altman updated his research in 2012, Altman's Z-score plus model, that can help predict bankruptcy in Non- manufacturing and manufacturing firms and public/ private companies in the US and Non-US firms. Applying this model, Professor Sajjan's study revealed that no companies fall in the safe zone except for a few years. (Sajjan, 2016) stated that Distress Zone shows the firms likely to experience bankruptcy. In 2015, industrial companies listed in the Iraq stock exchange had undergone bankruptcy prediction using Altman's model. These companies make up the markets industrial sector. The study furnished a clear contrast at the level of utilizing Altman's model to foresee bankruptcy of companies in Iraq. Most firms fall within the grey area, which shows a disadvantage in performance and the incapability of making satisfactory profits for the shareholders (Abbas, 2015).

3. RESEARCH GAPS

- Only a few articles are examined regarding the bankruptcy model in the light of banking industries in India.
- Choice of banks are based on their assets.
- The latest data handled is up to 2014-2015.
- Few research articles exist on the predictions of firms using the models.

4. OBJECTIVES

- To Predict the bankruptcy of the 5 Private and 5 Public banks in India.
- To Interpret and compare the financial health of private and public sector banks.

5. METHODOLOGY

Data has been extracted from the Money control website. The top 5 private sector and public sector banks in India were selected based on 2018 Net profit. The private sector banks are – HDFC Bank, ICICI, Yes Bank, Kotak Mahindra Bank, and IndusInd Bank & the public sector banks are Indian Bank, Vijaya Bank, Punjab & Sind Bank, Bank of Maharashtra and United Bank of India (Moneycontrol, n.d.).

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(Altman E. I., 1968) had created an alternative model for firms involved in non-manufacturing activities and services. Unlike the original model, this linear model created with 4 business ratios helps in determining whether the firm would be bankrupt (Siddiqui, 2012).

Financials of banks have been taken from the year 2015-16, 2016-17 and 2017-18. This has been done because the model's accuracy is reliable only up to 2 years with about 90% and 72% accuracy in the first and second year (Ready Ratios, n.d.).

5.1 The Z-Score Model:

Z = 6.56z1 + 3.26z2 + 6.72z3 + 1.054z4

Where,

- z1=net working capital/total asset
- z2=retained earning /total asset
- z3=EBIT/total asset
- z4=book value of equity /total asset

Stages of Bankruptcy – the Z scores calculated are allocated to 3 distinctive zones.

- 2.6 or more – Safe Zone
- Between 2.6 -1.1 – Grey Zone
- Less than 1.1 – Distress Zone

  After analysing the Z scores, Prediction of Bankruptcy can be done.

5.2 *Operation definitions:* *Current Assets include cash in hand and with RBI, cash with other banks & call money and other assets.*

5.2 Financial Analysis

Private Sector Banks:

Banks	**Variables**	**2015-16**	**2016-17**	**2017-18**
HDFC Bank	z1	0.0568495	0.0399062	0.10717773
	z2	0.1018164	0.1029702	0.09941965
	z3	0.0173468	0.016843	0.01643591
	z4	0.0004055	0.0004041	0.00038499
Z Score		**0.821851**	**0.711077**	**1.1380475**

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ICICI Bank	z1	0.1174974	0.1347546	0.1192339
	z2	0.1228893	0.1279876	0.1181402
	z3	0.0134957	0.0126991	0.0077087
	z4	0.0002141	0.0002223	0.000186
Z Score		**1.2623179**	**1.3868014**	**1.2193095**
YES Bank	z1	0.0583674	0.0955853	0.0916153
	z2	0.0808774	0.1004258	0.0809667
	z3	0.0153661	0.0154845	0.0135209
	z4	0.0019837	0.0022465	0.000358
Z Score		**0.7518935**	**1.0608427**	**0.9561847**
Kotak Mahindra	z1	0.062955	0.1092564	0.0735046
	z2	0.1198476	0.1244029	0.1378793
	z3	0.0108696	0.0158978	0.0154163
	z4	0.0006794	0.0006991	0.0007425
Z Score		**0.877445**	**1.2298427**	**1.0360539**
IndusInd Bank	z1	0.0854167	0.1038585	0.0785141
	z2	0.1220019	0.1121352	0.1048019
	z3	0.0163251	0.0160533	0.0162706
	z4	0.0021236	0.0019321	0.0017923
Z Score		**1.0699942**	**1.1567792**	**0.9679268**

Table 1

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Public sector Banks:

Banks	**Variables**	**2015-16**	**2016-17**	**2017-18**
Indian Bank	z1	0.0608976	0.0623851	0.0598212
	z2	0.0774604	0.0764399	0.0711001
	z3	0.0034921	0.0064412	0.0049818
	z4	0.0016641	0.0016373	0.0015199
Z Score		**0.6772234**	**0.7034444**	**0.6592876**
Vijaya Bank	z1	0.0773562	0.0770462	0.1026614
	z2	0.0445101	0.0461813	0.0524852
	z3	0.0026257	0.0048456	0.0040928
	z4	0.000546	0.0005269	0.0004588
Z Score		**0.6707778**	**0.6890899**	**0.8725459**
Punjab & Sind	z1	0.0717932	0.075149	0.0963265
	z2	0.0542965	0.059415	0.049383
	z3	0.0032753	0.002081	-0.006538
	z4	0.0014535	0.001587	0.0009621
Z Score		**0.6715059**	**0.702315**	**0.7499628**
Bank of Maharashtra	z1	0.0715538	0.1184851	0.1410623
	z2	0.0473343	0.0389847	0.0469876
	z3	0.0006256	-0.008615	-0.007328
	z4	0.0004673	0.0003964	0.0002448
Z Score		**0.6283975**	**0.8468786**	**1.0295582**
United Bank of India	z1	0.0899197	0.1196597	0.1873768
	z2	0.0386278	0.0420513	0.0391132

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	z3	-0.002178	0.0015562	-0.010048
	z4	0.0005373	0.0003725	0.0001994
Z Score		**0.7017254**	**0.9329035**	**1.2893871**

Table 2

7. FINDINGS

According to the Z scores produced, these are the respective findings

Bank	**Years**	**Z Scores**	**Zones**
Private Sector Banks			
HDFC Bank	2016	0.821851	Distress Zone
	2017	0.711077	Distress Zone
	2018	1.1380475	Grey Zone
ICICI Bank	2016	1.2623179	Grey Zone
	2017	1.3868014	Grey Zone
	2018	1.2193095	Grey Zone
YES Bank	2016	0.7518935	Distress Zone
	2017	1.0608427	Distress Zone
	2018	0.9561847	Distress Zone
Kotak Mahindra	2016	0.877445	Distress Zone
	2017	1.2298427	Grey Zone
	2018	1.0360539	Distress Zone
IndusInd Bank	2016	1.0699942	Distress Zone
	2017	1.1567792	Grey Zone
	2018	0.9679268	Distress Zone
Public sector Banks			

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Indian Bank	2016	0.6772234	Distress Zone
	2017	0.7034444	Distress Zone
	2018	0.6592876	Distress Zone
Vijaya Bank	2016	0.6707778	Distress Zone
	2017	0.6890899	Distress Zone
	2018	0.8725459	Distress Zone
Punjab & Sind	2016	0.6715059	Distress Zone
	2017	0.702315	Distress Zone
	2018	0.7499628	Distress Zone
Bank of Maharashtra	2016	0.6283975	Distress Zone
	2017	0.8468786	Distress Zone
	2018	1.0295582	Distress Zone
United Bank of India	2016	0.7017254	Distress Zone
	2017	0.9329035	Distress Zone
	2018	1.2893871	Grey Zone

Table 3

Table 3 shows non-existence of banks in the SAFE ZONE. Nevertheless, ICICI has been the most consistent bank, being in the grey zone throughout. Similarly, Yes Bank, Indian Bank, Vijaya Bank, Punjab & Sind Bank and Bank of Maharashtra have also been unswerving in the distress zone.

The table shows the increase of the score of HDFC bank in 2017-18 compared to the previous 2 years. This is mainly because their net working capital had increased massively during that year. Yes Bank had almost reached the grey zone during 2016-17 because of an increase in their net working capital and retained earnings. During the next year, a decrease in these variables pushed them further down the ladder. Kotak Mahindra Bank descended to the distress zone and was struggling to be stable, with their Z score at 1.03, because of the effect of net working capital. Although IndusInd Bank was in the distress Zone in 2015-16, their Z score was gradually

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increasing and the next year they were in the grey zone. Like previous situations, it was because of the effect of the net working capital and retained earnings.

Among the PSUs, only United Bank joined the grey zone during 2017-18. According to the trend of the Z Scores, Bank of Maharashtra is also at the verge of entering the grey zone. Apart from performing better, this could be a reason for RBIs decision to remove BoM out of the PCA supervision even though Bank of Maharashtra is in the distress zone (business today, n.d.).

Ironically, the only bank that has entered the grey zone in 2017-18 under the PSUs – United bank, is still under the supervision of the PCA framework. Whereas our prediction of Punjab & Sind bank could be more accurate because, not only are their Z scores very less but also, they are still under the PCA supervision.

The study predicts a major downfall of Indian Bank, but they aren't under the PCA supervision. This is because among the 19 PSUs, Indian Bank has the lowest NPA ratio with 3.81% in 2017-18 (economic times, n.d.).

Trend of Z-Score Among Banks

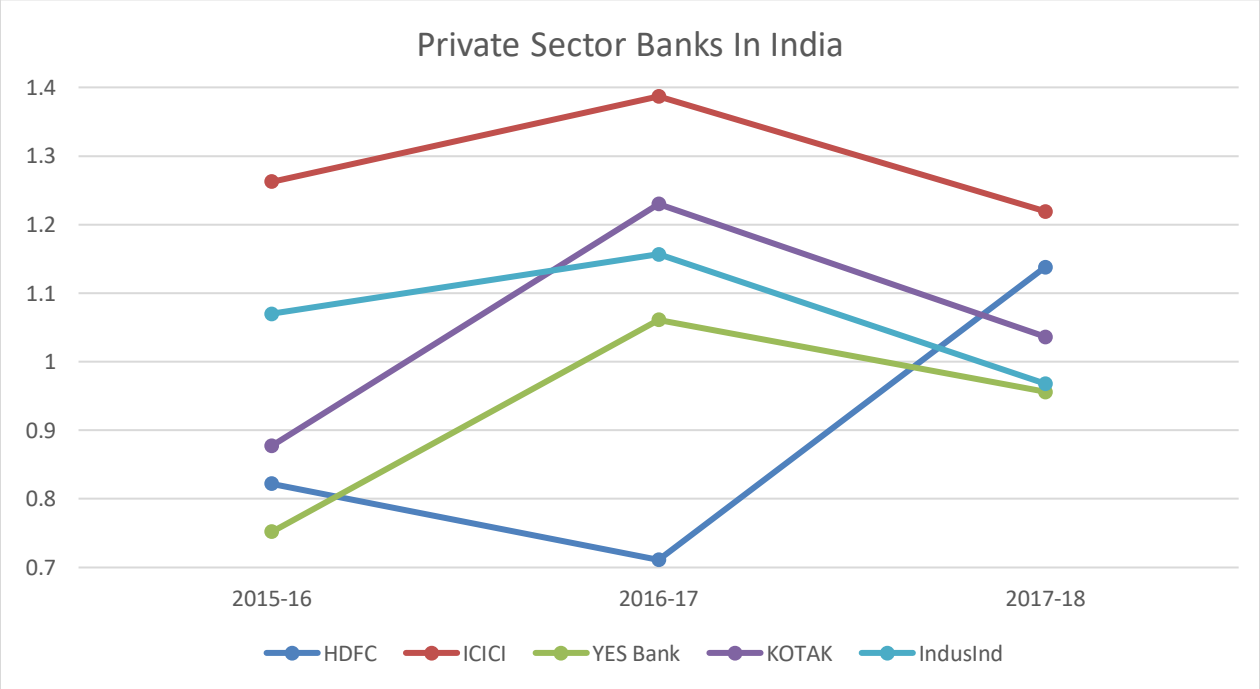

Fig 1.

Fig. 1, exhibits that in the year 2016, all the banks were in the distress zone, except for ICICI bank, because of their higher net working capital ratio compared to the other banks. In the year

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2017 Kotak Mahindra Bank, ICICI & IndusInd Bank were in the Grey Zone, YES bank tries to cross the Distress Zone and HDFC bank faces a major setback as their Z score is lesser than 0.8.

Yes Bank has not been able to cross the zone of distress, mainly because of its net working capital and retained earnings ratios. The study predicts the downfall of Yes bank as they consistently have the least Z score. Apart from the Z scores, Yes bank is one among the private banks with the high NPAs.

(Siddiqui, 2012) says many times, we ignore firms with Z scores in the Grey zone being the Zone of Ignorance. These companies performing inadequately, might finish in the Distress Zone, like IndusInd and Kotak Mahindra in the year 2018, but HDFC bank has skyrocketed and ICICI has been consistent with their Z scores being better than the other three banks. Poignantly, ICICI Bank, HDFC, Kotak Mahindra Bank and Yes Bank are among the banks that suffered colossal increase in accumulated NPA. (business today, n.d.)

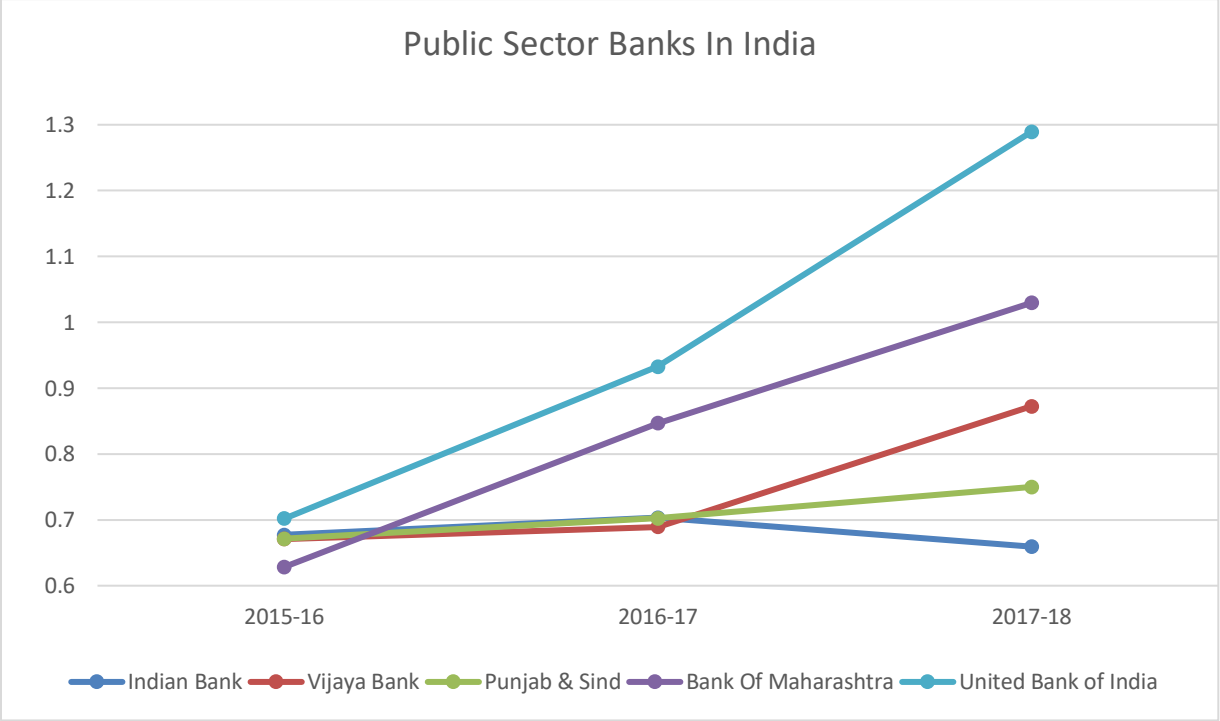

Fig. 2

Fig 2 reveals that only in 2018, is United bank being able to cross the distress zone. The study discloses that all the banks in 2016 and 2017 are in the Zone of distress. In 2018, the net working capital of United bank advanced to such a degree, pushing them to join the Grey Zone, even though their EBIT is a negative figure. Meanwhile, the Z score of Indian Bank has plummeted to

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0.65, Punjab & Sind to 0.74 and Vijaya Bank to 0.87. Vijaya Bank was in the Distress Zone during 2017-18, but not as much as Indian Bank. In 2018, their struggle increased, hence creating the first ever 3-way merger in Indian Banking sector- Vijaya Bank, Dena Bank and Bank of Baroda. (economic times, n.d.).

8. LIMITATIONS OF THE STUDY

- Accuracy of the model is only 80-90%. Its validity is restricted to 3 years.
- NPAs aren't considered in the Model.
- Several new models with higher accuracy have come into light.
- Even though studies have proved many variables having a correlation with bankruptcy, only 4 factors have been considered in this model.

9. SCOPE FOR FUTURE STUDY

- ❖ Data and findings can be used for Random forests and Support vector machine model developments for the training phase, helping to create a better model.
- ❖ The study helps people understand a trend in bankruptcy and accordingly invest their savings in the banks.

10. CONCLUSION

Predicting Bankruptcy was possible because of Altman's model. It has now escalated with the help of AI and Artificial neural networks (Charalambous, 2000)**.** This study has helped us predict bankruptcy among banks in India. If a firm is in the distress zone, it means that those firms could face bankruptcy soon. The study confirms that even though both the sectors have firms in the distress zone, Private Sector Banks perform better than Public Sector Banks. The study suggests that if these banks increase their net working capital and retained earnings, they could be stable at least in the grey zone. Public banks must strive to regain profits rather than losses for consecutive years. (Provost, 2013) expresses that if the Board of directors enforce effective planning and control of the management and the resources, being up-to-date about the current affairs and with proper business analytics for better decision making, might result in higher performance of the company.

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