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Performance of Credit Risk Management in Indian Commercial Banks

A. Singh

Mewar University, Chittorgarh, Rajasthan, India

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ABSTRACT:
For banks and financial institutions, credit risk had been an essential factor that needed to be managed well. Credit risk was the possibility that a borrower of counter party would fail to meet its obligations in accordance with agreed terms. Credit risk; therefore arise from the bank's dealings with or lending to corporate, individuals, and other banks or financial institutions.
Credit risk had been the oldest and biggest risk that bank, by virtue of its very nature of business, inherited.Currently in India there were many banks in operation. From these some public sector banks are namely State Bank of India, Punjab National Bank, Oriental Bank of Commerce, Bank of India, Indian Bank, Indian Overseas Bank, Syndicate Bank, Bank of Baroda, Canara Bank, Allahabad Bank, UCO Bank, Vijaya Bank and private sector banks are Axis Bank, ICICI Bank, IndusInd Bank, ING Vysya Bank, Dhanlaxmi Bank, HDFC Bank, YES Bank, Kotak Mahindra Bank, Karnataka Bank, ABN Amro Bank, Federal Bank, Laxmi Vilas Bank were selected to examine the impact level of credit risk management towards the profitability of Indian commercial banks. To examine its impact level the researcher had used multiple regression models by taking 11 years return on asset (ROA), non performing asset (NPA) and capital adequacy ratio (CAR) from each bank. The researcher had collected data from RBI annual report since 2003 to 2013 for regression purpose.

Keywords: *Banks, Commercial banks, Private sector banks, Public sector banks, Return on asset, Net performing asset, Capital adequacy ratio*

INTRODUCTION

Economic development had been a continuous process. The success of economic development depended essentially on the extent of mobilization of resources and investment and on the operational efficiency and economic discipline displayed by the various segments of the economy. The banking had become the foundation of modern economic development.

Banks played a positive role in the economic development of a country as they not only accepted and deployed large funds in a fiduciary capacity but also leveraged such funds through credit creation. A commercial bank was a financial intermediary which accepted deposits of money from the public and lent them with a view to make profits. A post office might accept deposits but it could not be called a bank because it did not perform the other essential function of a bank, i.e. lending money. The banking system formed the core of the financial sector of an economy. The role of commercial banks was particularly important in

***Corresponding Author, Email:** *asha2007singh@yahoo.co.in*, Asha Singh

underdeveloped countries. Through mobilization of resources and their better allocation, commercial banks played an important role in the development process of underdeveloped countries. A commercial bank accepted deposits which were of various types like current, savings, securing and fixed deposits. It granted credit in various forms such as loans and advances, discounting of bills and investment in open market securities. It rendered investment services such as underwriters and bankers for its issue of securities to the public.

Banks were financial institutions that accepted deposit and made loans. Commercial banks in India extended credit (loan) to different types of borrower for many different purposes. For most customers, bank credit was the primary source of available debt financing and for banks; good loans were the most profitable assets (Mishkin, 2004).

Credit risk management determined the effectiveness of a commercial bank. The main functions of a commercial bank could be segregated into three main areas:

(i) Payment System
(ii) Financial Intermediation
(iii) Financial Services.

(i) Payment System: Banks were at the core of the payments system in an economy. A payment referred to the means by which financial transactions were settled. A fundamental method by which banks helped in settling the financial transaction process was by issuing and paying cheques issued on behalf of customers. Further, in modern banking, the payments system also involved electronic banking, wire transfers, settlement of credit card transactions, etc. In all such transactions, banks played a critical role.

(ii) Financial Intermediation: The second principal function of a bank was to take different types of deposits from customers and then lend these funds to borrowers, in other words, financial intermediation. In financial terms, bank deposits represented the banks' liabilities, while loans disbursed, and investments made by banks were their assets. Bank deposits serve the useful purpose of addressing the needs of depositors, who wanted to ensure liquidity, safety as well as returns in the form of interest. On the other hand, bank loans and investments made by banks played an important function in channelling funds into profitable as well as socially productive uses.

(iii) Financial Services: In addition to acting as financial intermediaries, banks today involved with offering customers a wide variety of financial services including investment banking, insurance-related services, government-related business, foreign exchange businesses, wealth management services, etc. Income from providing such services improved a bank's profitability.

As per different researchers and authors, Credit risk was the most significant of all risks in terms of size of potential losses. As the extension of credit had always been at the core of banking operation, the focus of banks' risk management had been credit risk management. When banks managed their risk better, they would get advantage to increase their performance (return). Better risk management indicated that banks operated their activities at lower relative risk and at lower conflict of interests between parties (Santomero, 1997).

The advantages of implementing better risk management led to better banks performance. Better bank performance increases their reputation and image from public or market point of view. The banks also get more opportunities to increase the productive assets, leading to higher bank profitability, liquidity, and solvency (Eduardus et al., 2007). Therefore, Effective credit risk management should be a critical component of a bank's overall risk management strategy and considered essential to the long-term success of any banking organization. It therefore appeared more and more significant in order to ensure sustainable profits in banks.

Literature Review

Within the last few years, a number of studies had provided the discipline into the practice of credit risk management within banking sector. An insight of related studies could be as follows:

Private sector banks were more serious to implement effective credit risk management practice than state owned banks. A study conducted by Kuo and Enders (2004) of credit risk management policies for state banks in China and found that mushrooming of the financial market; the state owned commercial banks in China were faced with the unprecedented challenges and tough for them to compete with foreign bank unless they could make some thoughtful change. In this thoughtful change, the reform of credit risk management was a major step that determined whether the state owned commercial banks in China would survive the challenges or not.

Felix and Claudine (2008) investigated the relationship between bank performance and credit risk management. It could be inferred from their findings that return on equity (ROE) and return on assets (ROA) both measuring profitability were inversely related to the ratio of non-performing loan to total loan of financial institutions thereby leading to a decline in profitability.

Ahmad and Ariff (2007) examined the key determinants of credit risk of commercial banks on emerging economy banking systems compared with the developed economies. The study found that regulation was important for banking systems that offered multi-products and services; management quality is critical in the cases of loan-dominant banks in emerging economies. An increase in loan loss provision was also considered to be a significant determinant of potential credit risk.

Ghosh and Das (2005) focused on whether, and to what extent, governments should impose capital adequacy requirements on banks, or alternately, whether market forces could also ensure the stability of banking systems. The study contributed to this debate by showing how market forces might motivate banks to select high capital adequacy ratios as a means of lowering their borrowing costs. Empirical tests for the Indian public sector banks during the 1990s demonstrate that better capitalized banks experienced lower borrowing costs. These findings suggested that ongoing reform efforts at the international level should primarily focus on increasing transparency and strengthening competition among the banks.

Thiagarajan et al. (2011) analyzed the role of market discipline on the behavior of commercial banks with respect to their capital adequacy. The study showed that the Capital Adequacy Ratio (CAR) in the Indian commercial banking sector showed that the commercial banks were well capitalized and the ratio was well over the regulatory minimum requirement. The private sector banks showed a higher percentage of tier-I capital over the public sector banks. However the public sector banks showed a higher level of tier-II capital. Although the full implementation of Basel II accord by the regulatory authority (RBI) might have influenced the level of capital adequacy in the banking sector. The study indicated that market forces influence the bank's behavior to keep their capital adequacy well above the regulatory norms. The Non-Performing Assets significantly influenced the cost of deposits for both public and private sector banks. The return on equity had a significant positive influence on the cost of deposits for private sector banks. The public sector banks could reduce the cost of deposits by increasing their tier-I capital.

Based upon literature review, this research paper analyzed the performance of private sector and public sector banks undertaken for the study.

Statement of the Problem

Banking Industry happened to be the backbone of an economy, without proper banking channels the total business environment would be adversely affected. After liberalization an extensive banking network had been established and Indian banking system was no longer confined to urban area: in fact, Indian banking sector had undergone a tremendous change in the last few decades. Earlier banks were only considered as means of depositing money but now the total scenario had changed. Today more and more private banks came forward for providing a number of financial and non-financial services. The modern banking was placed in a very complex and intricate environment so its proper functioning was very essential for the growth of an economy.

This study was an attempt to sketch the various important aspects of the Private and Public banking sector. A major part of the work was to ascertain as to what extent banks could manage their credit risks, what tools or

techniques were at their disposal and to what extent their performance could be augmented by proper credit risk management policies and strategies. Also intended to have a comparative study of Non Performing Assets (NPAs), Capital Adequacy Ratio (CAR), Return on Asset (ROA) of Private and Public Sector Banks in India.

Objective of the Study

The main objective of the study was to have bigger picture on credit risk management and its impact on their performance and to make the comparison of the performances of Public Sector Banks (PSB) and Private Sector Banks (PvtSB) in India.

Significance of the Study

The significance of this paper was:

- ✓ To show the relationship between credit risk management and performance.
- ✓ To show relationship between ROA, NPA and CAR.

Research Hypothesis

The researcher expected with better credit risk management with high return on asset (ROA) and lower non-performing asset (NPA).With the help of data the study was established and tested the following hypothesis:

Hypothesis 1 (H0): credit risk management had an effect on the bank performance.

Hypothesis 2 (H1): credit risk management had no effect on the bank performance.

RESEARCH METHOD

The researcher used the data from private sector banks and public sector banks of India for analysis to examine the relationship between return on asset (ROA) which was performance indicators capital adequacy ratio (CAR) and non-performing assets (NPAs). These two were the indicators of risk management which affected the profitability of banks. NPA, in particular, indicated how banks managed their credit risk. The research was quantitative research. Meant for, the researcher used regression model to analyze the data which was collected from the public and private sector banks of India.

RESULTS AND DISCUSSION

Analysis of Data

Before rushing towards data analysis and presentation the researcher made a diagnostic test for the data which collected from the annual report of Reserve Bank of India (RBI). Researcher had collected data of ROA, Net NPAs and CAR of Public and Private Sector banks from annual report of RBI since 2003 to 2013. The researcher has conducted correlation and linear regression test between ROA & NPA and ROA & CAR of public and private sector banks.

Comparison between ROA, NPAs and CAR of Public Sector Banks (PSB)

Table 1 shows the comparison between percentage of ROA, Net NPAs and CAR of public sector banks for 11 years.

The result of correlation and linear regression test between ROA & NPA was in figure 1.

Where Y axis = ROA and X axis = NPA

The equation of the straight line relating ROA and NPA was estimated as: ROA = (0.8409) + (0.0503) NPA using the 11 observations in this dataset. The y-intercept, the estimated value of ROA when NPA was zero, was 0.8409 with a standard error of 0.0835. The slope, the estimated change in ROA per unit change in NPA, was 0.0503 with a standard error of 0.0400. Table 2 shows the value of R-Squared, the proportion of the variation in ROA that could be accounted for by variation in NPA, was 0.1494. The correlation between ROA and NPA was 0.3865.

Table 3 shows, in case of dependent variable, the standard deviation = 0.1427, minimum value = 0.7800 and maximum value = 1.2700 whereas in case of independent variable, the standard deviation = 1.0968, minimum value = 0.9400 and maximum value = 4.5400.

Table 1: Comparison of ROA, Net NPAs & CAR of PSB

Years	ROA (%)	Net NPA (%)	CAR (%)
2002-03	1	4.54	12.6
2003-04	1.27	3	13.2
2004-05	0.9	2	12.9
2005-06	0.8	1.3	12.2
2006-07	0.8	1.1	12.36
2007-08	1	1	12.51
2008-09	1.02	0.94	13.11
2009-10	0.97	1.09	13.28
2010-11	0.86	1.2	12.87
2011-12	0.85	1.7	12.49
2012-13	0.78	2.02	12.38

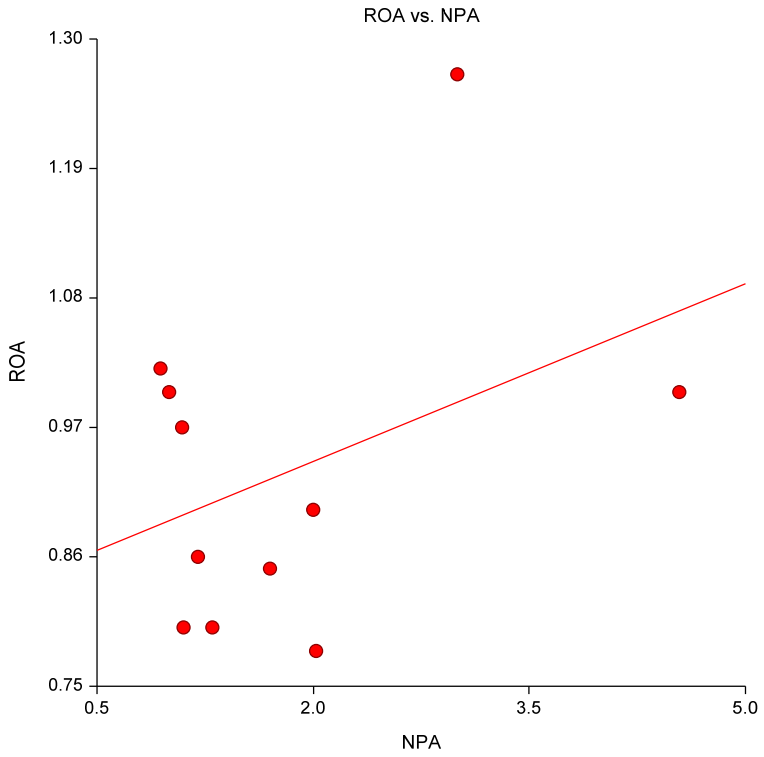

Figure1: Linear regression between ROA and NPA of PSB

Table 2: Run summary section

Parameter	Value	Parameter	Value
Dependent variable	ROA	Rows Processed	11
Independent Variable	NPA	Rows used in Estimation	11
Frequency variable	None	Rows with X Missing	0
Weight Variable	None	Rows with Freq. Missing	0
Intercept	0.8409	Rows Prediction Only	0
Slope	0.0503	Sum of Frequencies	11
R-Squared	0.1494	Sum of Weights	11.0000
Correlation	0.3865	Coefficient of variation	0.1489
Mean Square Error	0.01923905	Square Root of MSE	0.1387049

Table 3: Descriptive statistics section

Parameter	Dependent	Independent
Variable	ROA	NPA
Count	11	11
Mean	0.9318	1.8082
Standard Deviation	0.1427	1.0968
Minimum	0.7800	0.9400
Maximum	1.2700	4.5400

Table 4 shows, a significance test that the slope was zero resulted in a t-value of 1.2573. The significance level of this t-test was 0.2403. Since 0.2403 > 0.0500, the hypothesis that the slope was zero was not rejected.

The estimated slope was 0.0503. The lower limit of the 95% confidence interval for the slope was -0.0402 and the upper limit was 0.1408. The estimated intercept was 0.8409. The lower limit of the 95% confidence interval for the intercept was 0.6519 and the upper limit was 1.0299.

It also shows the least-squares estimates of the intercept and slope followed by the corresponding standard errors, confidence intervals, and hypothesis tests. These results were based on several assumptions.

Estimated Model

ROA = (0.840899782796974) + (0.0502816686391794) * (NPA)

Table 5 shows the F-Ratio for testing whether the slope was zero, the degrees of freedom, and the mean square error. The mean square error, which estimated the variance of the residuals, was used extensively in the calculation of hypothesis tests and confidence intervals.

Table 6 shows that there was no serial correlation.

Table 4: Regression estimation section

Parameter	Intercept B(0)	Slope B(1)
Regression Coefficients	0.8409	0.0503
Lower 95% Confidence Limit	0.6519	- 0.0402
Upper 95% Confidence Limit	1.0299	0.1408
Standard Error	0.0835	0.0400
Standardized Coefficient	0.0000	0.3865
T Value	10.0663	1.2573
Prob Level(T Test)	0.0000	0.2403
Reject H0(Alpha = 0.0500)	Yes	No
Power (Alpha = 0.0500)	1.0000	0.2032
Regression of Y on X	0.8409	0.0503
Inverse Regression from X on Y	0.3233	0.3366
Orthogonal Regression of Y and X	0.8396	0.0510

Table 5: Analysis of variance section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	9.551136	9.551136			
Slope	1	0.03041218	0.03041218	1.5808	0.2403	0.2032
Error	9	0.1731514	0.01923905			
Adj. Total	10	0.2035636	0.02035636			
Total	11	9.7547				

s = Square Root (0.01923905) = 0.1387049

Table 6: Tests of assumptions section

Assumption/Test Residuals follow Normal Distribution?	Test Value	Prob Level	Is the Assumption Reasonable at the 0.2000 Level of Significance?
Shapiro Wilk	0.9039	0.206401	Yes
Anderson Darling	0.5583	0.149388	No
D'Agostino Skewness	1.4977	0.134215	No
D'Agostino Kurtosis	0.5088	0.610903	Yes
D'Agostino Omnibus	2.5019	0.286229	Yes
Constant Residual Variance?			
Modified Levene Test	0.0011	0.974035	Yes
Relationship is a Straight Line?			
Lack of Linear Fit F(0,0) Test	0.0000	0.000000	No

Residual Plot Section

Figure 2 shows scattered diagram between residuals of ROA vs NPA.

The relationship between ROA vs CAR of public sector banks by using data of table1 was given in figure 3.

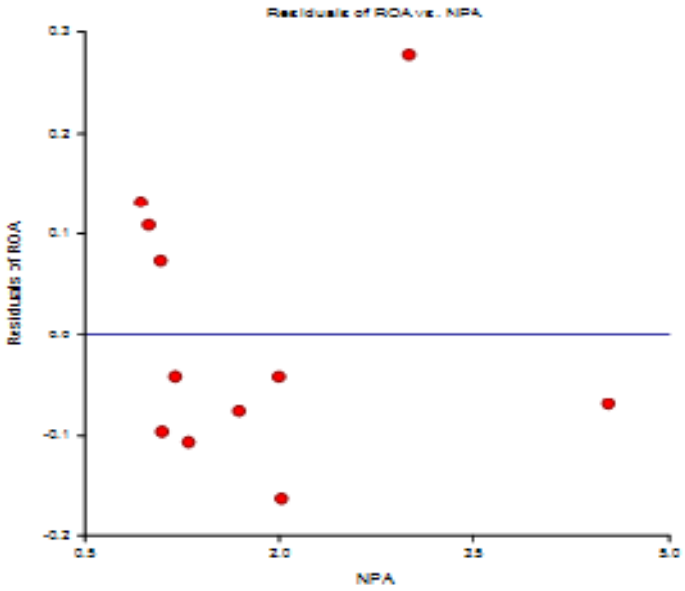

Figure 2: Residuals of ROA vs NPA

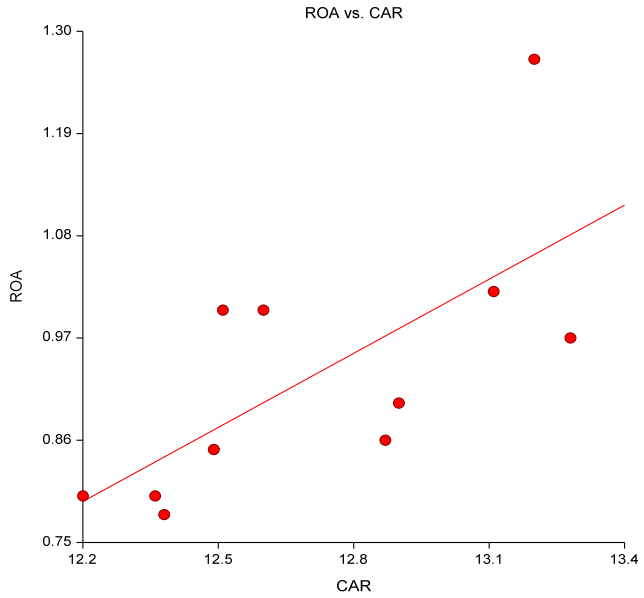

Figure 3: Linear regression plot Section between ROA and CAR of PSB

The equation of the straight line relating ROA and CAR was estimated as: ROA = (-2.4420) + (0.2653) CAR using the 11 observations in this dataset. The y-intercept, the estimated value of ROA when CAR was zero, was -2.4420 with a standard error of 1.1796. The slope, the estimated change in ROA per unit change in CAR, was 0.2653 with a standard error of 0.0927. Table 7 shows the value of R-Squared, the proportion of the variation in ROA that could be accounted for by variation in CAR, was 0.4763. The correlation between ROA and CAR was 0.6902.

Table 8 shows, in case of dependent variable, the standard deviation = 0.1427, minimum value = 0.7800 and maximum value = 1.2700 whereas in case of independent variable, the standard deviation = 0.3712, minimum value = 12.2000 and maximum value = 13.2800.

Table 9 shows a significance test that the slope was zero resulted in a t-value of 2.8613. The significance level of this t-test was 0.0187. Since 0.0187 < 0.0500, the hypothesis that the slope was zero was rejected.

The estimated slope was 0.2653. The lower limit of the 95% confidence interval for the slope was 0.0555 and the upper limit was 0.4750. The estimated intercept was -2.4420. The lower limit of the 95% confidence interval for the intercept was -5.1104 and the upper limit was 0.2264.

It also shows the least-squares estimates of the intercept and slope followed by the corresponding standard errors, confidence intervals, and hypothesis tests. These results were based on several assumptions.

Table 7: Run summary section

Parameter	Value	Parameter	Value
Dependent variable	ROA	Rows Processed	11
Independent Variable	CAR	Rows used in Estimation	11
Frequency variable	None	Rows with X Missing	0
Weight Variable	None	Rows with Freq. Missing	0
Intercept	-2.4420	Rows Prediction Only	0
Slope	0.2653	Sum of Frequencies	11
R-Squared	0.4763	Sum of Weights	11.0000
Correlation	0.6902	Coefficient of variation	0.1168
Mean Square Error	0.01184408	Square Root of MSE	0.1088305

Table 8: Descriptive statistics section

Parameter	Dependent	Independent
Variable	ROA	CAR
Count	11	11
Mean	0.9318	12.7182
Standard Deviation	0.1427	0.3712
Minimum	0.7800	12.2000
Maximum	1.2700	13.2800

Estimated Model

ROA = (-2.44197036470223) +
(0 .265272866416879) * (CAR)

Table 10 shows the F-Ratio for testing whether the slope was zero, the degrees of freedom, and the mean square error. The mean square error, which estimated the variance of the residuals, was used extensively in the calculation of hypothesis tests and confidence intervals.

Table 11 shows that there was no serial correlation.

Table 9: Regression estimation section

Parameter	Intercept B(0)	Slope B(1)
Regression Coefficients	-2.4420	0.2653
Lower 95% Confidence Limit	-5.1104	0.0555
Upper 95% Confidence Limit	0.2264	0.4750
Standard Error	1.1796	0.0927
Standardized Coefficient	0.0000	0.6902
T Value	-2.0702	2.8613
Prob Level(T Test)	0.0683	0.0187
Reject H0(Alpha = 0.0500)	No	Yes
Power (Alpha = 0.0500)	0.4559	0.7217
Regression of Y on X	-2.4420	0.2653
Inverse Regression from X on Y	-6.1508	0.5569
Orthogonal Regression of Y and X	-2.7034	0.2858

Table 10: Analysis of variance section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power(5%)
Intercept	1	9.551136	9.551136			
Slope	1	0.09696688	0.09696688	8.1869	0.0187	0.7217
Error	9	0.1065968	0.01184408			
Adj. Total	10	0.2035636	0.02035636			
Total	11	9.7547				

Table 11: Tests of assumptions section

Assumption/Test Residuals follow Normal Distribution?	Test Value	Prob Level	Is the Assumption Reasonable at the 0.2000 Level of Significance?
Shapiro Wilk	0.9016	0.193148	No
Anderson Darling	0.5010	0.207532	Yes
D'Agostino Skewness	1.4626	0.143640	No
D'Agostino Kurtosis	0.3048	0.760556	Yes
D'Agostino Omnibus	2.2314	0.327686	Yes
Constant Residual Variance?			
Modified Levene Test	0.2319	0.641647	Yes
Relationship is a Straight Line?			
Lack of Linear Fit F(0,0) Test	0.0000	0.000000	No

Residual Plot Section

Figure 4 shows scattered diagram between residuals of ROA vs CAR.

Comparison between ROA, NPAs and CAR of Private Sector Banks (PvtSB)

Table 12 shows the comparison between percentage of ROA, Net NPAs and CAR of Private sector banks for 11 years. Researcher applied Correlation and Linear Regression Test on given data in table 12.

The result of Correlation and Linear Regression analysis about private sector banks was as given in figure 5.

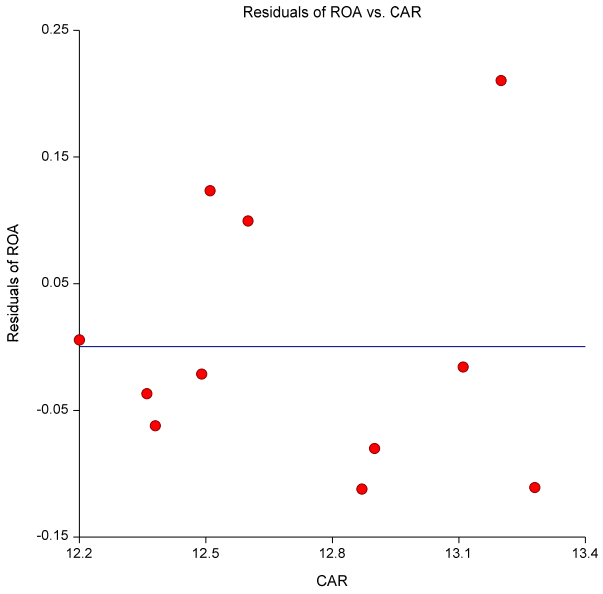

Figure 4: Residuals of ROA vs CAR

Table 12: Comparison of ROA, Net NPAs & CAR of private sector banks

Years	ROA (%)	Net NPA (%)	CAR (%)
2002-03	0.83	4.95	12.8
2003-04	0.75	2.8	12.7
2004-05	0.13	2.7	12.5
2005-06	0.9	1.7	11.7
2006-07	0.9	1	12.08
2007-08	1.12	0.7	14.08
2008-09	1.1	0.9	16.29
2009-10	1.2	0.82	16.24
2010-11	1.02	0.53	15.99
2011-12	1.12	0.6	12.25
2012-13	1.63	0.74	13.72

Where Y= ROA and X = NPA

The equation of the straight line relating ROA and NPA was estimated as: ROA = (1.2058) + (-0.1470) NPA using the 11 observations in this dataset. The y-intercept, the estimated value of ROA when NPA was zero, was 1.2058 with a standard error of 0.1514. The slope, the estimated change in ROA per unit change in NPA, was -0.1470 with a standard error of 0.0735. Table 13 shows, the value of R-Squared, the proportion of the variation in ROA that could be accounted for by variation in NPA, was 0.3078. The correlation between ROA and NPA was -0.5548.

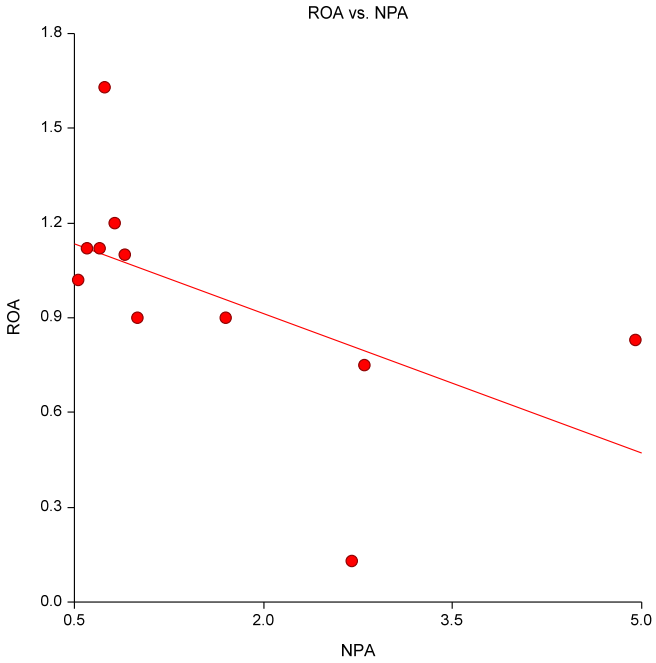

Figure 5: Linear regression between ROA and NPA of PvtSB

Table 13: Run summary section

Parameter	Value	Parameter	Value
Dependent variable	ROA	Rows Processed	11
Independent Variable	NPA	Rows used in Estimation	11
Frequency variable	None	Rows with X Missing	0
Weight Variable	None	Rows with Freq. Missing	0
Intercept	1.2058	Rows Prediction Only	0
Slope	-0.1470	Sum of Frequencies	11
R-Squared	0.3078	Sum of Weights	11.0000
Correlation	-0.5548	Coefficient of variation	0.3296
Mean Square Error	0.1027637	Square Root of MSE	0.3205678

Table 14 shows, in case of dependent variable, the standard deviation = 0.3655, minimum value = 0.1300 and maximum value = 1.6300 whereas in case of independent variable, the standard deviation = 1.3796, minimum value = 0.5300 and maximum value = 4.9500.

Table 15 shows a significance test that the slope was zero resulted in a t-value of -2.0007. The significance level of this t-test was 0.0765. Since 0.0765 > 0.0500, the hypothesis that the slope was zero was not rejected.

The estimated slope was -0.1470. The lower limit of the 95% confidence interval for the slope was -0.3132 and the upper limit were 0.0192. The estimated intercept was 1.2058. The lower limit of the 95% confidence interval for the intercept was 0.8634 and the upper limit was 1.5482.

It also shows the least-squares estimates of the intercept and slope followed by the corresponding standard errors, confidence intervals, and hypothesis tests. These results were based on several assumptions.

Table 14: Descriptive statistics section

Parameter	Dependent	Independent
Variable	ROA	NPA
Count	11	11
Mean	0.9727	1.5855
Standard Deviation	0.3655	1.3796
Minimum	0.1300	0.5300
Maximum	1.6300	4.9500

Table 15: Regression estimation section

Parameter	Intercept B(0)	Slope B(1)
Regression Coefficients	1.2058	-0.1470
Lower 95% Confidence Limit	0.8634	-0.3132
Upper 95% Confidence Limit	1.5482	0.0192
Standard Error	0.1514	0.0735
Standardized Coefficient	0.0000	-0.5548
T Value	7.9658	-2.0007
Prob Level (T Test)	0.0000	0.0765
Reject H0 (Alpha = 0.0500)	Yes	No
Power (Alpha = 0.0500)	1.0000	0.4316
Regression of Y on X	1.2058	-0.1470
Inverse Regression from X on Y	1.7299	-0.4776
Orthogonal Regression of Y and X	1.2174	-0.1543

Estimated Model

ROA = (1.20580591296107) + (-0.14701061023921) * (NPA)

Table 16 shows the F-Ratio for testing whether the slope was zero, the degrees of freedom, and the mean square error. The mean square error, which estimates the variance of the residuals, was used extensively in the calculation of hypothesis tests and confidence intervals.

Table 17 shows that there was no serial correlation.

Residual Plot Section

Figure 6 shows scattered diagram between residuals of ROA vs NPA.

The relationships between ROA vs. CAR of private sector banks by using data of table 12 was in figure 7.

Table 16: Analysis of variance section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power(5%)
Intercept	1	10.40818	10.40818			
Slope	1	0.411345	0.411345	4.0028	0.0765	0.4316
Error	9	0.9248731	0.1027637			
Adj. Total	10	1.336218	0.1336218			
Total	11	11.7444				

s = Square Root (0.1027637) = 0.3205678.

Table 17: Tests of assumptions section

Assumption/Test Residuals follow Normal Distribution?	Test Value	Prob Level	Is the Assumption Reasonable at the 0.2000 Level of Significance?
Shapiro Wilk	0.9040	0.206587	Yes
Anderson Darling	0.6460	0.091945	No
D'Agostino Skewness	-0.8286	0.407346	Yes
D'Agostino Kurtosis	1.6798	0.093005	No
D'Agostino Omnibus	3.5081	0.173071	No
Constant Residual Variance?			
Modified Levene Test	0.5177	0.490065	Yes
Relationship is a Straight Line?			
Lack of Linear Fit F(0,0) Test	0.0000	0.000000	No

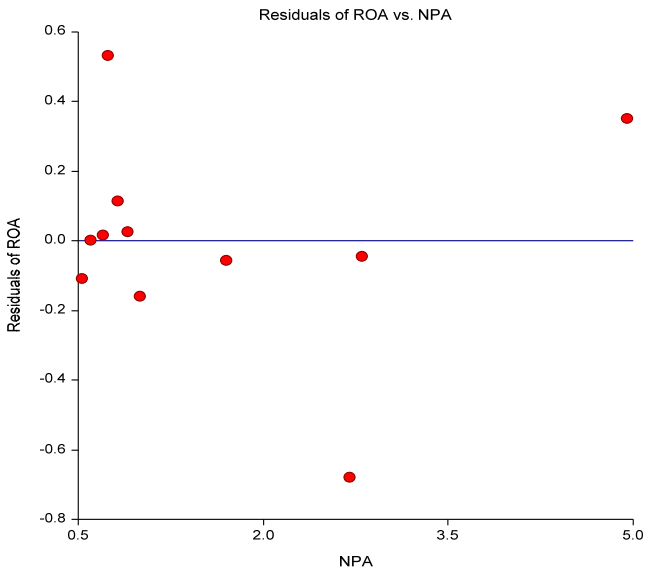

Figure 6: Residuals of ROA vs. NPA

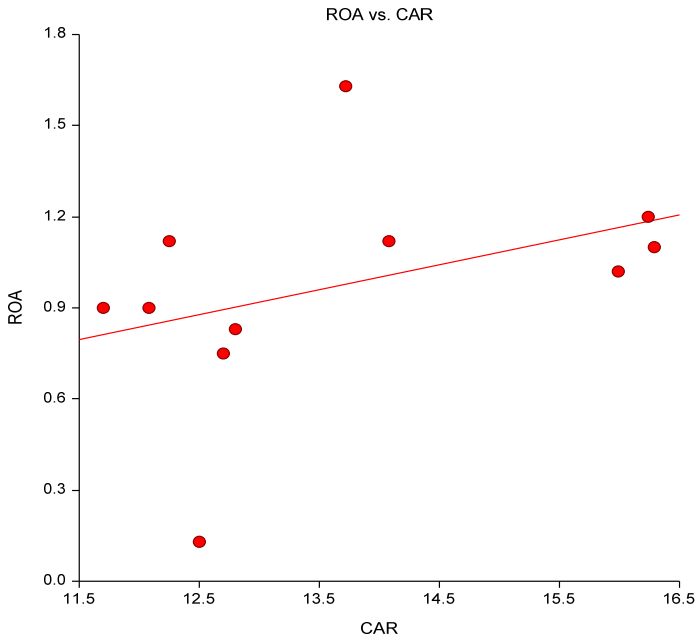

Figure 7: Linear regression between ROA and CAR of PvtSB

The equation of the straight line relating ROA and CAR was estimated as: ROA = (-0.1455) + (0.0818) CAR using the 11 observations in this dataset. The y-intercept, the estimated value of ROA when CAR was zero, was -0.1455 with a standard error of 0.8840. The slope, the estimated change in ROA per unit change in CAR, was 0.0818 with a standard error of 0.0642. Table 18 shows, the value of R-Squared, the proportion of the variation in ROA that could be accounted for by variation in CAR, was 0.1529. The correlation between ROA and CAR was 0.3910.

Table 19 shows, in case of dependent variable, the standard deviation = 0.3655, minimum value = 0.1300 and maximum value = 1.6300 whereas in case of independent variable, the standard deviation = 1.7468, minimum value = 11.7000 and maximum value = 16.2900.

Table 20 shows, a significance test that the slope was zero resulted in a t-value of 1.2743. The significance level of this t-test was 0.2345. Since 0.2345 > 0.0500, the hypothesis that the slope was zero was not rejected.

The estimated slope was 0.0818. The lower limit of the 95% confidence interval for the slope was -0.0634 and the upper limit was 0.2270. The estimated intercept was -0.1455. The lower limit of the 95% confidence interval for the intercept was -2.1453 and the upper limit was 1.8543. It also shows the least-squares estimates of the intercept and slope followed by the corresponding standard errors, confidence intervals, and hypothesis tests. These results were based on several assumptions.

Table 18: Run summary section

Parameter	Value	Parameter	Value
Dependent variable	ROA	Rows Processed	11
Independent Variable	CAR	Rows used in Estimation	11
Frequency variable	None	Rows with X Missing	0
Weight Variable	None	Rows with Freq. Missing	0
Intercept	-0.1455	Rows Prediction Only	0
Slope	0.0818	Sum of Frequencies	11
R-Squared	0.1529	Sum of Weights	11.0000
Correlation	0.3910	Coefficient of variation	0.3646
Mean Square Error	0.1257752	Square Root of MSE	0.3546481

Table 19: Descriptive statistics section

Parameter	Dependent	Independent
Variable	ROA	CAR
Count	11	11
Mean	0.9727	13.6682
Standard Deviation	0.3655	1.7468
Minimum	0.1300	11.7000
Maximum	1.6300	16.2900

Estimated Model

ROA = (-0.145500032771452) +
(0.081812440043139) * (CAR)

Table 21 shows the F-Ratio for testing whether the slope was zero, the degrees of freedom, and the mean square error. The mean square error, which estimated the variance of the residuals, was used extensively in the calculation of hypothesis tests and confidence intervals.

Table 22 shows that there was no serial correlation.

Table 20: Regression estimation section

Parameter	Intercept B(0)	Slope B(1)
Regression Coefficients	-0.1455	0.0818
Lower 95% Confidence Limit	-2.1453	-0.0634
Upper 95% Confidence Limit	1.8543	0.2270
Standard Error	0.8840	0.0642
Standardized Coefficient	0.0000	0.3910
T Value	-0.1646	1.2743
Prob Level(T Test)	0.8729	0.2345
Reject H0(Alpha = 0.0500)	No	No
Power (Alpha = 0.0500)	0.0525	0.2075
Regression of Y on X	-0.1455	0.0818
Inverse Regression from X on Y	-6.3431	0.5352
Orthogonal Regression of Y and X	-0.1883	0.0849

Table 21: Analysis of variance section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power(5%)
Intercept	1	10.40818	10.40818			
Slope	1	0.204241	0.204241	1.6239	0.2345	0.2075
Error	9	1.131977	0.1257752			
Adj. Total	10	1.336218	0.1336218			
Total	11	11.7444				

s = Square Root (0.1257752) = 0.3546481

Table 22: Tests of assumptions section

Assumption/Test Residuals follow Normal Distribution?	Test Value	Prob Level	Is the Assumption Reasonable at the 0.2000 Level of Significance?
Shapiro Wilk	0.9031	0.201400	Yes
Anderson Darling	0.6370	0.096779	No
D'Agostino Skewness	-0.6296	0.528948	Yes
D'Agostino Kurtosis	1.8920	0.058490	No
D'Agostino Omnibus	3.9761	0.136963	No
Constant Residual Variance?			
Modified Levene Test	0.0352	0.855279	Yes
Relationship is a Straight Line?			
Lack of Linear Fit F(0,0) Test	0.0000	0.000000	No

Residual Plot Section

Figure 8 shows scattered diagram between residuals of ROA vs CAR.

The researcher had observed from correlation and linear regression test conducted between public sector and private sector banks by using variables ROA and NPA that in case of public sector banks the correlation between ROA and NPA was 0.3865 and a significance test that the slope was zero resulted in a t-value of 1.2573. The significance test level of this t-test was 0.2403. Since 0.2403>0.0500, the hypothesis that the slope of zero was not rejected. But in case of private sector banks correlation between ROA and NPA was -0.5548 and significance test that the slope was zero resulted in a t-value of -2.0007. The significance test level of this t-test was 0.0765. Since 0.0765 >0.0500, the hypothesis that the slope of zero was not rejected.

The researcher had also observed from correlation and linear regression test conducted between public sector and private sector banks by using variables ROA and CAR. In case of public sector banks, significance test that the slope was zero resulted in a t-value of 2.8613. The significance level of this t-test was 0.0187. Since 0.0187<0.0500, the hypothesis that the slope was zero was rejected. Whereas in case of private sector banks, significance test that the slope was zero resulted in a t-value of 1.2743. The significance level of this t-test was 0.2345. Since 0.2345>0.0500, the hypothesis that the slope was zero was not rejected. It means the performance of private sector banks was much better than public sector banks.

The researcher had observed from correlation and linear regression test conducted between public sector and private sector banks by using variables ROA, NPAs and CAR. It had been observed that in case of ROA and NPA for public sector banks, significance test that the slope was zero resulted in a t-value of 1.2573.The significance of this t- test was 0.1494.But in case of private sector banks t-value was -2.0007 and significance level of this t-test was 0.0765. The researcher had also been observed that in case of ROA and CAR for public sector banks, significance test that the slope was zero resulted in a t-value of 2.8613. The significance level of this t-test was 0.0187. Since 0.0187<0.0500, the hypothesis that the slope was zero, was rejected. Whereas in case of private sector banks, significance test that the slope was zero resulted in a t-value of 1.2743. The significance level of this t-test was 0.2345. Since 0.2345>0.0500, the hypothesis that the slope was zero, was not rejected. It means the performance of private sector banks was much better than public sector banks.

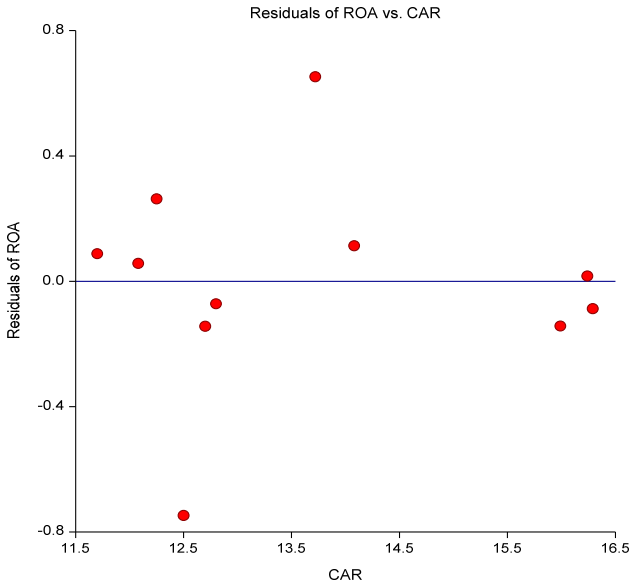

Figure 8: Residuals of ROA vs CAR

CONCLUSION

This study shows that there was a significant relationship between bank performance (in terms of return on asset) and credit risk management (in terms of nonperforming asset). Better credit risk management results in better bank performance. Thus, it was of crucial importance that banks practiced prudent credit risk management and safeguarding the assets of the banks and protected the investors' interests. The study also revealed banks with higher profit potentials could better absorb credit losses whenever they cropped up and therefore recorded better performances. Furthermore, the study showed that there was a direct but inverse relationship between return on asset (ROA) and the ratio of non-performing asset (NPA). This had led us to accept our hypothesis and conclusion that banks with higher interest income had lower non-performing assets, hence good credit risk management strategies.

RECOMMENDATION

Based on the findings the researcher would recommend that the banks could establish a credit risk management team that should be responsible for the following actions that would help in minimizing credit risk;

- ✓ The public sector banks needed to effectively use technology to counter the challenges posed by the private sector banks, especially in the retail business. Better customer services backed by superior technology and the lack of legacy systems have enabled the private sector banks to gain market share from the public sector banks.
- ✓ Banks should initiate efforts on adopting the new technologies in order to improve their customer service levels and provide new delivery platforms to them. The success of these initiatives would have a bearing on their banks market position.
- ✓ Banks should participate in portfolio planning and management.
- ✓ Banks should provide training for the employee to enhance their capacity and reviewing the adequacy of credit training across.

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