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A Z - Score Analysis to Evaluate the Financial Soundness of Select Scheduled Commercial Banks

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Abstract: *Financial sector is one of the most significant sectors for a developing country like India.An efficient and vibrant banking system is the backbone of the financial sector. The sustainability and growth of banking sector is important for development of the financial sector as well as economic growth. The soundness of the banking system reflects the development of the economy. Thus, it becomes important to measure the financial soundness of the banks in order to judge their respective position.*

The present study was conducted to measure the financial health of select banks with the help of Z-Score and to find if there is any difference in the assets and return on equity of the select banks t-test was employed. The empirical results revealed that the select five private sector banks were in safe zone and five public sector banks fall under grey zone.

Keywords: *Financial soundness, Z-Score, Banking, Scale of zones.*

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I. Introduction

Banking is an essential part for the development of an economy.The bank plays a significant role in economic transformation. The smooth cash flow from individual to individual, business to business is because of banking system. It acts as a financial intermediary between savers and borrowers. The primary functions of the scheduled commercial banks are mobilization of deposits and lend in the form of advances for productive purpose, which helps to provide capital for innovation, credit creation, promotion of entrepreneur and overall prosperity. The development of an economy is reflected through the soundness of the banking system and its sound application. Hence it is important to evaluate the financial soundness of scheduled commercial banks in India. Thus, the current study focuses to measure the financial soundness of the select banks using Z-Score to sustain and grow in the banking sector.

DISCUSSION QUESTIONS:

1. Are the select scheduled commercial banks financially sound?
2. Is there any difference in total assets of select public and private sector banks?
3. Is there any difference in return on equity of select public and private sector banks?

II. Review Of Literature

Md. Abdul KaiumMasud and Md. MahbubulHaq (2016) analyzed the financial performance of the select banks by measuring branch expansion and employment generation. It was concluded that all the select banks had positive result in these two factors. *Irina – RalucaBadea and Gheorghe Matei (2015***)** measured both initial model and the revised model to examine the financial soundness. The result outline the evolution of the financial stability for decision making and it helps to improve the techniques for monitoring and managing risks. *ParulChotalia (2014)* evaluated the financial health and soundness of the select private sector bank. Result shows that all the select banks are required to improve their financial performance to avoid bankruptcy. *RoliPradhan (2014)* adopted Z score to predict the Z score value for the future period. The study concluded that the Z score of Oriental Bank of Commerce has the highest value among the above mentioned three banks. The banks condition was improved from 2011 onwards. *Matias Costa Navajas and Aaron Thegeya1 (2013)* studied the financial soundness indicators and banking crises. It showed that the lack of return on equity was a leading indicator of banking crises. *Daniela zapodeanu and mihail-ioancociuba (2010)* examined a financial soundness indicators proposed by IMF. The result showed that the main indicators of the financial soundness were Assets, loans, return on equity, profit and market share.

III. Objectives Of The Study

The primary objective of the study is to evaluate the financial soundness of the select scheduled commercial banks.

IV. Hypothesis Of The Study

H_{01}: There is no significant difference in total assets of select scheduled commercial banks during the study period.
H_{02}: There is no significant difference in return on equity of select scheduled commercial banks during the study period.

V. Research Methodology

The study has a sample of five public sector banks (Bank of Baroda, Bank of India, Canara Bank, Punjab National Bank, and Union Bank of India) and five private sector banks (Axis Bank, HDFC Bank, ICICI Bank, Kotak Mahindra Bank and Yes Bank) based on the top-lying total assets value in the industry. The research has been carried out for the period of five consecutive years starting from the financial year 2011-2012 to 2017-2018. The secondary data pertaining to the study were collected from the concerned banks annual reports, articles and journals.Z-Score analysis and t-test analysis has been applied to picture the conclusion of the research. The Z-Score value of the select banks has been calculated based on the following Z-Score bankruptcy formula.

$$\textit{Z-Score} = 6.56X1 + 3.26X2 + 6.72X3 + 1.05X4.$$

X1 = Working Capital to Total Assets
X2 = Retained Earnings to Total Assets
X3 = Earnings before Interest and Taxes to Total Assets
X4 = Book value of equity to Total Liabilities.

The discriminant zones are assigned based on the Z-Score value they obtained to picture the financial soundness of the banks.

Table 1 Scale of Zones based on Z-Score value

Z-Score value	Discriminant Zone	Description
Z > 2.6	Safe Zone	It indicates that the bank is financially healthy and least possibility to face financial distress.
1.1<Z <2.6	Grey Zone	The bank under gray zone implies that they have minimum risk and less possibility to face instant financial distress in upcoming years.
Z < 1.1	Distress Zone	The bank falls under distress zone means they have maximum risk and has high possibility to face bankruptcy in near future.

LIMITATIONS OF THE STUDY

- The study is limited only to ten banks for the period of seven years.
- The study is limited on secondary data, so it limits the bias of the conclusion.

VI. Results And Discussions

Evaluation of the financial soundness of select scheduled commercial banks

Altman Z Score was used to analyze the financial soundness of the select scheduled commercial banks. It is the output of a financial strength and used to determine the level of bankruptcy. It is based on four components that can be calculated with the help of financial statement of the respective banks. The four components are

- Working capital to total assets
- Retained earnings to total assets
- EBIT to total assets
- Book value of equity to total assets

The results are discussed below.

TABLE 2 WORKING CAPITAL TO TOTAL ASSETS OF SELECT SCHEDULED COMMERCIAL BANKS

Name of the Bank/year	2017-2018	2016-2017	2015-2016	2014-2015	2013-2014	2012-2013	2011-2012	Average
Bank Of Baroda	0.1208	0.2068	0.1905	0.1970	0.1890	0.1469	0.1341	**0.1693**
Bank Of India	0.1480	0.1470	0.1569	0.1114	0.1020	0.1150	0.0843	0.1235
Canara Bank	0.0652	0.0937	0.0961	0.0832	0.0853	0.0787	0.0702	0.0818
Punjab National Bank	0.1178	0.1167	0.1043	0.0867	0.0755	0.0503	0.0569	0.0869
Union Bank Of India	0.2205	0.0655	0.0655	0.0103	0.0589	0.0453	0.1459	0.0874
Axis Bank	0.0513	0.0737	0.0516	0.0652	0.0614	0.0472	0.0357	0.0552
HDFC Bank	0.1025	0.0329	0.0394	0.0461	0.0638	0.0388	0.0304	0.0506
ICICI Bank	0.0837	0.0832	0.0719	0.0512	0.0552	0.0642	0.0599	0.0670
Kotak Mahindra Bank Ltd	0.0652	0.0948	0.0469	0.0448	0.0549	0.0309	0.0253	0.0518
Yes Bank Ltd.	0.0692	0.0813	0.0399	0.0441	0.0440	0.0309	0.0370	**0.0495**

Source: Compiled and calculated by using published RBI reports

Working capital to total assets of the select banks shown in Table 2 reflects the liquidity position in relation to total capitalization. It helps to measure the efficiency and its short-term financial health of the banks. An increasing value screen a positive sign, it shows that the liquidity improved over the period of time.

Table 2 reveals the proportion of working capital to total assets.Bank of Baroda recorded a highest average of 0.1693 among all the select scheduled commercial banks and Yes bankshas the lowest average of 0.0495 among all the select banks. A decrease in value indicates that they may have too many current liabilities. All the select banks showed a fluctuating trend throughout the study period.

TABLE 3 RETAINED EARNINGS TO TOTAL ASSETS OF SELECT SCHEDULED COMMERCIAL BANKS

Name of the Bank/year	2017-2018	2016-2017	2015-2016	2014-2015	2013-2014	2012-2013	2011-2012	Aver-age
Bank Of Baroda	-0.0338	0.0151	0.0804	0.0373	0.0549	0.0653	0.0964	0.0451
Bank Of India	-0.2388	-0.1247	-0.0998	0.0223	0.0420	0.2489	0.2435	0.0133
Canara Bank	-0.1124	0.0192	-0.0509	0.0394	0.0393	0.0557	0.0747	0.0093
Punjab National Bank	-0.1602	0.0184	-0.0596	0.0403	0.0541	0.0792	0.0903	**0.0090**
Union Bank Of India	-0.1071	0.0123	0.0301	0.0366	0.0405	0.6168	0.1310	0.1086
Axis Bank	0.3372	0.4329	0.9289	0.4280	0.3994	0.3425	0.2995	0.4526
HDFC Bank	0.4714	0.4408	0.4024	0.3872	0.3655	0.3451	0.3058	0.3883
ICICI Bank	0.0274	0.3490	0.3341	0.3342	0.2868	0.2435	0.1959	0.2530
Kotak Mahindra Bank Ltd	0.5559	0.5418	0.9493	0.5461	0.5088	0.4147	0.3861	**0.5575**
Yes Bank Ltd.	0.3716	0.4127	0.3836	0.3552	0.3364	0.2769	0.2650	0.3430

Source: Compiled and calculated by using published RBI reports

Retained earnings to total assets, is an indication of how profitable a bank to its total assets. The higher the value, the greater the financial stability of the banks, lower the value reveals the lesser financial stability of the banks. It also depicts that the banks have been utilizing its own earnings as non-expensive source of finance rather than debt finance. It outlines the capacity of the bank to accumulate profit based on its assets.

Table 3 shows a proportion of retained earnings to total assets. Kotak Mahindra bank has highest value of 0.5575 and Punjab National Bank has the least value of 0.0090 among all the select banks. In public sector, all the select banksrecorded negative value in the year 2017-18 and showed a decreasing trend which indicates that, those banks were less capable to retain more earnings using their own assets. In private sector all the select banks were in fluctuating trend during the study period.

TABLE 4 Earnings Before Interest And Tax (Ebit) To Total Assets Of Select Scheduled Commercial Banks

Name of the Bank/year	2017-2018	2016-2017	2015-2016	2014-2015	2013-2014	2012-2013	2011-2012	Average
Bank Of Baroda	0.1667	0.1579	0.1313	0.1387	0.1409	0.1645	0.1918	0.1560
Bank Of India	0.1168	0.1554	0.0990	0.1210	0.1469	0.1150	0.0843	0.1198
Canara Bank	0.1540	0.1528	0.1292	0.1268	0.1382	0.1428	0.1588	0.1432
Punjab National Bank	0.1342	0.2022	0.1830	0.1981	0.2068	0.2277	0.2317	0.1977
Union Bank Of India	0.1538	0.1641	0.1394	0.1526	0.1475	0.1789	0.5150	0.2073
Axis Bank	0.2255	0.2924	0.3065	0.2898	0.2989	0.2732	0.2602	0.2781
HDFC Bank	0.3066	0.2979	0.3014	0.2947	0.2921	0.2855	0.2649	**0.2919**
ICICI Bank	0.2814	0.3432	0.3311	0.3052	0.2791	0.2459	0.1693	0.2793
Kotak Mahindra Bank Ltd	0.2702	0.2789	0.2102	0.2827	0.2942	0.2577	0.2520	0.2637
Yes Bank Ltd.	0.2480	0.2714	0.2603	0.2386	0.2466	0.2161	0.2092	0.2415

Source: Compiled and calculated by using published RBI reports

Earnings before Interest and Tax (EBIT) to Total Assets is an indicator of how efficiently a bank is using its assets to generate earnings. Better the earnings implies that the banks are using their assets more effectively. This helps to measures the ability of the bank to generate earnings from their asset.

Table 4 revealed that EBIT to total assets of public sector banks recorded a fluctuating trend during the study period. The proportionate value of Union Bank of India followed by Punjab National Bank recorded an average of 0.2073 and 0.1977 which was highest among all the select public sector banks. This indicates that these banks have the capacity to generate high earning in proportion to its assets. Bank of India has lower value of 0.1198 among the select public sector banks. It shows that they have low earnings in proportion to its assets.

In private sector, HDFC Bank has highest value of 0.2919 followed by ICICI bank and Axis bank. Yes bank has lowest of 0.2415 and shows a fluctuating trend during the study period.

TABLE 5 Book Value Of Equity To Total Liabilities Of Select Scheduled Commercial Banks

Name of the Bank/year	2017-2018	2016-2017	2015-2016	2014-2015	2013-2014	2012-2013	2011-2012	Average
Bank Of Baroda	0.0007	0.0007	0.0007	0.0006	0.0007	0.0008	0.0009	**0.0007**
Bank Of India	0.0029	0.0017	0.0013	0.0011	0.0011	0.0013	0.0015	0.0016
Canara Bank	0.0012	0.0010	0.0010	0.0009	0.0009	0.0011	0.0012	0.0010
Punjab National Bank	0.0007	0.0006	0.0006	0.0006	0.0007	0.0007	0.0007	**0.0007**
Union Bank Of India	0.0024	0.0015	0.0017	0.0017	0.0021	0.0023	0.0114	0.0033
Axis Bank	0.0007	0.0008	0.0009	0.0010	0.0012	0.0014	0.0014	0.0011
HDFC Bank	0.0005	0.0006	0.0007	0.0008	0.0010	0.0012	0.0014	0.0009
ICICI Bank	0.0015	0.0015	0.0016	0.0018	0.0019	0.0021	0.0024	0.0018
Kotak Mahindra Bank Ltd	0.0036	0.0043	0.0048	0.0036	0.0044	0.0045	0.0056	**0.0044**
Yes Bank Ltd.	0.0015	0.0021	0.0025	0.0031	0.0033	0.0036	0.0048	0.0030

Source: Compiled and calculated by using published RBI reports

It is calculated to know the long-term financial soundness of the select scheduled commercial banks and it expresses the financial stability of the banks on a long term, mainly on how much the firm's book value can decline before the liabilities exceeds its assets.

Table 5 shows the book value of equity to total liabilities of select scheduled commercial banks. Kotak Mahindra Bank followed by Union Bank of India has the highest value of 0.0044 and 0.0033 in maintaining the financial stability. Bank of Baroda and Punjab National Bank has the least value of 0.0007. In private sector, HDFC bank has the least value of 0.0009. ICICI Bank and Yes Bank recorded a decreasing trend and all the other select banks were fluctuating during the study period.

TABLE 6 Z Score Values Of Select Scheduled Commercial Banks

Name of the Bank/year	2017-2018	2016-2017	2015-2016	2014-2015	2013-2014	2012-2013	2011-2012
Bank Of Baroda	1.8038	2.4681	2.3948	2.3463	2.3662	2.2825	2.4842
Bank Of India	**0.9800**	1.6038	1.3703	1.6175	1.7945	1.2985	1.9003
Canara Bank	**1.0973**	1.7047	1.3340	1.5277	1.6170	1.6590	1.7725
Punjab National Bank	1.1532	2.1848	1.7205	2.0323	2.0622	2.1196	2.2249
Union Bank Of India	2.1334	1.5745	1.4663	1.2142	1.5118	3.5125	4.8570
Axis Bank	2.9526	3.8604	5.4272	3.7712	3.7147	3.2635	2.9603
HDFC Bank	4.2704	3.6553	3.5964	3.5466	3.5742	3.2991	2.9775
ICICI Bank	2.5312	3.9911	3.7877	3.4785	3.1745	2.8695	2.1717
Kotak Mahindra Bank Ltd	4.0590	4.2667	4.8199	3.9783	4.0005	3.2909	3.1239

Yes Bank Ltd.	3.3333	3.7047	3.2644	3.0539	3.0460	2.5613	2.5176

Source: Compiled and calculated by using published RBI reports

Table 6 exposes the financial health of all the select scheduled commercial banks. The value above 2.6 indicate that the banks are under safe zone which means they are financially healthy, if the values lies between 2.6 to 1.1 they fall under grey zone, it implies that the banks are carrying a low risk and the value below 1.1 are under the distress zone, which indicates that the banks are under high risk.

The Z-Score value of the select public sector banks liesbetween 1.1 to 2.6 means it carries a low risk. The value below 1.1 indicates that the banks were in distress zone. Due to decrease in liquidity against total assets and decline in book value of equity against total liabilities, Bank of India and Canara bank falls distress zone by recording 0.9800 and 1.0973 in 2017-18. The Z-score value for the private sector banks is above 2.6, which indicates that all the select banks under study were in safe zone. During 2011-2012, 2012-2013 Yes bank recorded value of 2.5176 and 2.5613. Similarly, ICICI Bank has value of 2.5312 in 2017-2018 and comes under grey zone.Kotak Mahindra Bank balancing the Z-Score value throughout the period.

TABLE 7 Discriminant Zones Of Select Scheduled Commercial Banks

Name of the Bank/year	Average	Discriminant Zones
Bank Of Baroda	2.3066	grey zone
Bank Of India	**1.5093**	grey zone
Canara Bank	1.5303	grey zone
Punjab National Bank	1.9282	grey zone
Union Bank Of India	2.3242	grey zone
Axis Bank	3.7071	safe zone
HDFC Bank	3.5599	safe zone
ICICI Bank	3.1435	safe zone
Kotak Mahindra Bank Ltd	**3.9342**	safe zone
Yes Bank Ltd.	3.0687	safe zone

Source: Compiled and calculated by using published RBI reports

Table 7 shows the discriminant zones obtained by the select banks by considering the Z-Score average value during the study period. The Kotak Mahindra bankwas found to befinancially sound with an highest average Z-Score value of (3.9342), followed by Axis Bank (3.7071) and HDFC Bank (3.5599) subsequent banks were ICICI Bank(3.1435), Yes bank (3.0687), Union Bank of India (2.3242), Bank of Baroda(2.3066), Punjab National Bank(1.9282). The least Z-Score value of (1.5303) and (1.5093) occupied by Canara bank and Bank of India.

In public sector banks, Union Bank of India and Kotak Mahindra Bank in case of private sector banks were in higher position. The present study showed that all the select five public sector banks were under Grey zone and private sector banks were under Safe zoneduring the study period.

t-test analysis

Hypothesis

H_o: There is no significant difference in total assets among selected banks during the study period

Table 8 Total Assets Of Select Banks During The Study Period 2011-12 To 2015-16.

Name of the Bank / Year	t-test value	Significance (P – Value)	Result
Bank of Baroda	**16.557**	.000	Reject
Bank of India	**15.275**	.000	Reject
Canara Bank	**14.972**	.000	Reject
Punjab National Bank	**13.578**	.000	Reject
Union Bank of India	**7.264**	.000	Reject
Axis Bank	**8.522**	.000	Reject
HDFC Bank	**6.463**	.001	Reject
ICICI Bank	**12.772**	.000	Reject
Kotak Mahindra Bank	**4.929**	.003	Reject
Yes Bank	**5.102**	.002	Reject

Source: Computed data

Table 8 revealed the results of the hypothesis. To test if there was difference in total assets of the select banks during the study period, t-test was applied and the result shows that total assets of the select public sector banks and private sector banks varied during the study period. The p value of total assets was found to be p=0.000, 0.001, 0.002, 0.003 which is less than 0.05.The null hypothesis does not support statistically. Hence, the alternative hypothesis was accepted and the null hypothesis was rejected.

H_o: There is no significant difference in Return on equity of the selected banks during the study period

Table 9 Return On Equity Of Select Banks During The Study Period 2011-12 To 2015-16.

Name of the Bank / Year	t-test value	Significance (P – Value)	Result
Bank of Baroda	**30.373**	**.000**	Reject
Bank of India	**5.492**	**.002**	Reject
Canara Bank	**12.042**	**.000**	Reject
Punjab National Bank	**14.473**	**.000**	Reject
Union Bank of India	**9.396**	**.001**	Reject
Axis Bank	**42.108**	**.000**	Reject
HDFC Bank	**66.995**	**.000**	Reject
ICICI Bank	**64.242**	**.000**	Reject
Kotak Mahindra Bank	**5.516**	**.001**	Reject
Yes Bank	**22.996**	**.000**	Reject

Source: Computed data

Table 9 revealed the results of the hypothesis. To test if there isany difference in return on equity of the select scheduled commercial banks during the study period, t-test were applied. It was found that return on equity of the select public sector banks and private sector banks varied during the study period. The result showed that,the p-value of all the banks was below 0.05 andthus, null hypothesis does not support statistically. This states that there is a significant difference in return on equity of the select banks.

VII. Suggestions

- Liquidity is a critical criteria for the banks. Hence, the banks much have adequate working capital without much of deviations.
- The retained earnings by the banks must be maintained at a significant level, to use it for productive purposes.
- Banks must take measures to improve its earning through effective business operations.

VIII. Conclusion

Banking sector plays a pivotal role in strengthening the economic conditions. The banks performances are measured with the help of financial results over the period of time. Keeping in view the operation of commercial banks, the study was conducted to measure the financial soundness of selected scheduled commercial banks for the period between 2011-12 and 2017-18. In this paper, an attempt was made to analyze the financial soundness of selected banks using Z-Score and t-test analysis. The study revealed that the select five private sector banks are in safe zone and select five public sector banks are in grey zone. All the private sector banks are in safe zone indicates that the banks are financially sound and is witnessed through their healthy performance during the study period. Among public sector banks, Bank of India, Canara Bank and Punjab National Bank of the select banks are required to improve their financial performance to avoid bankruptcy.

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