

Unveiling the bank's performance and financial distress through Z- Score model

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Abstract

The banks are combating with economic world and competing within the industry today. So, need emerges to survey the banks and assess their performance on regular basis and to ensure its security and stability. For the manifestation of this, Altman's Z score is developed to give a warning signal for the forthcoming bankruptcy of the companies. Z score is till date one of the most acclaimed model among the research community. This Z score is employed in this research study to analyze 10 commercial banks of India, 5 banks from public and private sector each, of the scrutiny period of 5 years from 2016 to 2020. The study concludes that out of the 5 Public sector banks, 3 are in the Distress zone thus facing high financial hardships and likely to head towards bankruptcy. Focusing on the private sector banks only 1 out of the 5 is in Distress zone and hence these sector banks signifies less possibility of insolvency. In a nutshell, Altman's Z score evaluates that private sector banks surpasses Public sector banks in India.

Keywords: *Performance Evaluation, Public sector banks, Private sector Banks, Bankruptcy, Z score model*

JEL Classification: *G21*

Introduction

When penning down the enumeration of the bank's functions, in 21st century, the enlisting would go long enough. The fundamentals of bank's services, titled as borrowing and lending of money, were its prominent functions earlier. However, today, with time, bank has evolved and has formed a huge cluster of functions which become basic necessities for every human and business. Precisely, in this era of technological development and mass progress in the standard of living, banks stand as everyone's basic utility. Today, banks struggle and settle with the economic, political, regulatory and global trends and environments. These changing times, affect banks every now and then and they swerve with their statuses. This quivering act of banks demands timely supervision and scrutiny for the interest of the stakeholders. Thus, it causes the need to check their financial health and see if they are secured institutions to be the custodian of people's money.

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Therefore, in order to confirm that your money is secured being in hands of these financial institutions, there are various models devised by eminent researchers, that enables one to assess their financial condition and alarms us if there are discrepancies. One such popular model is the Z- score. **Edward (1968)** made the Z score formula for predicting bankruptcy of companies. The model was altered and revised, to suit the changing scenarios and times. It is known that Z score is professed to be an appropriate, accurate model to assess the financial soundness of companies and predict its bankruptcy at an early stage. Thus, researchers and analysts use this model to appraise the companies, firms as well as banks.

Literature Review

Sharma (2021) studied on the solvency of 20 bankrupt companies and 20 non bankrupt companies through Z score model. The study advocates that India is an emerging market and hence Z score cut off score needs to be altered according to the present situation.

Joshi (2020) employed the Altman's Z- Score model to check the financial performance of selected Public Sector banks with highest level of gross NPAs during 2009 to 2019. The reveals that with every increase of 1% in GNPA there was a decline of 3.1% in the Z score, whereas; with just 1% rise in Net Profits the Z score spiked to 15.31%.

Agarwal (2018) assessed the validity and trend of the Z score for selected 5 Public sector banks on the basis of the market capitalization volume from 2012 to 2017. The analysis confers that all the banks' financial health is satisfactory and Z score is capable in predicting the financial condition of banks. However, it suggests that instead of applying this model for only five years if longer span of time say ten years is taken then the reliability of Z score can increase further and prove to be a more beneficial to all stakeholders.

Ningsih & Permatasari (2018) studied on the financial difficulties of 13 automotive industries and its component companies during 2012 to 2016. The study found that out of 13, 7 companies were financially weak.

Bal (2015) employing Z score model for the prediction of corporate bankruptcy of selected five FMCG companies of India during 2011-2015 is tested. The findings reveal that all FMCG companies are financially sound and have less probability of facing financial embarrassment. The importance of Z score is emphasized for strategic management and investment decisions.

Pradhan (2014) evaluated performance of the Oriental Bank of Commerce, Punjab National Bank and State Bank of India using Z score model for the period from 2000 to 2009 is used. BPNN (Back Propagation Neural Network) is applied to the internal parameters of Z score to predict the future Z scores of these banks. The study suggested that BPNN is capable to forecast the Z score value of the firms precisely and accurately.

Sharma & Mayanka (2013) applied Altman Z score to 36 Indian commercial banks comprising of 20 Public and 16 Private sector banks. The study concluded all banks are financially sound except for the two, Kotak Mahindra Bank belonging to private sector and Canara Bank from Public sector, though the capital adequacy ratio of both of these banks were sound when compared with others in the industry.

Objectives of the Study

1. To evaluate the financial condition of the select public and private sectors banks in India.
2. To compare the financial health of the select public and private sector banks.

Research Methodology of the Study

Method of Data Collection

The present study uses both primary and secondary data. The secondary sources of data used in the present study are Reserve Bank of India, Economic Times, and Annual Financial Reports of banks for the period from 2016 to 2020.

Population of the Study

The population of the study includes all the Public sector banks and the private sector banks.

Sample Size

Post Mega-Merger, there are only 6 PSB out of 12 that remain independent. These 6 PSB are neither part of “Anchor bank” nor “banks Merged”. From these 6 independent banks, 5 are selected for the study. Out of 7 New Generation Private banks, 5 are selected for this study. Hence, 10 commercial banks in total are selected for this study.

Table 1: List of Sample Banks

Public Sector Banks	Private Sector Banks
Bank of India	Axis Bank
Central Bank of India	DCB Bank
Indian Overseas Bank	HDFC Bank
Punjab and Sindh Bank	ICICI Bank
UCO Bank	Kotak Mahindra Bank

Estimation Model

Working capital, Retained Earnings of banks, Earnings before Interest and Tax, Book Value of Equity, Total Assets and Total Liabilities are incorporated in this hybrid

model which enables to predict the future of these banks. Z score model has been designed with the following equation:

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

Where, **X₁ represents Working Capital to Total Assets Ratio:** The difference between the banks' current assets and current liabilities is the Working Capital. In this study cash and balance with banks, other banks, call money except loans and advances is considered. Working Capital signifies the short-term financial prospects of the bank. A Positive ratio of working capital is required to resemble good health.

X₂ represents Retained Earnings to Total Assets Ratio: A high ratio means that a bank is in a position to finance its capital expenditure and need not depend on borrowed funds. A lower Retained Earnings Ratio enhances the chances of the bank going bankrupt.

X₃ represents Earnings before Interest and Tax (EBIT) to Total Assets Ratio: It measures the bank's profitability, and showcases that the bank's is capable to earn profit out of its operations alone.

X₄ represents Book Value of Equity to Total Liabilities Ratio: A high ratio refers to high confidence of the customers and the stakeholders in the banks and its performance.

Table 2: Zones of Discrimination: Cut off limits

Score	Zone	Results
$Z > 2.6$	Safe zone	Secured
$1.1 < Z < 2.6$	Grey zone	Steady
$Z < 1.1$	Distress zone	Heading towards bankruptcy

Data Analysis and Interpretation

Table 3 portrays that Z-score for Bank of India has shown a growth trend by maintaining a score of above 1.1 cut off limit all throughout the years from 2016-2020. Thus, the average Z score resulting in 1.492 falls under grey zone depicting steady financial condition for Bank of India.

Table 4 shows that Z-score for Central Bank of India of 2016, that is 0.775, flung to 2.058 in 2017. The reason being the sudden increase in its current asset in the year 2017. Though, this growth did not last long, as in 2018 it went back to number 1.297 and further decreased more in the coming years 2019 and 2020. Passing through these moderations, it resulted in the average score of 1.251 ranging in Grey zone.

Table 5 shows that Indian Overseas bank has experienced an upward trend in its performance of the bank's Z- score is rising continuously with each year. The first 4 years

from 2016 to 2019 the score has escalated. However, in the year 2020, it declined to 0.711 being its lowest score in the study period. Its average Z-score is 1.084 pulling it in the Distress zone.

Table 6 depicts that the trend of Punjab and Sindh bank. It shows a momentum of rising above a bit and then coming back to the same score in the years 2016 and in 2018. Then it picks up in the coming years and reaches 1.204 in 2020. Signifying a mix trend, this bank's average score is 1.002, placing it in Distress area.

Table 7 showcases that Z-score for UCO bank was 0.945 in 2016, which dipped further to 0.933 in 2017, and not even maintaining that much stagnancy, it decreased even more to 0.794 in 2018. In 2019 it took a push up reaching till 1.065 in 2019, which was considerable development but not enough. In fact, it faced downfall back in 2020 leading to a drop to 0.912. Thus, the conclusive average score is 0.930, scoring below 1.1 cut off limit. UCO Bank falls in the Distress zone, signaling a weak financial condition and needs timely revival.

Table 8 presents that Axis bank displays a stability of having Z-score above 1.1 for most of the years except 2018 – 1.021. In 2020 it reached 1.311 but Average Z score is 1.180 making the bank go under Grey zone.

Table 9 highlights the positive and growing trend of DCB Bank. The Z score is rising constantly year on year from 2016 to 2020, that from 0.785 in 2016 to 1.291 in 2020. The bank is climbing the ladder slowing and steadily. However, after calculating the average for this Bank, it comes to 0.999, which is much below the least cut off limit of 1.1 and thus DCB Bank remains in the Distress zone.

Glaring at Table 10 it is clear that HDFC Bank has seen a fluctuating trend during the study period of 2016 to 2020. Its performance was the best in 2018, Z score being 1.438, as compared to other 4 years. But the bank could not sustain this score and as it can be seen, from 2019 Z score fell to 1.214 and further declined to 1.098 in 2020. HDFC Bank Average Z score is 1.146 which is the Grey Zone area.

Table 11 presenting Z score calculation for ICICI Bank exhibits that it has seen a mix trend from 2016 to 2020. It is noteworthy that the Z score never slipped below 1.1 in any of the 5 years. The Average Z score of ICICI Bank is 1.365 thus launching it in the Grey area that is above the Distress zone

The Overall trend of Kota Mahindra Bank as presented in Table 12 shows that it has remained near to stable except for a slight slippage in the two years- 2018 and 2019. The Bank saw a steep rise in the year 2020 reaching a score of 1.869. This could be due to improvement in the working capital to Total Assets ratio. As only in this year 2020 this ratio is 0.123 as against other 4 years it was below 0.1. The Average Z Score of Kotak Mahindra Bank is 1.460 which is responsible of placing it in the Grey zone area.

Table 3: Z score of Bank of India

Variables		2020	2019	2018	2017	2016
X1: Working Capital /Total Assets	CA	86456	94811	95883	95888	99141
	CL	17922	13800	9591	14385	13509
	WC	68535	81011	86291	81503	85632
	TA	645396	617696	605533	611925	596405
	X1	0.106	0.131	0.143	0.133	0.144
X2: Retained Earnings/ Total Assets	RE	34216	32648	28248	29710	30196
	TA	645396	617696	605533	611925	596405
	X2	0.053	0.053	0.047	0.049	0.051
X3: EBIT/Total Assets	EBIT	38615	35202	34704	37197	36107
	TA	645396	617696	605533	611925	596405
	X3	0.060	0.057	0.057	0.061	0.061
X4: Book Value Equity /Total liabilities	BVE(TA-TL)	43816	46319	35541	32487	32317
	TL	601580	571377	569992	579438	564088
	X4	0.073	0.081	0.062	0.056	0.057
Z = 6.56X₁ + 3.26X₂ + 6.72X₃ + 1.05X₄		1.348	1.501	1.538	1.499	1.574
		Average=1.492				

Source: Derived**Table 4: Z score of Central Bank of India**

Variables		2020	2019	2018	2017	2016
X1: Working Capital /Total Assets	CA	36039	31200	39228	78767	15541
	CL	15456	6476	7695	9497	11860
	WC	20583	24724	31534	69269	3681
	TA	340980	324242	318531	323905	296899
	X1	0.060	0.076	0.099	0.214	0.012
X2: Retained Earnings/ Total Assets	RE	15720	14888	15367	15366	12697
	TA	340980	324242	318531	323905	296899
	X2	0.046	0.046	0.048	0.047	0.043
X3: EBIT/Total Assets	EBIT	20278	18993	20252	21176	21465
	TA	340980	324242	318531	323905	296899
	X3	0.059	0.059	0.064	0.065	0.072
X4: Book Value Equity /Total liabilities	BVE(TA-TL)	21429	19147	17986	17951	18214
	TL	319550	305095	300545	305954	278684
	X4	0.067	0.063	0.060	0.059	0.065
Z = 6.56X₁ + 3.26X₂ + 6.72X₃ + 1.05X₄		1.016	1.109	1.297	2.058	0.775
		Average=1.251				

Source: Derived

Table 5: Z score of Indian Overseas Bank

Variables		2020	2019	2018	2017	2016
X1: Working Capital /Total Assets	CA	24061	30892	26545	23223	22246
	CL	16200	4968	8634	5983	7073
	WC	7860	25923	17911	17240	15173
	TA	244527	245040	239334	243350	269775
	X1	0.032	0.106	0.075	0.071	0.056
X2: Retained Earnings/ Total Assets	RE	-282	7218	8383	9124	11447
	TA	244527	245040	239334	243350	269775
	X2	-0.001	0.029	0.035	0.037	0.042
X3: EBIT/Total Assets	EBIT	15637	17386	16077	18179	21020
	TA	244527	245040	239334	243350	269775
	X3	0.064	0.071	0.067	0.075	0.078
X4: Book Value Equity /Total liabilities	BVE(TA-TL)	16155	16360	13274	13745	15666
	TL	228372	228680	226060	229606	254109
	X4	0.071	0.072	0.059	0.060	0.062
Z = 6.56X₁ + 3.26X₂ + 6.72X₃ + 1.05X₄		0.711	1.342	1.118	1.152	1.096
		Average =1.084				

Source: Derived

Table 6: Z score of Punjab and Sindh Bank

Variables		2020	2019	2018	2017	2016
X1: Working Capital /Total Assets	CA	9578	6618	7133	4590	4903
	CL	2027	2009	2167	2002	2522
	WC	7551	4609	4965	2587	2380
	TA	98477	106973	111592	94641	100059
	X1	0.077	0.043	0.044	0.027	0.024
X2: Retained Earnings/ Total Assets	RE	4895	5136	5618	5742	5570
	TA	98477	106973	111592	94641	100059
	X2	0.050	0.048	0.050	0.061	0.056
X3: EBIT/Total Assets	EBIT	6969	7676	6858	7255	7838
	TA	98477	106973	111592	94641	100059
	X3	0.071	0.072	0.061	0.077	0.078
X4: Book Value Equity /Total liabilities	BVE(TA-TL)	5596	5701	6183	6142	5970
	TL	92881	101272	105409	88499	94089
	X4	0.060	0.056	0.059	0.069	0.063
Z = 6.56X₁ + 3.26X₂ + 6.72X₃ + 1.05X₄		1.204	0.980	0.931	0.965	0.931
		Average =1.002				

Source: Derived

Table 7: Z score of UCO Bank

Variables		2020	2019	2018	2017	2016
X1: Working Capital /Total Assets	CA	17806	24432	14748	18100	18559
	CL	7800	6863	6800	7767	8002
	WC	10006	17570	7948	10333	10557
	TA	230457	225971	211608	225898	239246
	X1	0.043	0.078	0.038	0.046	0.044
X2: Retained Earnings/ Total Assets	RE	6943	6021	5165	7719	8146
	TA	230457	225971	211608	225898	239246
	X2	0.030	0.027	0.024	0.034	0.034
X3: EBIT/Total Assets	EBIT	14878	12780	12230	15435	17316
	TA	230457	225971	211608	225898	239246
	X3	0.065	0.057	0.058	0.068	0.072
X4: Book Value Equity /Total liabilities	BVE(TA-TL)	19210	17391	14957	12753	12522
	TL	211247	208580	196650	213145	226724
	X4	0.091	0.083	0.076	0.060	0.055
Z= 6.56X₁ + 3.26X₂ + 6.72X₃ + 1.05X₄		0.912	1.065	0.794	0.933	0.945
		Average =0.930				

Source: Derived**Table 8: Z score of AXIS Bank**

Variables		2020	2019	2018	2017	2016
X1: Working Capital /Total Assets	CA	97268	67205	43455	50256	33325
	CL	42158	33073	26245	26295	15109
	WC	55110	34132	17209	23961	18217
	TA	873007	767923	665084	575172	510359
	X1	0.063	0.044	0.026	0.042	0.036
X2: Retained Earnings/ Total Assets	RE	84384	66162	62932	55284	52688
	TA	873007	767923	665084	575172	510359
	X2	0.097	0.086	0.095	0.096	0.103
X3: EBIT/Total Assets	EBIT	60867	52283	42757	44034	40259
	TA	873007	767923	665084	575172	510359
	X3	0.070	0.068	0.064	0.077	0.079
X4: Book Value Equity /Total liabilities	BVE(TA-TL)	84948	66676	63445	55763	53165
	TL	788059	701247	601639	519410	457194
	X4	0.108	0.095	0.105	0.107	0.116
Z = 6.56X₁ + 3.26X₂ + 6.72X₃ + 1.05X₄		1.311	1.130	1.021	1.214	1.223
		Average =1.180				

Source: Derived

Table 9: Z score of DCB BANK

Variables		2020	2019	2018	2017	2016
X1: Working Capital /Total Assets	CA	3546	2793	2372	1192	892
	CL	1305	1518	1481	1276	1252
	WC	2241	1275	891	-84	-361
	TA	37437	34518	28992	23026	17916
	X1	0.060	0.037	0.031	-0.004	-0.020
X2: Retained Earnings/ Total Assets	RE	2873	2561	2248	1661	1456
	TA	37437	34518	28992	23026	17916
	X2	0.077	0.074	0.078	0.072	0.081
X3: EBIT/Total Assets	EBIT	3025	2539	1943	1697	1428
	TA	37437	34518	28992	23026	17916
	X3	0.081	0.074	0.067	0.074	0.080
X4: Book Value Equity /Total liabilities	BVE(TA-TL)	3422	3116	2808	2205	1792
	TL	34015	31403	26184	20822	16124
	X4	0.101	0.099	0.107	0.106	0.111
Z = 6.56X₁ + 3.26X₂ + 6.72X₃ + 1.05X₄		1.291	1.083	1.017	0.818	0.785
		Average =0.999				

Source: Derived

Table 10: Z score of HDFC Bank

Variables		2020	2019	2018	2017	2016
X1: Working Capital /Total Assets	CA	86619	81348	122915	48952	38919
	CL	67394	55108	45764	56709	36725
	WC	19224	26239	77151	-7757	2194
	TA	1463117	1189432	1018171	807131	672120
	X1	0.013	0.022	0.076	-0.010	0.003
X2: Retained Earnings/ Total Assets	RE	170438	148662	105776	88950	72172
	TA	1463117	1189432	1018171	807131	672120
	X2	0.116	0.125	0.104	0.110	0.107
X3: EBIT/Total Assets	EBIT	107376	90479	72771	61899	53993
	TA	1463117	1189432	1018171	807131	672120
	X3	0.073	0.076	0.071	0.077	0.080
X4: Book Value Equity /Total liabilities	BVE(TA-TL)	170986	149206	106295	89462	72678
	TL	1292131	1040226	911876	717669	599443
	X4	0.132	0.143	0.117	0.125	0.121
Z = 6.56X₁ + 3.26X₂ + 6.72X₃ + 1.05X₄		1.098	1.214	1.438	0.942	1.039
		Average =1.146				

Source: Derived

Table 11: Z score of ICICI Bank

Variables		2020	2019	2018	2017	2016
X1: Working Capital /Total Assets	CA	119156	80296	84169	75713	59869
	CL	47995	37851	30196	34245	34726
	WC	71161	42445	53973	41468	25142
	TA	1053485	929652	851996	740588	688786
	X1	0.068	0.046	0.063	0.056	0.037
X2: Retained Earnings/ Total Assets	RE	112091	104029	100864	95738	85748
	TA	1053485	929652	851996	740588	688786
	X2	0.106	0.112	0.118	0.129	0.124
X3: EBIT/Total Assets	EBIT	69633	59824	56682	58906	55379
	TA	1053485	929652	851996	740588	688786
	X3	0.066	0.064	0.067	0.080	0.080
X4: Book Value Equity /Total liabilities	BVE(TA-TL)	116504	108368	105159	99951	89736
	TL	936981	821284	746837	640637	599051
	X4	0.124	0.132	0.141	0.156	0.150
Z= 6.56X₁ + 3.26X₂ + 6.72X₃ + 1.05X₄		1.365	1.235	1.396	1.487	1.343
		Average =1.365				

Source: Derived

Table 12: Z score of Kotak Mahindra Bank

Variables		2020	2019	2018	2017	2016
X1: Working Capital /Total Assets	CA	53292	24676	19620	22572	10880
	CL	10420	11143	9652	8451	8679
	WC	42873	13533	9968	14121	2201
	TA	349832	301029	255281	206139	183581
	X1	0.123	0.045	0.039	0.069	0.012
X2: Retained Earnings/ Total Assets	RE	47559	41444	36529	26696	23042
	TA	349832	301029	255281	206139	183581
	X2	0.136	0.138	0.143	0.130	0.126
X3: EBIT/Total Assets	EBIT	23451	21032	17375	15558	13525
	TA	349832	301029	255281	206139	183581
	X3	0.067	0.070	0.068	0.075	0.074
X4: Book Value Equity /Total liabilities	BVE(TA-TL)	49018	42900	37484	27618	23962
	TL	300814	258129	217797	178521	159618
	X4	0.163	0.166	0.172	0.155	0.150
Z = 6.56X₁ + 3.26X₂ + 6.72X₃ + 1.05X₄		1.869	1.388	1.361	1.541	1.141
		Average = 1.460				

Source: Derived

. Table 13: Average Z score for all the banks

Type of Bank	Name of the Bank	Average Z Score	Rank	Result
Public Sector Banks	Bank of India	1.492	1	Grey Zone
	Central Bank of India	1.251	2	Grey Zone
	Indian Overseas Bank	1.084	3	Distress Zone
	Punjab and Sindh Bank	1.002	4	Distress Zone
	UCO Bank	0.930	5	Distress Zone
Private Sector Banks	Axis Bank	1.180	3	Grey Zone
	DCB Bank	0.999	5	Distress Zone
	HDFC Bank	1.146	4	Grey Zone
	ICICI Bank	1.365	2	Grey Zone
	Kotak Mahindra Bank	1.460	1	Grey Zone

Source: Derived

Table 13 illustrates the exact financial position of the banks in both sectors. While comparing the financial performance of the those in the public sector, Bank of India is at the top, followed by Central Bank of India, Indian Overseas Bank, Punjab and Sindh Bank and the last is UCO Bank. For Private sector banks Kotak Mahindra Bank is in the lead, ICICI Bank on the second position, Axis Bank on the Third, fourth is HDFC Bank and DCB Bank secured the last position.

Findings and Conclusion

The empirical analysis asserts that out of the five Public sector banks, three banks are in Distress Zone and two are in Grey zone. For Private Sector Banks out of five banks only one is in Distress Zone rest all are in Grey zone. Thus, it is evident from the above analysis that according to the Altman's Z score model, Private sector Banks are better than Public Sector banks. This analysis also highlights a very interesting observation that none of the banks could score more than 2.6 score and appear in the safe zone. Although, Z score is known for its accuracy in predicting the future of the banks, it cannot be treated as the only tool to predict bankruptcy as it does not incorporate the very critical indicator of financial health that is the Non-performing assets. The distress state of public sector banks may be probably due to the presence of huge piles of NPA as these banks have social obligations to cater to the needs of the weaker sections of the economy.

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