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Credit Rating of Securities: A Study on Selected Indian Banks

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Abstract

Indian Banks are playing vital role in the economic development of the country. Banks are integrating all the industries over the country by providing loans and advances. The banking industry helps in the formation of capital and provides short-term capital to the business and industries. Credit rating of Indian banks is very important to determine their ability to generate credit in future and to determine whether they were able or not to contribute to the economic progress of the country. In this studies the credit rating of 5 Indian banks for a period of 10 years were taken to determine the creditworthiness of the bank and analyze the trend. The different types of ratios like CASA ratio, Debt-equity ratio and ROCE, interest income to total assets, interest expenses to total asset and NPAs are tested with the help of regression equation to know the impact of these ratios on the credit rating of the securities. We found from the study that ROA, CAR, Interest expenses to total asset ratios, interest income to total asset ratios and net NPA ratios have significant impact on the credit rating of the securities of the bank.

Keywords: Credit rating, securities, default risk.

Introduction

The Credit Rating plays an important role in evaluating the creditworthiness of a bank. Investors can take decision about the investment in the securities of the bank by judging securities by its credit rating indicators. Because, the credit rating agencies arrange the different types of securities according to its default risk. The higher is the default risk, lower is the rating and vice versa. The credit rating agencies take into consideration the capital structure of bank, debt capital and stock of the bank while doing the credit rating. So the credit rating has a positive or negative impact on the goodwill of the bank and has also impact on the price of the share capital of the bank. Different rating agencies use the different rating scale to rate the securities in the market.

The banking sector has grown relevantly during the last few years due to the increase in savings habit of the people and significant growth in the national income of India. India is now fifth largest economy and we know, the banking sector is one of the pillar of an economy. There were 12 public sector banks, 21 private sector banks, 45 foreign banks, 12 small finance banks currently operating in India. It is projected that the BFSI sector will generate over 7% employment in future.

Bandhan Bank is one of the largest bank operating in India. It mainly focuses on providing banking services to the unbanked areas and rural development by providing loan to the people in rural areas. It also focuses on microfinance and financial inclusion.

ICICI primarily focuses on creating the development financial institution for providing medium-term and long-term project financing to Indian Business. It also provides the service of underwriting of securities of the issuing bank.

State Bank of India is the largest public sector bank in India with largest market share of 23% and share of 25% in total loan and deposit market. It is the largest employer in the banking industry providing employment in different posts like SBI clerks, SBI probationary officer, SBI SO etc.

Punjab National Bank is a major Indian public sector bank established in 1894. It has a large number of ATMs and branches across the India and outside the India. It provides banking services to a wide range of customers. It offers a range of product and services including savings account, current account, recurring account, term deposit account and provides short-term loans to the business and also provides insurance services.

The Bank of Baroda has a significant presence outside the Indian subcontinent. It provides services like the investment banking, asset management, and corporate finance. It is one of the India's top five bank with market share of 6% in financial year 2024.

ICRA

ICRA is a prominent credit rating agency founded in 1991. It

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provides credit rating services to help investor to take decision about the investment in securities of different bank. ICRA is registered with the SEBI and is a public limited bank. ICRA use symbol AAA for long term securities, symbol A1 for short term securities, AAA (SO) for long term structured securities, A1 (SO) for short term structured securities, AAA (CE) for long term credit enhancement, A1 (CE) for short term credit enhancement as highest rating symbols. The highest symbol denotes lower default risk.

Literature Review:

(Aktam *et al*, 2019) Firms should give high attention to credit rating while making decisions related to capital structure. Credit ratings had the potential to affect the cost of capital, investment process, accessibility to financial markets, and in turn, the overall value of firm.

(Raftey *et al*, 2017) Credit ratings are predicted by important firm specific factors like size, growth opportunities, capital intensity, assets returns, sector type etc. Firms with higher credit ratings tend to had better performance.

(Sunitha, G. *et al*, 2021). When banks get positive ratings, loans are issues, bank can start and expand their business and provide employment opportunities to many people. The credit ranking has a constructive effect on the credit of the banking sector in India.

(Hertikasari, A. *et al*) Some factors influence credit ratings and some factors are influenced by credit ratings. The economic actors on matters that affect credit ratings, so that they can be taken into consideration in making decisions.

(Adelson, 2012) The main role of credit rating is to close the gap between lenders and borrowers by providing independent opinions of creditworthiness.

(Butler, w. *et al*). The level of interaction between bond rating agencies and firm's rating varies substantially cross-section ally. Many bond ratings were solicited by bond issuer, resulting in a relationship between the bond issuer and bond rating agencies they hire. But other bond ratings were unsolicited, whereby there is no interchange of information between the bond issuer and the agency except the information already in public.

(Cantor. *et al*) Although the rating provides the accurate rank ordering of default risk, the meaning of specific letter grades varies from agencies to agencies and also varies over times. Noting that current regulations do not explicitly adjust for agency difference.

(Alali, F. *et al*, 2011) According to Fatima Alali, firms characterized by stronger corporate governance has a significantly higher credit rating and that this association is accentuated for smaller firms relative to larger firms. An improvement in corporate governance is improvement in credit rating.

(Cheng, M. *et al*, 2009) When the rating agencies face the criticism of the investors, they not only improve the timeliness of rating the securities but also improve the rating accuracy and reduce the rating volatility.

(Bhojraj, S. *et al*, 2001). There is evidence linking the corporate governance to higher bond ratings and lower bond yields. Corporate governance can reduce the default risk by mitigating the agency cost and monitoring financial performance and by reducing information asymmetry between the firm and lender. The firms that has greater institutional ownership and stronger outside control of the board enjoy lower bond yields and higher bond ratings on their new bond issue.

(Gupta, R. *et al*) The likelihood of credit ratings to be on the higher side is more with increase of size, liquidity, profitability, interest coverage, growth, net cash flows and with a decrease in leverage. Out of seven financial variables only size, profitability, interest coverage and leverages were found to be statistically significant determinants.

(Jain, T. *et al*). Credit rating agencies influence investor behavior and regulate issuers' access to financial markets and thus, they act as markets' gatekeepers, further, given the statutory requirements for rating of securities before trading can commence thereon, CRAs occupy an intriguing inter-twined position of quasi-public regulators charged with the implementation of good governance norms and informational intermediaries seeking to protect the investors by purging the markets of information asymmetry.

(M, Jayadev) the internal credit rating models of banks were expected to produce the probability of default and loss given default to estimate the capital requirement of credit risk. The components of internal rating systems, their architecture, and operation differ substantially across banks.

Methodology of Study

Research Design

Research design can be thought of as the structure of research- It is the "glue" that holds all of the elements in a research project together. Research design concerns the planning of scientific inquiry, the development of a strategy for founding out something. So Preparation of research design is important for the purpose of research. Research may be called a plan to answer the research question. Research method is used to implement that plan.

Method of Collection of Data

It is important to determine the method of collecting the data for the research purpose. There were two methods of collecting the data. One is sampling techniques and other is census. Here sampling technique is used to collect the data. The data of 10 years' of the five banks i.e. State Bank of India, Punjab National Bank, Bank of Baroda, ICICI bank, Bandhan Bank were taken to analyze.

Source of Data

To conduct the research it is important to collect data related with the research subject. Data can be collected from two sources. One is primary source and other is secondary source.

Secondary Data: Secondary data, on the other hand were those which had been already collected by someone else and which had been already passed through the statistical process. Secondary data include the information from the company annual reports which include financial statement like balance sheet and income statement and other information from the text book of financial management, journals, and magazines also been collected.

For the purpose of the study necessary information had been collected from secondary sources. The data collection for the study was from the secondary sources. Like

i). Online reports
ii). Books
iii). Journal
iv). Websites (Moneycontrol.com)

Analysis of Data

After collecting the data from secondary sources, the data was analyzed with the help of some statistical techniques. Average, standard deviation, regression analysis were used to analyze the data.

Objective of the Study

The objectives of the study are as follows:

i). To analyze the credit rating of the selected banks under study.
ii). To identify the determinants of credit rating of the selected banks under study.
iii). To judge the impact of size of the business, debt-equity ratio, CASA ratio, ROE, ROI and market capitalization on credit rating of the selected banks.
iv). To ascertain the capability of the selected banks to meet their future debt obligation.

Scope of the Study

The study focused on the analysis of different determinants which influence the credit rating of securities and also focused on the analysis of the past 10 years of credit rating (FROM YEAR- 2015 TO 2024) of Bandhan Bank Limited, State Bank of India Limited, Bank of Baroda, Industrial Credit and Investment Corporation of India Limited, Punjab National Bank.

Limitation of the Study

- This study is based on the secondary data collected from the websites of bank, ICRA and money control.
- The study covered a limited period of 10 years.

Important Parameters of the Bank in Regards of Credit Rating

There are some key rating drivers considered by the ICRA and other rating agencies which influence the credit rating of a banking bank. Some of these rating drivers were as follows:

i). Size of the business and growth rate of industry
ii). Market share of business and competitive position of business
iii). Growth rate of Loans and advances of the banking bank and also the growth of deposits of the banking bank.
iv). The debt structure, profitability ratio and liquidity ratio of the banking bank.
v). The corporate governance and efficiency of the management.
vi). The capital adequacy ratio of the banking bank as per the Basel 3 norms.

Dependent Variable

Here, dependent variable is the credit rating of securities like long-term, short-term, term-loans, and certificate of deposits etc. by denoting symbols like AAA, A1, AA, BB, and BBB etc.

Independent Variable

- **Financial Variable:** Debt-to-equity Ratio, Interest on Total Asset ratio, Return on Asset, Return on Equity, capital adequacy ratio, Current Account Savings Account Ratio (CASA).
- **Non-financial Variable:** Industry in which the bank operate, Bank Size, Market capitalization, Asset Quality (NPA).

Relationship between Dependent and Independent Variable

We explained the relationship between the dependent and independent variable by the use of regression analysis. Here dependent variable is credit rating score of the securities and independent variables are debt-to-equity ratio, return on asset, Asset quality and bank size, market capitalization, industry in which the bank operate etc.

Relationship expressed in a mathematical equation as follows:

$$CR=\beta_0+\beta_1 ROE+\beta_2 ROCE+\beta_3 CASA+\beta_4 DEBT\text{-}TO\text{-}EQUITY+\beta_5 ROA+\beta_6 INT.\ INCOME/ASSET+\beta_7 INT.EXPENSES/ASSET+\beta_8 CAR+\xi$$

Where;
CR= credit rating of securities
$\beta 0$= constant term

β_1, β_2, β_3, β_4, β_5, β_6, β_7, β_8 are the coefficient of independent variables of return on equity, return on capital employed, current account and savings account ratio, debt-to-equity ratio, return on asset, interest income on total asset, interest expenses on assets, capital adequacy ratio respectively. ξ denotes the error.

Return on Equity: Return on equity indicates the return on investment of the shareholders. The investors invest in the share capital of the bank. Return on equity judges how much return the equity shareholders were getting from their investment. It has a significant impact on the credit rating of long-term securities of the banking bank. Higher ROE denotes the higher capability of the bank to meet its obligation in future. The creditworthiness of the bank is improved with the increase of return on equity.

Formula to calculate the ROE is- Net Income/Shareholder's Fund

Return on Capital Employed: Return on capital employed is a financial metric that measures a company's profitability and efficiency in using its capital to generate profits. It indicates how well a company utilizes its capital (both debt and equity) to generate returns. Companies with high ROCE value tend to receive higher credit ratings, as they demonstrate efficient capital utilization and high profitability.

Formula to calculate the ROCE is- EBIT/CAPITAL EMPLOYED * 100

CASA Ratio: CASA denotes current account and savings account ratio. The CASA ratio indicates the funding base of the banking bank. So a higher CASA ratio is always beneficial to the banking bank. A higher CASA ratio is an indication of higher liquidity of the bank. The bank is able to meet its short-term obligation in an effective way. The higher CASA ratio leads to better credit rating of the bank. The formula to calculate the CASA ratio is- (Current Account + Savings Account Deposits)/Total Deposits

Debt-Equity Ratio: The debt-equity ratio signifies the proportion of debt and equity of the bank. Higher debt-equity ratio signifies higher debt of the banking bank. The lower signifies the low risk of default in payment of interest on borrowing and repayment of debt. The lower debt-equity ratio is a significant indicator of financial stability of the banking bank. Better financial stability means lower risk of investment. It impact the credit rating of the banking bank significantly. The formula of calculation is- Total Debt/Total Equity

Return on Asset: The ROA signifies the return on asset utilization. A higher return on asset means the higher income from the asset of the banking bank. Higher return on asset indicates the bank is able to generate sufficient cash flow to meet its short-term obligation like payment of interest on debt securities. Higher cash flow influences the credit rating of the securities positively, the formula to calculate the ROA is- Net Income/Total Asset

Interest Income on Asset: The interest income on asset signifies the percentage of interest income generated by the use of the asset of the bank. It measures the ability of the bank to generate income from the loans and investments. The high ratio of interest income on asset signifies higher profitability of the bank and efficient utilization of the asset. Higher profitability and efficient utilization of the asset indicates the high creditworthiness of the banking bank. So it has a significant impact on the credit rating of the bank. The formula of calculation is – Interest Income/total asset.

Interest Expenses on Asset: Interest expenses to total asset ratio has significant influence on the credit rating of securities. Lower ratio signifies efficient debt management in the company. Because lower ratio signifies the lower interest expenses and less chance of default in case of payment of interest on debt. So lower interest expenses on total asset leads to high credit rating of securities. The formula to calculate the interest expenses to total asset ratio is- Interest expenses/total asset

Capital Adequacy Ratio: capital adequacy ratio measures a bank's capital position in relation to the risk weighted asset. The higher CAR denotes higher financial stability of the bank. The investor get confidence if the bank has high CAR. Because high CAR assists the bank to absorb the future losses from the risk weighted assets. Formula to calculate the CAR is – (Tier 1 capital + Tier 2 capital)/Risk-Weighted Assets

Non-Performing Asset: A non-performing asset is a loan or advance that a bank or financial institution has extended, but which is not repaid on time in forms of payment of interest or principal. The time period is 90 days or more. It is the part of asset which has stopped the generating income from such asset. The formula to compute the net asset ratio is – Net NPA Ratio = Net NPA/Net Advances *100

Table 1: Table Showing Rating Term (ICRA)

5 Point Likert Scale					
Rating Term (ICRA)	**Highest Safety (5)**	**High Safety (4)**	**Adequate Safety (3)**	**Moderate Safety (2)**	**Low Safety (1)**
Long-term and Medium Term Securities	AAA/MAAA	AA+/MAA+	AA/MAA	AA-/MAA-	BELOW AA-
Short-term Securities	A1	A2	A3	A4	D

Analysis:
Bandhan Bank Ltd.
Credit Rating of Securities (NCD, Term Loan, NCD Tire – II)

Table 2: Table Showing Credit Rating Score of Bandhan Bank

Year	Credit Rating (ICRA)	Rating Score	Weights	Final Score
2023-24	AA-	2	1	2
2022-23	AA-	2	0.9	1.8
2021-22	AA-	2	0.8	1.6
2020-21	AA	3	0.7	2.1
2019-20	AA	3	0.6	1.8
2018-19	AA	3	0.5	1.5
2017-18	AA	3	0.4	1.2
2016-17	AA-	2	0.3	0.6
2015-16	AA-	2	0.2	0.4
2014-15	AA-	2	0.1	0.2

Table 3: Table Showing Credit Rating Parameter of Bandhan Bank

Important Parameter Influencing the Credit Rating of Bandhan Bank										Credit Rating Score
Year	**ROE**	**ROCE**	**CASA**	**Debt-to-Equity**	**ROA**	**Interest Income/Total Asset**	**Interest Expenses/Total Asset**	**CAR**	**Net NPA (%)**	**Average numeric score of all securities**
2023-24	15.85	2.01	38.76	0.845	1.12	7.10	4.28	15.84	1.11	2
2022-23	14.36	1.91	39.47	1.03	0.96	6.14	3.30	15.46	1.17	1.8
2021-22	8.46	1.81	41.45	1.19	0.56	5.46	2.91	16.24	1.66	1.6
2020-21	1.07	1.85	40.15	0.865	0.07	6.10	3.60	15.68	3.51	2.1
2019-20	0.76	1.77	35.28	1.26	0.04	6.56	4.19	13.30	0.58	1.8
2018-19	0.94	1.78	35.03	1.38	0.05	6.37	4.00	14.52	0.58	1.5
2017-18	-5.60	1.72	35.81	2.79	-0.33	6.06	3.90	11.81	0.58	1.2
2016-17	3.43	1.63	32.15	1.12	0.19	6.07	4.12	12.24	0.00	0.6
2015-16	-13.42	1.36	26.36	1.5	-0.80	6.56	4.66	13.17	0.00	0.4
2014-15	-13.42	1.43	26.38	1.2	0.47	6.00	4.16	12.95	0.00	0.2
Average	3.432	1.727	35.084	1.318	0.233	6.242	3.912	14.121	0.919	1.32
S.D.	9.588	0.1930	5.098871	0.5280	0.544207	0.4145	0.4858	1.5381	1.011943	0.653911
Minimum	-13.42	1.36	26.36	0.845	-0.8	5.46	2.91	11.81	0	0.2
Maximum	15.85	2.01	41.45	2.79	1.12	7.1	4.66	15.84	3.51	2.1

We found that the average ROE during the period of study is 3.432 and standard deviation is 9.588. The standard deviation is high. It indicated that the values are widely spread from the mean. The minimum ROE was -13.42 (2014-15 and 2015-16) and maximum was 15.85 (2023-24).

The average ROCE during the period is 1.727 and the standard deviation is 0.193. A standard deviation below 1 for an independent variable indicates that the data points are closely clustered around the mean, with the typical deviation being less than one unit of variable. The minimum value of ROCE was 1.36 (in the year 2015-16) and maximum value was 2.01 (2023-24). The ROCE has improved continuously during the period of study.

The average CASA ratio during the period of study is 35.084 and the standard deviation is 5.0988. A standard deviation above 1 means higher scatter of value from the mean value of the independent variable. The minimum value of CASA was 26.36 in the year 2015-16 and maximum value was 41.45 in the year 2021-22. The CASA ratio improved during the financial year between 2015-16 and 2021-22.

The average debt-to-equity ratio during the period of study is 1.318 and the standard deviation is 0.5280. A standard deviation below 1 for an independent variable indicates that the data points were closely clustered around the mean, with the typical deviation being less than one unit of variable. The minimum value of debt-equity ratio was 0.845 (2023-24) and maximum debt-to-equity ratio was 2.79 (2017-18). It indicated that the debt-to-equity ratio decreased during the last 8 years.

The average ROA is 0.233 and standard deviation is 0.544. The standard deviation is higher than average. The minimum value of ROA was -0.8 (2015-16) and maximum value was 1.12 (2023-24). The ROA improved during the study period.

The average interest income to total asset is 6.242 and standard deviation is 0.4858. A standard deviation below 1 for an independent variable indicates that the data points were closely clustered around the mean, with the typical deviation being less than one unit of variable. The minimum value of interest income to total asset ratio was 5.46 in the year 2021-22 and maximum value was 7.1 in the year 2023-24. The interest income to total asset ratio improved.

The average interest expense to total asset is 3.912 and standard deviation is 0.4858. A standard deviation below 1 for an independent variable indicates that the data points were closely clustered around the mean, with the typical deviation being less than one unit of variable. The minimum value of interest expenses to total asset ratio was 2.91 (2021-22) and maximum value of interest expenses to total asset ratio was 4.66 (2015-16). The interest expenses during the period was decreased which is positive factor for credit rating of securities.

The average capital adequacy ratio is 14.121 and standard deviation is 1.5381. A standard deviation above 1 means higher scatter of value from the mean value of the independent variable. The minimum value of CAR was 11.81 (2017-18) and maximum value is 15.84 (2023-24).

The average Net NPA is 0.919 and standard deviation is 1.019. A standard deviation above 1 means higher scatter of value from the mean value of the independent variable. The minimum value of net NPA is 0 (2015-16, 2016-17) and maximum value is 3.51 (2020-21).

The credit rating of securities is high in the 2020-21 i.e. 2.1 and got minimum rating in the year 2014-15 i.e. 0.2.

Bandhan Bank

Table 4: Table Showing Credit Rating Predictor of Bandhan Bank

Model No.	Constant Predictor	R	R^2	Adjusted R^2	Standard Error of Estimate	F	P
1.	ROE	0.749	0.562	0.507	0.48410	10.246	0.013
2.	ROE, ROCE	0.947	0.898	0.868	0.25011	30.678	0.000
3.	ROE, ROCE, CASA	0.955	0.913	0.869	0.24925	20.942	0.001
4.	ROE, ROCE, CASA, Debt-to-Equity Ratio	0.968	0.938	0.888	0.23040	18.888	0.003
5.	ROE, ROCE, CASA, Debt-to-Equity Ratio, ROA	0.982	0.964	0.920	0.19484	21.726	0.005
6.	ROE, ROCE, CASA, Debt-to-Equity Ratio, ROA, Interest Income to Total Asset Ratio	0.988	0.976	0.928	0.18489	20.348	0.016
7.	ROE, ROCE, CASA, Debt-to-Equity Ratio, Interest Income to Total Asset, Interest Expenses to Total Asset	0.994	0.988	0.946	0.15951	23.722	0.041

In the stepwise regression analysis of the variables, we found that the ROE had significant effect on the credit rating of the bank. Value of R signifies the positive relationship between the independent and dependent variable. The value of R square signifies the change in the percentage of dependent variable due to 1% change in the independent variable. Here, the R square value of ROE signified 56.2% change in credit rating of the securities. In model 2, 3,4,5,6 and 7 showed the combination of other independent variable with ROE. In model 7 shows the impact of ROE, ROCE, CASA, Debt-to-equity, and interest income to total asset, interest expenses to total asset ratio on the credit rating of the securities. The R^2 value in model 7 is 0.988 which signifies that there is change of 98.8% of the dependent variable credit rating due to change of the dependent variable in model 7. The p value signifies the probability value in the model. Here in all model p value is less than 0.05 which is the significant value to judge the fitness of the model. The standard error of estimation is also below 1 in all model. F value indicates the variability between the groups. F>2.5 is considered good for a model. Here, the F value is 23.722 in model 7 which meant the independent variables in model 7 had significant impact on the credit rating of the bank. The value of other independent variables like NPA and CAR were not statistically significant.

State Bank of India:
Credit Rating of Securities (Long-term Bond, Infrastructure Bond, BASEL-III Tire – II Bond)

Table 5: Table Showing Credit Rating Score of SBI

Year	Credit Rating (ICRA)	Rating Score	Weights	Final Score
2023-24	AA+	5	1	5.00
2022-23	AA+	5	0.9	4.50
2021-22	AA+	5	0.8	4.00
2020-21	AA+	5	0.7	3.50
2019-20	AA+	5	0.6	3.00
2018-19	AA+	5	0.5	2.50
2017-18	AA+	5	0.4	2.00
2016-17	AA+	5	0.3	1.50
2015-16	AA+	5	0.2	1.00
2014-15	AA+	5	0.1	.50

Table 6: Table Showing Credit Rating Parameter of SBI

Important Parameter Influencing the Credit Rating of State Bank of India										
Year	ROE	ROCE	CASA	Debt-to-Equity	ROA	Interest Income/Total Asset	Interest Expenses/Total Asset	CAR	Net NPA (%)	Rating Score
2023-24	17.46	1.47	39.89	15.42	0.98	6.71	4.13	14.28	0.57	5.00
2022-23	16.75	1.59	42.66	14.53	0.91	6.01	3.39	14.68	0.67	4.50
2021-22	12.33	1.42	44.51	14.85	0.63	5.52	3.10	13.85	1.02	4.00
2020-21	8.86	1.64	45.39	15.1	0.45	5.84	3.40	13.74	1.50	3.50
2019-20	6.95	1.79	44.22	14.4	0.36	6.51	4.02	13.13	2.23	3.00
2018-19	0.39	0.00	0.00	16.89	0.02	6.59	4.19	12.72	3.01	2.50
2017-18	-3.37	1.81	44.48	15.79	-0.18	6.38	4.21	12.60	5.73	2.00
2016-17	6.69	1.99	44.57	15.08	0.38	6.48	4.20	13.11	3.71	1.50
2015-16	6.89	1.96	42.61	14.24	0.42	6.95	4.53	13.12	3.81	1.00
2014-15	10.20	2.06	41.34	13.87	0.63	7.44	4.75	12.00	2.12	.50
Average	8.315	1.573	38.967	15.03556	0.46	6.443	3.992	13.323	2.437	2.6475
S.D.	6.169522	.563667	13.08885	.870059	0.339411	0.525053	0.502211	.77262	1.48676	1.295773
Minimum	-3.37	0	0	13.87	-0.18	5.52	3.1	12	0.57	0.5
Maximum	17.46	2.06	45.39	16.89	0.98	7.44	4.75	14.68	5.73	5.0

The average ROE during the study period is 8.315 and standard deviation is 6.1695. The higher standard deviation means the variables were widely spread from the population we had taken. The return on equity is minimum in the year -3.37 (2017-18) the maximum is 17.46 (2023-24). So, we can say that the ROE is improved during the last few years.
The average ROCE during the study period is 1.573 and standard deviation is 0.56366. The standard deviation below 1 means the independent variable has impact on the dependent variable. Because all the variables were not widely scattered from mean. The minimum return on capital employed is 0 (2018-19) and maximum is 2.06 (in the year 2014-15). There is negative effect of ROCE on the credit rating of the securities due to decline during the last past year.
The average CASA ratio during the period of study is 38.967 and the standard deviation is 13.0885. The higher standard deviation means the variables were not near to the mean value. The minimum CASA ratio during the period of study is 0 (2018-19) and maximum is 45.39 (2020-21).
The average Debt-to-equity ratio is 15.035 and standard deviation is 0.870059. A standard deviation below 1 for an independent variable indicates that the data points were closely clustered around the mean, with the typical deviation being less than one unit of variable. The minimum debt-to-equity ratio is 13.87 (2014-15) and maximum is 16.89 (2018-19). But it decreased gradually during the study period.
The average ROA during the period of study is 0.46 and standard deviation is 0.33941. The minimum ROA is -0.18 (2017-18) and maximum is 0.98 (2023-24). The return on asset has improved during the study period.
The average interest income to total asset is 6.443 and standard deviation is 0.5251. The minimum interest income to total asset is 5.52 (2020-21) and maximum is 7.44 (2014-15). The interest income to total asset ratio is decreased during the period.
The average of interest expenses to total asset is 3.992 and standard deviation is 0.5022. The ratio of minimum interest expenses to total asset is 3.1 (2021-22) and maximum is 4.75 (2014-15). Interest expenses to total asset ratio has decreased during the last few years.
The average capital adequacy ratio is 13.323 and standard deviation is 0.77262. The minimum CAR is 12 (2014-15) and maximum is 14.68 (2022-23). The capital adequacy ratio is improved during the last 10 years.
The average NPA ratio is 2.437 and standard deviation is 1.4867. The minimum NPA ratio is 0.57 (2023-24) and maximum is 5.73 (2017-18). The non-performing asset ratio decreased during the period.

The bank got maximum rating of securities in the year 2023-24 i.e. 5.0 and the bank got low rating in the year 2014-15 i.e. 0.5. The securities rating improved during the study period.

State Bank of India:

Table 7: Table Showing Credit Rating Predictor of SBI

Model No.	Constant Predictor	R	R^2	Adjusted R^2	Standard Error of Estimate	F	P
1.	CAR	0.878	0.771	0.742	0.76848	26.924	0.001
2.	CAR, NPA	0.890	0.793	0.733	0.78177	13.374	0.004
3.	ROA, CAR, NPA	0.939	0.882	0.823	0.63760	14.911	0.003
4.	CAR, Interest Income to Total Asset, ROA, NPA	0.939	0.882	0.788	0.69755	9.347	0.015
5.	CAR, NPA, ROA, Interest Income to Total Asset, Interest Expenses to Total Asset	0.968	0.937	0.858	0.57100	11.852	0.016

In stepwise regression analysis we found that the independent variable CAR had significant effect on the credit rating of the securities. The R^2 value denotes the percentage of change in dependent variable due to 1% change in the independent variable. In model no. 1, the R^2 value is 0.771. There is 77.1% change in the dependent variable due to the 1% change in the independent variable i.e. CAR. In the following model no. 2,3,4,5 we had added more variable to know the highest impact of the independent variable on the dependent variable. In model number 5 we found the independent variables such as CAR, NPA, ROA, Interest income to total asset, Interest expenses to total asset had highest impact on the dependent variable i.e. credit rating of securities. The value of R^2 is 0.937 which means there will be 93.7% change in the dependent variable due to the change of independent variable in model 5. We can't accept null hypothesis if $p<0.05$. The P value is always less than 0.05 in all models. So, we can say the models were perfectly showing the relationship among the dependent variable and independent variables. The standard errors of estimates were below 1 in all models. The independent variables ROE, ROCE, Debt-To-Equity ratio, CASA had no significant impact on the credit rating of the securities. Among all the models the model 1 has the highest F value i.e. 26.924 which is F>2.5.

Bank of Baroda
Rating of Securities (Fixed Deposit, Infrastructure Bond, BASEL-III Tire – II Bond)

Table 8: Table Showing Credit Rating Score of Bank of Baroda

Year	Credit Rating (ICRA)	Rating Score	Weights	Final Score
2023-24	AA+	5	1	5.00
2022-23	AA+	5	0.9	4.50
2021-22	AA+	5	0.8	4.00
2020-21	AA+	5	0.7	3.50
2019-20	AA+	5	0.6	3.00
2018-19	AA+	5	0.5	2.50
2017-18	AA+	5	0.4	2.00
2016-17	AA+	5	0.3	1.50
2015-16	AA+	5	0.2	1.00
2014-15	AA+	5	0.1	.50

Table 9: Table Showing Credit Rating Parameter of Bank of Baroda

Important Parameter Influencing the Credit Rating of Bank of Baroda										
Year	ROE	ROCE	CASA	Debt-to-Equity	ROA	Interest Income/Total Asset	Interest Expenses/Total Asset	CAR	NPA	Rating Score
2023-24	15.85	2.01	38.76	0.845	1.12	7.10	4.28	15.84	0.68	5
2022-23	14.36	1.91	39.47	1.03	0.96	6.14	3.30	15.84	0.89	4.5
2021-22	8.46	1.81	41.45	1.19	0.56	5.46	2.91	16.24	1.72	4
2020-21	1.07	1.85	40.15	0.865	0.07	6.10	3.60	15.68	3.09	3.5
2019-20	0.76	1.77	35.28	1.26	0.04	6.56	4.19	13.30	3.13	3
2018-19	0.94	1.78	35.03	1.38	0.05	6.37	4.00	14.52	3.33	2.5
2017-18	-5.60	1.72	35.81	2.79	-0.33	6.06	3.90	11.81	5.49	2
2016-17	3.43	1.63	32.15	1.12	0.19	6.07	4.12	12.24	4.72	1.5
2015-16	-13.42	1.36	26.36	1.5	-0.80	6.56	4.66	13.17	5.06	1
2014-15	8.53	1.43	26.38	1.2	0.47	6.00	4.16	12.95	1.89	0.5
Average	3.438	1.727	35.084	1.319	0.233	6.242	3.912	14.159	3	2.75
S.D.	8.42255	0.193031	5.098871	0.52719	0.544207	0.414507	0.485877	1.574925	1.619907	1.436141
Minimum	-13.42	1.36	26.36	0.845	-0.8	5.46	2.91	11.81		
Maximum	15.85	2.01	41.45	2.79	1.12	7.1	4.66	16.24		

The average ROE during the study period is 3.432 and standard deviation is 8.4225. The minimum ROE during the study period is -13.42 (2015-16) and maximum is 15.85 (2023-24). The return on equity has improved during the study period.
The average ROCE during the study period is 1.727 and standard deviation is 0.1930. The minimum ROCE is 1.36 (2015-16) and maximum is 2.01 (2023-24). The ROCE has increased during the study period.
The average CASA ratio is 35.084 and standard deviation is 5.0988. The minimum CASA ratio during the study period is 26.36 (2015-16) and maximum is 41.45 (2021-22). The CASA ratio has improved during the study period.
The average Debt-to-equity ratio is 1.318 and standard deviation is 0.528. A standard deviation below 1 for an independent variable indicates that the data points were closely clustered around the mean, with the typical deviation being less than one unit of variable. The minimum debt-to-equity ratio is 0.845 (2023-24) and maximum is 2.79 (2017-18). But it decreased gradually during the study periods.
The average ROA during the period of study is 0.233 and standard deviation is 0.5442. The minimum ROA is -0.8 (2015-16) and maximum is 1.12 (2023-24). The return on asset has improved during the study period.
The average interest income to total asset is 6.242 and standard deviation is 0.4145. The minimum interest income to total asset is 5.46 (2021-22) and maximum is 7.1 (2023-24). The interest income to total asset ratio is increased during the period.
The average ratio of interest expenses to total asset is 3.912 and standard deviation is 0.4858. The minimum ratio of interest expenses to total asset is 2.91 (2021-22) and maximum is 4.66 (2015-16). Interest expenses to total asset ratio has decreased during the last few years.
The average capital adequacy ratio is 14.121 and standard deviation is 1.5381. The minimum CAR is 11.81 (2017-18) and maximum is 16.24 (2021-22). The capital adequacy ratio is improved during the study period.
The average NPA ratio is 3 and standard deviation is 1.6199. The minimum NPA ratio is 0.68 (in the year 2023-24) and maximum is 5.49 (2017-18). The non-performing asset ratio decreased during the period.
The bank got maximum rating of securities in the year 2023-24 i.e. 5.0 and the bank got low rating in the year 2014-15 i.e. 0.5. The securities rating improved during the study period.

Bank of Baroda

Table 10: Table Showing Credit Rating Predictor of Bank of Baroda

Model No.	Constant Predictor	R	R^2	Adjusted R^2	Standard Error of Estimate	F	P
1.	ROCE	0.933	0.871	0.855	0.57627	54.106	0.000
2.	ROCE, CASA	0.938	0.881	0.847	0.59285	25.840	0.001
3.	ROCE, CASA, Debt-to-Equity Ratio	0.953	0.909	0.864	0.55883		
4.	ROCE, CASA, Debt-to-Equity Ratio, Interest Income to Total Asset	0.991	0.982	0.960	0.30187	44.467	0.001
5.	ROCE, CASA, Debt-to-Equity Ratio, Interest Income to Total Asset, Interest Expenses to Total Asset	0.998	0.997	0.990	0.15465	143.220	0.001
6.	ROCE, CASA, Debt-to-Equity Ratio, Interest Income to Total Asset, Interest Expenses to Total Asset, CAR	0.999	0.998	0.990	0.15501	122.340	0.008
7.	ROCE, CASA, Debt-to-Equity Ratio, Interest Income to Total Asset, Interest Expenses to Total Asset, CAR, ROA	0.999	0.998	0.990	0.15501	122.340	0.008

The stepwise regression analysis showed that model 1 had p value 0.000 which is exact fitness of the model. ROCE has significant impact on the credit rating of the bank. The R value is 0.933 which indicates the strong positive relationship between the independent and dependent variable because R>0.7. The R^2value is 0.871 in model 1 which signified the 87.1% change in the dependent variable due to the change of independent variable i.e. ROCE. We added more independent variables in model 2,3,4,5 and 6. The model 6, there were 7 independent variables which had significant impact on the credit rating of the bank. The independent variables were ROCE, CASA, Debt-to-equity, Interest income to total asset ratio, Interest expenses to total asset ratio, CAR, ROA. The R value of 0.999 denotes the positive relationship between the independent and dependent variables. There is 99.8% change in the dependent variable due to the 1% change in the independent variables because R^2value is 0.998. The p value is less than 0.05 in all models. The standard error of estimation is below 1 in all models. The independent variables NPA, ROE had no significant impact on the credit rating of securities.

ICICI Bank
Credit Rating of Securities (BASEL-III Tier-II Bond, BASEL-III Tier-I Bond, Infrastructure Bond, BASEL-II Tier-II Bond)

Table 11: Table Showing Credit Rating Score of ICICI Bank

Year	Credit Rating (ICRA)	Rating Score	Weights	Final Score
2023-24	AA+	5	1	5.00
2022-23	AA+	5	0.9	4.50
2021-22	AA+	5	0.8	4.00
2020-21	AA+	5	0.7	3.50
2019-20	AA+	5	0.6	3.00
2018-19	AA+	5	0.5	2.50
2017-18	AA+	5	0.4	2.00
2016-17	AA+	5	0.3	1.50
2015-16	AA+	5	0.2	1.00
2014-15	AA+	5	0.1	.50

Table 12: Table Showing Credit Rating Parameter of ICICI Bank

Important Parameter Influencing the Credit Rating of Icici Bank										
Year	**ROE**	**ROCE**	**CASA**	**Debt-to-Equity**	**ROA**	**Interest Income/Total Asset**	**Interest Expenses/Total Asset**	**CAR**	**Net NPA (%)**	**Rating Score**
2023-24	17.37	3.27	42.17	6.57	2.18	7.63	3.66	16.33	0.45	5
2022-23	16.13	3.27	45.83	6.60	2.01	6.89	2.97	18.34	0.51	4.5
2021-22	13.94	2.92	48.69	7.01	1.65	6.12	2.75	19.2	0.81	4
2020-21	11.21	3.10	46.28	7.09	1.31	6.43	3.26	19.1	2.10	3.5
2019-20	6.99	2.67	45.11	8.24	0.72	6.80	3.78	16.11	1.54	3
2018-19	3.19	2.52	49.61	7.77	0.34	6.57	3.77	16.89	2.29	2.5
2017-18	6.63	2.91	51.68	7.28	0.77	6.25	3.63	18.42	5.43	2
2016-17	10.11	3.59	50.36	6.58	1.26	7.01	4.20	17.39	5.43	1.5
2015-16	11.19	3.47	45.82	6.86	1.34	7.31	4.37	16.64	2.98	1
2014-15	13.89	3.20	45.46	6.64	1.72	7.59	4.65	17.02	1.61	0.5
Average	11	3.092	47.101	7.064	1.33	6.86	3.704	17.544	2.315	4.78
S.D.	4.195235	0.321552	2.744276	0.533539	0.557728	0.504381	0.569916	1.078788	1.731891	0.169765
Minimum	3	2.52	42.17	6.57	0.34	6.12	2.75	16.11	0.45	4.33
Maximum	17	3.59	51.68	8.24	2.18	7.63	4.65	19.2	5.43	5

The average ROE during the period of study is 11 and the standard deviation is 4.195. The minimum ROE during the period is 3 (2018-19) and maximum ROE is 17.37 (2023-24). The return on equity has increased during the period of study.
The average ROCE during the period of study is 3.092 and standard deviation is 0.3215. The minimum ROCE is 2.52 (2018-19) and maximum ROCE is 3.59 (2016-17). The ROCE has slightly increased during the period of study.
The average CASA ratio during the period of study is 47.101 and standard deviation is 2.744. The minimum CASA during the period of study is 42.17 (2023-24) and maximum is 51.68 (2017-18). The CASA ratio has decreased during the period of study.
The average debt-to-equity ratio is 7.064 and standard deviation is 0.5335. The minimum debt-to-equity ratio is 6.57 (2023-24) and maximum is 8.24 (2019-20). The debt-to-equity ratio has decreased during the period of study.
The average ROA during the period of study is 1.33. The minimum ROA is 0.34 (2018-19) and maximum is 2.18 (2023-24). So, the ROA has improved during the period of study.
The average interest income to total asset ratio is 6.86 and standard deviation is 0.5043. The minimum interest income to total asset is 6.12 (2021-22) and maximum is 7.63 (2023-24). The interest income of the bank has increased during the period of study.
The average interest expenses to total asset ratio is 3.704 and standard deviation is 0.5699. The minimum ratio of interest expenses to total asset is 2.75 (2021-22) and maximum is 4.65 (2014-15). The interest expenses to total asset ratio has decreased during the period of study.
The average CAR ratio is 17.544 and standard deviation is 1.0787. The minimum CAR is 16.11 (2019-20) and maximum in the year 2021-22 (19.2). The CAR has decreased during the period of study.
The average Net NPA during the period of study is 2.315 and standard deviation is 1.731. The minimum NPA is 0.45 (2023-24) and maximum is 5.43 (in the year 2016-17). The net NPA ratio has decreased during the period of study.
The bank got maximum rating of securities in the year 2023-24 i.e. 5.0 and the bank got low rating in the year 2014-15 i.e. 0.5. The securities rating improved during the study period.

ICICI Bank

Table 13: Table Showing Credit Rating Predictor of ICICI Bank

Model No.	**Constant Predictors**	**R**	**R^2**	**Adjusted R^2**	**Standard Error OF Estimate**	**F**	**P**
1.	Interest Expenses to Total Asset	0.827	0.683	0.644	0.90380	17.249	0.003
2.	Interest Expenses to Total Asset, Interest Income to Total Asset	0.944	0.891	0.860	0.56741	28.531	0.000
3.	Interest Expenses to Total Asset, Interest Income to Total Asset, ROA	0.972	0.944	0.916	0.43802	33.834	0.000
4.	Interest Expenses to Total Asset, Interest Income to Total Asset, ROA, Debt-to-Equity Ratio	0.972	0.944	0.900	0.47927	21.198	0.002
5.	Interest Expenses to Total Asset, Interest Income to Total Asset, ROA, Debt-to-Equity Ratio, CAR	0.974	0.948	0.883	0.51768	14.592	0.011
6.	Interest Expenses to Total Asset, Interest Income to Total Asset, ROA, Debt-TO-Equity Ratio, CAR, Net NPA	0.979	0.958	0.874	0.53635	11.449	0.036

In regression analysis we found that interest expenses to total asset ratio has highest impact on the credit rating of securities. In model 1 R value is 0.827 which indicates a strong correlation because R>0.7. The R^2 value in the model 1 is 0.683 which indicates the change 68.3% in the dependent variable due to the 1% change in the independent variable i.e.

interest expenses to total asset ratio. In the subsequent models we had added other independent variables. In model 6 we had taken interest expenses to total asset ratio, interest income to total asset ratio, ROA, Debt-to-equity ratio, CAR, NPA as independent variables. The value of R^2value is 0.958 which signifies that 95.8% change in the dependent variable due to the 1% change of the independent variables in model 6. The p value 0.05 and below 0.05 is considered significant. In case of above models the p value is less than 0.05. So, all models were significant. The standard error of estimates in all models is less than 1. The ROE, ROCE, CASA ratios had no significant influence on the credit rating of the bank.

Punjab National Bank

Credit Rating of Securities (BASEL III Tier-II Bond, BASEL II Tier-II Bond, Fixed Deposit)

Table 14: Table Showing Credit Rating Score of PNB

Year	Credit Rating (ICRA)	Rating Score	Weights	Final Score
2023-24	AAA	5	1	5
2022-23	AA+	4	0.9	3.6
2021-22	AA+	4	0.8	3.2
2020-21	AA+	4	0.7	2.8
2019-20	AA-	2	0.6	1.2
2018-19	AA-	2	0.5	1
2017-18	AA+	4	0.4	1.6
2016-17	AA+	4	0.3	1.2
2015-16	AA+	4	0.2	0.8
2014-15	AA+	4	0.1	0.4

Table 15: Table Showing Credit Rating Parameter of PNB

Important Parameter Influencing the Credit Rating of Punjab National Bank										
Year	ROE	ROCE	CASA	Debt-to-Equity	ROA	Interest Income/Total Asset	Interest Expenses/Total Asset	CAR	Net NPA (%)	Rating Score
2023-24	8.39	1.63	40.33	13.15	0.52	6.84	4.27	15.97	0.73	5
2022-23	2.74	1.57	41.99	13.22	0.17	5.82	3.46	15.9	2.72	3.6
2021-22	3.90	1.61	46.55	12.44	0.26	5.69	3.51	14.5	4.80	3.2
2020-21	2.41	1.85	44.54	12.60	0.16	6.40	3.98	14.3	5.73	2.8
2019-20	0.58	1.80	42.97	12.10	0.04	6.47	4.37	14.14	5.78	1.2
2018-19	-24.20	1.70	42.16	17.36	-1.28	6.62	4.40	9.73	6.56	1
2017-18	-32.85	1.38	40.98	17.28	-1.60	6.26	4.31	9.20	11.24	1.6
2016-17	3.47	2.06	41.82	17.39	0.18	6.56	4.48	11.66	7.81	1.2
2015-16	-11.20	1.87	37.17	17.28	-0.59	7.10	4.81	11.28	8.61	0.8
2014-15	8.12	2.03	36.65	14.51	0.50	7.67	4.93	12.89	4.06	0.4
Average	-5.22556	1.763333	41.64778	14.90889	-0.24	6.51	4.25	12.62222	6.367778	1.755556
S.D.	13.48379	0.201792	2.856418	2.20273	0.703849	0.550546	0.459822	2.288034	2.851867	1.414779
Minimum	-32.85	1.38	36.65	12.1	-1.6	5.69	3.46	9.2	0.73	0.4
Maximum	8.39	2.06	46.55	17.39	0.52	7.67	4.93	15.97	11.24	5

The average ROE during the study period is 5.2556 and standard deviation is 13.463. The minimum ROE is -32.85 (2017-18) and maximum is 8.39 (2023-24). The ROE is improved during the study period.

The average ROCE during the study period is 1.763 and standard deviation is 2.856. The minimum ROCE is 1.38 (2017-18) and maximum is 2.06 (2016-17). The ROCE decreased during the study period.

The average CASA ratio during the study period is 41.64 and standard deviation is 2.856. The minimum CASA ratio is 36.65 (2014-15) and maximum is 46.55 (2021-22). The CASA ratio is improved during the period.

The average debt-to-equity ratio during the study period is 14.91 and standard deviation is 2.2073. The minimum debt-to-equity ratio is 12.1 (2019-20) and maximum is 17.39 (2016-17). The debt-to-equity ratio has decreased during the study period.

The average ROA during the study period is -0.24 and standard deviation is 0.7038. The minimum ROA is -1.6 (2017-18) and maximum is 0.52 (2023-24). The ROA during the study period increased.

The average interest income to total asset is 6.51 and standard deviation is 0.5505. The minimum interest income to total asset is 5.69 (2021-22) and maximum is 7.67 (2014-15). The interest income to total asset has decreased during the study period.

The average ratio of interest expenses to total asset is 4.25 and standard deviation is 0.4598. The minimum interest expenses to total asset ratio is 3.46 (2022-23) and maximum is 4.93 (2014-15). The interest expenses to total asset ratio has decreased during the study period.

The average CAR during the study period is 12.62 and

standard deviation is 2.288. The minimum CAR during the study period is 9.2 (2017-18) and maximum is 15.97 (2023-24). The CAR has increased during the study period.
The average NPA during the study period is 6.367 and standard deviation is 2.851. The minimum NPA is 0.73 (2023-24) and maximum is 11.24 (2017-18). The Net NPA ratio has decreased during the study period.
The bank got low rating in the year 2014-15 i.e. 0.4 and maximum is 5 in the year 2023-24.

Punjab National Bank

Table 16: Table Showing Credit Rating Predictor of PNB

Model No.	Constant Predictor	R	R^2	Adjusted R^2	Standard Error of Estimate	F	P
1.	CAR, ROA	0.827	0.684	0.593	0.95123	7.561	0.018
2.	CAR, ROA, Interest Expense to Total Asset Ratio	0.843	0.710	0.565	0.98376	4.894	0.047

In the stepwise regression analysis, we found that in model 1 the two variables named CAR, ROA had impact on the credit rating of the securities. Value of R i.e. 0.827 (R>0.7) denotes a strong positive relationship among the dependent variables and independent variables. R^2 value is 0.684 which indicates that there will be 68.4% change in the dependent variable due to the 1% change in the independent variables. In the subsequent model no. 2 we had added one more variables named interest expenses to total asset ratio. The R^2 value is 0.710 which indicates that 71% change in the dependent variables due to 1% change in the independent variables. The value of F statistics is also greater than 2.5 in above two models which indicate that the models show the perfect variability of variables. The probability values of two models were also greater than 0.05 which indicate the significance of the models. The standard error of estimates is below 1 in above all models. The ROE, ROCE, Debt-to-equity ratio, CASA ratio, interest income to total asset ratio, NPA were not statistically significant.

Conclusion

From the above analysis of 5 banks, we can draw the following conclusions:

i). ROA had the most significant impact on credit rating of securities of all banks.
ii). ROCE is the best predictor of the BOB's credit rating of securities.
iii). Return on capital employed has increased in all banks except Punjab national bank.
iv). The debt-to-equity ratio is decreased in all banks during the study period except Bank of Baroda and Punjab National Bank.
v). The average ROA is maximum in the case of ICICI bank i.e. 1.33 and ROA is negative in case of Punjab national bank i.e. -0.24.
vi). The interest expenses of all banks decreased except the Punjab national bank. The interest income of all banks increased during the study period except Punjab national bank.
vii). The ICICI bank, SBI, Bank of Baroda got a stable credit rating during the study period. Whereas the credit rating of securities of Bandhan Bank and Punjab national bank were highly volatile.
viii). The independent variable ROE had no impact on the credit rating of the securities of bank except in case of Bandhan Bank.

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