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International Journal of Current Research
Vol. 5, Issue, 09, pp.2557-2562, September, 2013

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

CLASSIFICATION OF FINANCIAL RATIOS OF PUBLIC SECTOR BANKS IN INDIA USING MULTIVARIATE STATISTICAL ANALYSIS

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ARTICLE INFO

Article History:
Received 05th July, 2013
Received in revised form
24th August, 2013
Accepted 29th August, 2013
Published online 14th September, 2013

Key words:
Financial ratios,
Factor analysis,
Multivariate discriminant analysis,
Cluster analysis,
Perceptual mapping.

ABSTRACT

In the face of growing competition, the policy changes and the operational environment in respect of the Indian banking system, there has been an increased focus on profitability despite other social objectives being important. Moreover, the setting up of a new competitive environment has resulted in new challenges for the public sector banks to retain their shares. Keeping this in mind, the present study was undertaken to examine the classification pattern of financial ratios of all public sector banks in India, and a comparative analysis of the banks with their corporate offices in three different regions of the country. The present study is diagnostic and exploratory in nature and makes use of secondary data. The relevant secondary data have been collected from *Capita online* database for a period of 10 years from 2000-2001 to 2009-2010. Out of many possible financial ratios, the fifteen consistent profitability ratios are considered for the study. Based on the head office, all the 27 public sector banks in India are categorized into location of three different regions *viz*., Southern region (SR), Western region (WR) and North-eastern region (NER). The northern and eastern region banks are jointly presented for the analysis, since it is observed that the bank with their head offices in northern and eastern regions are few in number and only when they are clubbed, a balanced study among the regions can be conveniently attempted. The underlying objective is to examine the classification pattern of financial ratios that contribute to the overall performance of the public sector banks in India. For this purpose, Factor analysis (FA), Discriminant analysis (DA) and perceptual maps have been used. Factor Analysis on 19 variables (Financial ratios) resulted in four underlying categories (factors). Each factor is named in an appropriate manner considering the factor loadings and constituent variables (ratios). Representative ratios are identified for each such factor. To validate the result of factor analysis and to reach final conclusion regarding the representative ratios, Cluster analysis is performed. Multivariate Discriminant Analysis is performed for the original variables and using Standardized Canonical Discriminant Function Coefficients Perceptual mapping was drawn.

INTRODUCTION

Indian banking industry which has Reserve Bank of India as it is regulatory authority, is a mix of public, private sector, and foreign banks. Due to arrival of new private, foreign banks and non – banking financial services, presently banking sector faces many pressures from changing regulations, intensified competition from non-banking financial services firms, spreading inter-nationalization of markets and continuing innovations in technology and automation. Due to this, analyzing the banks performance has been an important issue particularly in developing countries because these banks are the dominant financial institutions and represent the major source of financial intermediation. Also evaluating banks profitability, overall performance and monitoring their financial condition is important to many parties such as, Investors, Managers, Creditors, auditors, financial analysts and others (Bendell, 1998). Financial ratio analysis is a useful measure to provide a snapshot of a firm's financial position at any particular moment of time or to provide a comprehensive idea about the financial performance of the firm's or company over a particular period of time (Muresan and Wolitzer, 2004). It is also a useful tool for comparing a firm's or company financial position and performance with respect to others in the same or different industry to pinpoint problem areas or to identify areas of further improvements. These financial ratios are computed from financial statements of a firm's or company, *viz*., Balance Sheet, Profit and Loss Account or Income Statement, and Cash Flow Analysis (De *et al*., 2010). Therefore, the present study was focused only on public sector banks in India and attempts to examine the classification pattern of financial ratios that contribute to the overall performance of the public sector banks in India and comparative analysis of the banks with their corporate head offices in the three different specified regions of the country was determined.

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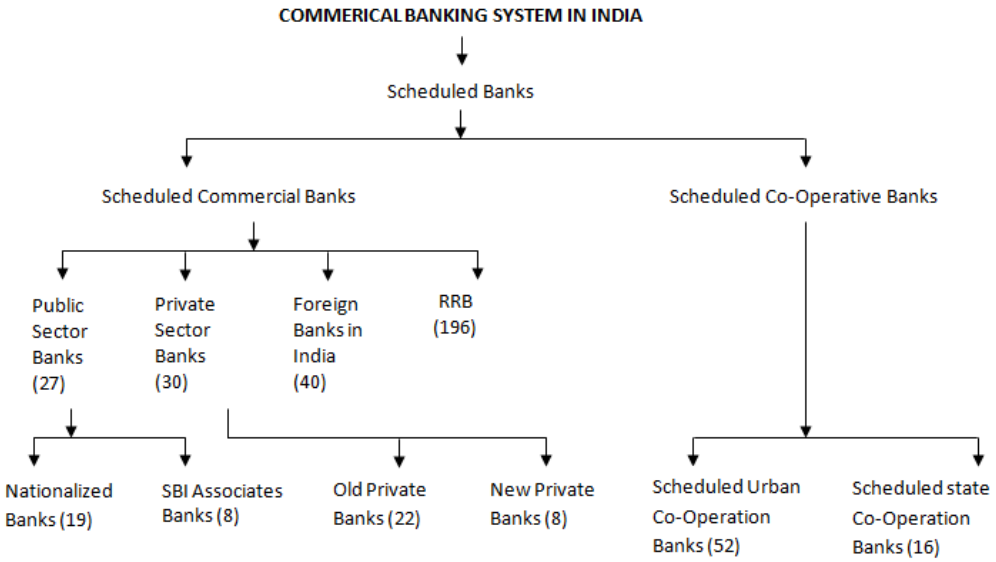
Commercial banking system in India

The banking system is an integral sub-system of the financial system. The Reserve Bank of India (RBI), India's central bank, is the apex body for all matters relating to the banking system. It is the banker to all other banks. The Indian banking industry, with Reserve Bank of India as its regulatory authority, is a blend of public, private and foreign banks. The private sector banks are again further split into old and new banks. The organization of this paper is as follows. Section 2 deals with the literature review. Section 3 describes the variable and sample selection for this study. Sections 4 describe the statistical method used for the analysis; section 5 presents and discusses the empirical findings. Conclusions are formulated in section 6.

Review of literature

To analysis the banks performance financial ratios where used as one of the factor, these ratios are calculated or obtained from banks balance sheet, profit and loss statements. Beaver (1966) was the first person to study the bankruptcy of the firms using financial ratios.



As included in the II Scheduled of the RBI Act, 1934
Note: Figures in brackets indicate number of banks in each group.

He applied uni-variate statistical analysis for the prediction of corporate failure also compared the means of the failed firms with non-failed firms and showed that failed firms have lower financial ratios and identified the following six as the important financial ratios cash flow to total debt, net income to total assets, total debt to total assets, working capital to total assets, current ratio, and no-credit interval. Seeking to eliminate the weakness of the Beaver's model, Altman (1968) used multiple discriminant analysis (MDA) to derive a linear combination of the ratios which best discriminate between financially failed and non-failed groups. He matched 33 bankruptcies firms with the 33 non-distressed firms from the same industry and of similar size. 22 financial ratios were used in his study and computed the Z-score with 5 most important financial ratios. Companies with a Z-score lower than the cutoff score are financially distressed; firms having a Z-score higher than the cutoff score are financially sound. The lower a firm's Z-score, the higher its probability of default. Ohlson (1980) introduced an alternative technique based on the logistic transformation (logit model). Like discriminant analysis, this technique weights the independent variables and assigns a score. Many new attempts were made by the researches to determine classification pattern of firms or banks using financial ratios. Pinches, Mingo and Caruthers (1973) developed an empirically based classification system for financial ratios using factor analysis method. It was a remarkable work and therefore many others researches used this method for their studies for eg. Laurent (1979), Courtis (1978), Jonson (1979), Aho (1980), Chen and Shimerda (1981), Cowen and Hoffer (1982), Litinen (1983). Yli-Olli and Virtasnen (1985) and Ezzamel, Brodie and Mar-Molinero (1987). Green (1978) stated that financial ratios have long been regarded as barometers of corporate health, being used for reporting liquidity, leverage, activity and profitability and that an investor may use financial ratios to appraise a company's performance and its future prospect of success. Bourke (1989) Using the factor analysis method to the financial ratios and found that there is a more important positive relationship between capital adequacy and banks profitability. Ali *et al*. (1995) and Charbaji (2001) classified banks into groups based on a number of performance measures; they used cluster analysis and MDA. Zopounidis *et al*. (1995) used ordinal regression models to evaluate bank's performance whereas Shih *et al*. (2007) only used the technique of PCA and compared performance amongst banks in different ownership groups. Cheng and Ariff (2007) investigated the relationship between banks' risk and abnormal returns using regression analysis whereas Yeh (1996) investigated the relationship between bank's efficiency scores produced by Data Envelopment Analysis (DEA) and banks' financial characteristics.

Variables and sample selection

The present study was diagnostic and exploratory in nature and makes use of secondary data. The relevant secondary data has been collected from *Capita online* database for a period of ten years from 2000-2001 to 2009-2010. Out of many profitability ratios, the most important 19 profitability ratios were considered. These 19 ratios were the mostly used by the previous research. List of profitability ratios which are used for this study are shown in Appendix A. Based on the head office located at every region all the 27 public sector banks in India are considered on three different regions *viz*., Southern, Western and North-eastern regions.

Statistical methods

For various statistical analysis of this study, the statistical software, IBM SPSS 19 version was used. First, a mean, standard deviation, minimum and maximum for all the profitability ratios were obtained (Table 1). Secondly, all variables were normalized using the formula $(x_i - Min\,(v_i))/\,(Max(v_i) - Min\,(v_i))$ and then factor analysis with Principal Component extraction method was performed on the selected set of variables. VARIMAX rotation was used to get better final results (Timm, 2011). To verify the categories of variables (factors) ascertained by the Factor Analysis, Cluster Analysis was applied on the same set of variables with the predefined number of clusters. To emphasize the degree of correlation amongst the variables as a measurement of similarity, hierarchical clustering approach using Ward's Method with the Pearson Correlation interval measure was applied (De *et al*., 2011).After the validation of the results of Factor Analysis is done, Multivariate Discriminant Analysis is performed for the original variables and using Standardized Canonical Discriminant Function Coefficients, Perceptual mapping drawn.

Empirical findings

Descriptive statistical analysis

Descriptive statistics such as mean, standard deviation, minimum and maximum for all the variables were calculated was shown in Table 1.

Factor analysis

Factor Analysis was conducted for the 19 financial ratios; it was observed that 19 ratios have been categorized in four factors.

Table 1. Descriptive analysis of financial ratios

VARIABLES	MEAN	SD	MIN	MAX
DEB	18.62	9.38	-61.59	72.74
NIITITA	2.95	0.38	1.89	3.94
IETOTA	5.36	1.06	2.95	7.81
COF	6.40	1.41	4.03	9.88
DEBTRAT	0.87	0.04	0.73	0.97
OPTOTA	2.06	0.84	-0.80	4.36
IITOTA	8.30	1.09	3.09	10.75
OINCTTIN	15.11	4.22	7.15	26.81
BTOTA	1.10	0.66	-0.75	2.87
BTOII	12.28	7.03	-9.61	28.50
NIITOTA	1.49	0.48	0.55	3.01
OETOTA	2.43	0.47	1.47	3.99
CDRATIO	51.72	10.14	6.60	76.61
PCTOTA	1.20	0.48	-0.13	2.88
TRDTOTD	63.51	5.47	47.87	75.23
SATOTA	88.01	6.66	63.14	99.41
TLTOTA	41.16	10.94	15.27	64.29
LIQRAT	1.62	0.85	0.40	5.22
IEXPIEAR	63.98	6.57	49.49	87.86

Mean value ranges from 0.87 to 88.01, the standard deviations of variable TLTOTA (10.94) and CDRATIO (10.14) are relatively higher; While the others range from 9.38 to 0.04 (average 2.77).

Table 2. Results of KMO and Bartlett's test

KMO of Sampling Adequacy	0.804
Bartlett's Test Approx. Chi-Square	5453.70
Degrees of freedom	171
Significance	0.000

These factors account for about 72% of the total variance, which can be considered as good. Results of KMO and Bartlett's Test are presented in Table 2. KMO sample adequacy is more than 0.7, which can be considered as reasonably good (Ocal *et al*., 2007). The rotated component matrix is produced in Table 5. From Table 5, it was observed BTOII, NIITOTA, BTOTA, OPTOTA, OINCTTIN and PCTOTA had greater value than other components and it formed the first factor, (Factor A). In the second factor COF, IETOTA, IITOTA, TLTOTA, IEXPIEAR, SATOTA and CDRATIO had greater values than others, and was named as factor B and the third factor includes TRDTOTD, NIITITA and OETOTA named as factor C and DEBTRAT, DEB, LIQRAT are in fourth factor and its named as factor D.

Table 3. Factor Analysis - Rotated Component Matrix

VARIABLES	FACTOR			
	A	B	C	D
BTOII	-0.907			
NIITOTA	0.890			
BTOTA	-0.869			
OPTOTA	0.859			
OINCTTIN	0.857			
PCTOTA	0.694			
COF		0.929		
IETOTA		0.885		
IITOTA		0.821		
TLTOTA		-0.799		
IEXPIEAR		0.738		
SATOTA		0.665		
CDRATIO		-0.475		
TRDTOTD			-0.779	
NIITITA			0.694	
OETOTA			0.659	
DEB				0.734
DEBTRAT				0.530
LIQRAT				0.445

Cluster analysis

Cluster analysis was performed on the same set of 19 variables on which factor analysis was performed already. Number of clusters was pre-defined, four (i.e. the number of factors already ascertained). The results of Cluster analysis are produced in Table 3.

Table 4. Cluster analysis result

S.NO	Ratio Code	Cluster Membership	S.NO	Ratio Code	Cluster Membership
1	DEB	1	11	NIITOTA	2
2	NIITITA	4	12	OETOTA	4
3	IETOTA	3	13	CDRATIO	2
4	COF	3	14	PCTOTA	2
5	DEBTRAT	1	15	TRDTOTD	4
6	OPTOTA	2	16	SATOTA	3
7	IITOTA	3	17	TLTOTA	2
8	OINCTTIN	2	18	LIQRAT	1
9	BTOTA	2	19	IEXPIEAR	3
10	BTOII	2			

Comparison of the result of factor analysis and cluster analysis

Final results of factor and cluster analysis were arranged in a manner such that comparison was possible against each other (Table 4). Clusters are plotted against the identical or most identical (on the basis of constituent variables) factors. After a careful study on Table 4, it was observed that Factor 3 was same with the corresponding clusters 4 and factor 4 was same with the corresponding Clusters 1. Factor 1 and Cluster 2 are almost same except for the presence of CDRATIO and TLTOTA in Cluster 2. The variable CDRATIO and TLTOTA are mismatched in Factor 2, which is evident from the corresponding cluster (Cluster 4). CDRATIO and TLTOTA are best suited in Factor 1 which is confirmed by its corresponding cluster (Cluster 2). This deviation did not significantly challenge the outcome of the factor analysis; rather the outcome improved and was validated by cluster analysis results. Therefore, it can be accepted that the four factors validated by the cluster analysis.

Table 5. Comparison of the Result of Factor Analysis and Cluster Analysis

Factor	Ratios	No. of Ratios	Clusters	Ratios	No. of Ratios
F1	BTOTA, NIITOTA, BTOII, OPTOTA, OINCTTIN, PCTOTA	6	C2	OPTOTA, OINCTTIN, NIITOTA, CDRATIO, PCTOTA, TLTOTA, BTOTA, BTOII	8
F2	IETOTA, IEXPRIEAR, COF, IITOTA, SATOTA,TLTOTA, CDRATIO	7	C3	IETOTA, IEXPIEAR, COF, IITOTA, SATOTA	5
F3	TRDTOTD, NIITITA, OETOTA	3	C4	OETOTA, NIITITA, TRDTOTD	3
F4	DEBTRAT, DEB, LIQRAT	3	C1	DEBTRAT, DEB, LIQRAT	3
	Total	19		Total	19

Multivariate discriminant analysis

Estimation of discriminant function

Multivariate discriminant analysis is performed for the original variables by grouping region wise. In the present study, the discriminant analysis was carried out for three regions of banks by 19

profitability ratios and it resulted in two discriminant functions and consequently two eigenvalues. The highest eigenvalue (0.517) corresponds to the first discriminant function, which shows the strongest power of discrimination of three regions. Further the first function accounts for 80% of dispersion of the group means, as compared to the other which accounts for less than 20% of dispersion. The canonical correlation coefficient, measuring the relation between the discriminant factorial coordinates and the grouping variable shows 34.11%, $(0.584)^2$ of the total variance (Table 6).

Table 6. Eigen value and Canonical correlation

Function	Eigen value	% of Variance	Cumulative %	Canonical Correlation
1	0.517	80.6	80.6	0.584
2	0.125	19.4	100.0	0.333

The discriminating variables are expressed in different units of measure, and consequently the standardized coefficients of the discriminant function were calculated (Jaba and Grama, 2004) (Table 7). The discriminant function coefficients were used for calculating the discriminant score for each case in particular. Taking into account, first function has the highest discriminating power, and shall focus our attention upon analyzing its results. Therefore, the first discriminant function is

$$D_1 = -0.045Z_1 - 0.775Z_2 + 0.283Z_3 + 0.559Z_4 + 0.097Z_5 - 0.787Z_6 - 0.200Z_7 + 0.238Z_8 - 0.902Z_9 + 0.825Z_{10} - 0.872Z_{11} + 0.310Z_{12} + 0.001Z_{13} + 0.110Z_{14} - 0.826Z15 + 0.697Z_{16} + 0.551Z_{17} + 0.125Z_{18} - 0.290Z_{19}$$

The second discriminant function is

$$D_2 = -0.332Z_1 - 0.299Z_2 - 0.320Z_3 + 1.062Z_4 + 0.564Z_5 + 0.241Z_6 + 0.524Z_7 - 0.273Z_8 - 0.096Z_9 + 1.122Z_{10} + 1.158Z_{11} - 0.493Z_{12} - 0.467Z_{13} - 0.427Z_{14} - 0.460Z_{15} + 0.232Z_{16} + 0.430Z_{17} - 0.262Z_{18} - 1.241Z_{19}$$

Where Z_i's are standardized value of X_i's variables. The size of the coefficients indicates the discriminant power of the predictor variables. The sign indicates the direction of the relationship. Therefore, it can be seen that the variables BTOTA, NIITOTA, TRDTOTD, BTOII, OPTOTA, NIITITA, SATOTA, COF, and TLTOTA discriminate best among the groups. From the second discriminant function, IEXPIEAR, NIITOTA, BTOII, COF, DEBTRAT IITOTA, OETOTA, CDRATIO and TRDTOTD are best predictors.

Table 7. Standardized Canonical discriminant function coefficients

Variable	Function	
	1	2
DEB	-0.045	-0.332
NIITITA	-0.775	-0.299
IETOTA	0.283	-0.320
COF	0.559	1.062
DEBTRAT	0.097	0.564
OPTOTA	0.787	0.241
IITOTA	-0.200	0.524
OINCTTIN	0.238	-0.273
BTOTA	-0.902	-0.096
BTOII	0.825	1.122
NIITOTA	-0.872	1.158
OETOTA	0.310	-0.493
CDRATIO	0.001	-0.467
PCTOTA	0.110	-0.427
TRDTOTD	-0.826	-0.460
SATOTA	0.697	0.232
TLTOTA	0.551	0.430
LIQRAT	0.125	-0.262
IEXPIEAR	-0.290	-1.241

Dominant variables in bank- groups

The dominant variables of each group of banks are shown in Table 8, from which it was observed that financial ratios NIITITA, IETOTA, IITOTA, OETOTA and TRDTOTD, were more dominant in southern region. In western regions, the variables DEB, OINCTTIN, NIITOTA, CDRATIO, PCTOTA, LIQRAT and IEXPIEAR were dominating. The variables COF, DEBTRAT, OPTOTA, BTOTA, BTOII, SATOTA and TLTOTA were dominants in the north- eastern region.

Table 8. Fisher's Linear discriminant functions

	REGIONS		
Variable	SRB	WRB	NERB
DEB	193.301	196.125	191.870
NIITITA	22.797	20.219	15.312
IETOTA	-97.013	-94.825	-94.841
COF	87.808	86.725	92.121
DEBTRAT	11.234	9.284	12.501
OPTOTA	514.773	518.020	523.371
IITOTA	20.695	16.809	18.448
OINCTTIN	206.666	208.568	208.542
BTOTA	-109.416	-113.482	-118.230
BTOII	581.715	581.341	589.993
NIITOTA	-116.598	-124.862	-124.122
OETOTA	-62.019	-58.674	-59.284
CDRATIO	27.107	29.452	26.916
PCTOTA	50.577	53.083	51.615
TRDTOTD	28.521	22.776	20.839
SATOTA	21.722	24.259	28.646
TLTOTA	35.430	36.250	39.899
LIQRAT	22.584	24.285	23.745
IEXPIEAR	380.228	383.898	376.812

*SRB – Southern Region Bank, WRB- Western Region Banks NERB-Northern and Eastern Region Banks

Efficiency of discriminant function

Based on the discriminant function, 62.2% of the bank groups has been correctly classified (Table 9), and the percentage of correctly classified cases was 73.0 % for southern, 46.7% for western and 66.3% for north-eastern regions.

Table 9. Classification of original and predicted groups

		Predicted group member			Total
		SRB	WRB	NERB	
Original	SRB	73	21	06	100
	WRB	22	42	26	90
	NERB	08	19	53	80
Percentage	SRB	73.0	21.0	6.0	100
	WRB	24.4	46.7	28.9	100
	NERB	10.0	23.8	66.3	100

The combined group plots are shown in Figure 1.

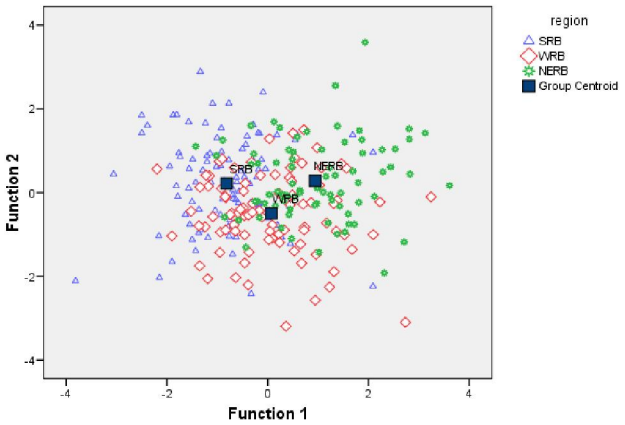


Figure 1. Combined group plots

Perceptual mapping

To find out the positioning of financial ratios to different regions, the attribute based perceptual mapping was used. Discriminant analysis was performed and significant differences between three regions were determined. From Standardized Canonical Discriminant Function Coefficients (Table 7); it appears that there are two different functions for 19 financial ratios; Function 1 consists of 6 ratios *viz*., NIITITA, OPTOTA, BTOTA, TRDTOTD, SATOTA and TLTOTA and Function 2 of 13 ratios, DEB, IETOTA, COF, DEBTRAT, IITOTA, OINCTTIN, BTOII, NIITOTA, OETOTA, CDRATIO, PCTOTA, LIQRAT and IEXPIEAR . A perceptual map was drawn using the Standardized canonical Discriminant Function coefficients (Table 7) and Discriminant Analysis Function at group centroids (Table 10).

Table 10. Discriminant analysis- functions at group centriods

REGION	FUNCTION	
	1	2
SRB	-0.817	0.220
WRB	0.072	-0.495
NERB	0.940	0.282

From Figure 2, it seems that three regions (Southern, Western and North-Eastern) have their unique position on the map. It was also observed that Southern and North-Eastern region are very strong in dimension 1 and western region associated with the dimension 2. The profitability ratios NIITOTA, BTOTA,TRDTOTD and NIITITA strongly contributes to southern region. The ratios IEXPRIER, CDRATIO, PCTOTA, LIQRAT, OETOTA, IETOTA and OINCTTIN to western region and for north-eastern region it was COF, BTOII, TLTOTA, SATOTA and OPTOTA. Even through the variable IITOTA and DEBTRAT fall in dimension 2 it does not contribute much for western region banks.

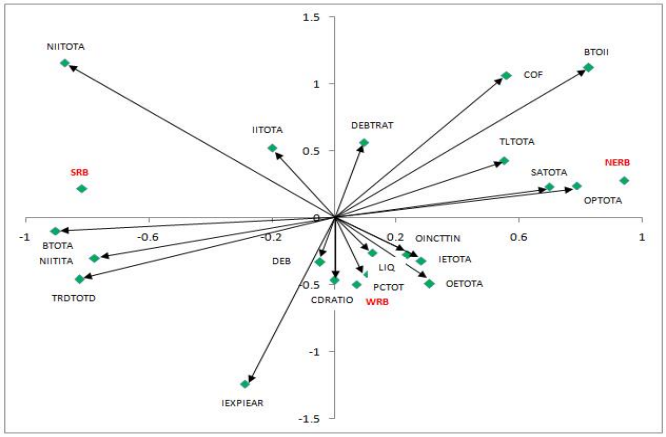


Figure 2. Perceptual map of bank groups and financial ratios

Conclusion

From the present study an attempt has been made to examine the classification pattern of financial ratios that contribute to the overall performance of the public sector banks in India and also perform comparative analysis of the banks with their corporate head offices in the three different specified regions of the country. For comparative study, based on the head office located at every region all the 27 public sector banks were considered on three different regions *viz*., southern, western and north-eastern regions. Factor analysis was used for the 19 financial ratios and was observed that 19 ratios have been categorized in four factors. These factors account for about 72% of the total variance. For the validation of factors, cluster analysis was performed on the same set of 19 variables on which factor analysis was performed already. Number of clusters was also pre-defined (four). By comparing both, it was observed that factor 3 and cluster 4 financial ratios were same similarly factor 4 was same with corresponding cluster 1. Factor 1 and Cluster 2 are almost same except for the presence of CDRATIO and TLTOTA in cluster 2 The variable CDRATIO and TLTOTA are mismatched in factor 2, which is evident from the corresponding cluster (cluster 4). CDRATIO and TLTOTA are best suited in factor 1 which is confirmed by its corresponding cluster (cluster 2). This deviation did not significantly challenge the outcome of the factor analysis; rather the outcome was improved and validated by cluster analysis results. Therefore, it can be accepted the three factors as validated by the Cluster analysis.

From factor analysis, BTOII, NIITOTA, BTOTA, OPTOTA, OINCTTIN and PCTOTA had greater value than other components and it formed the first factor, (Factor A). In the second factor COF, IETOTA, IITOTA, TLTOTA, IEXPIEAR, SATOTA and CDRATIO had greater values than others, and was named as factor B and the third factor includes TRDTOTD, NIITITA and OETOTA named as factor C and DEBTRAT, DEB, LIQRAT are in fourth factor and its named as factor D. By performing the multivariate discriminant analysis for the original 19 financial ratios by grouping region wise and it resulted in 2 discriminant functions and consequently 2 eigenvalues. The highest eigenvalue (0.517) corresponds to the first discriminant function, which shows that it has the strongest power of discrimination of the three regions. From fisher linear discriminant function financial ratios NIITITA, IETOTA, IITOTA, OETOTA and TRDTOTD were more dominant in southern region. In western regions, the variables DEB, OINCTTIN, NIITOTA, CDRATIO, PCTOTA, LIQRAT and IEXPIEAR were dominating. The variables COF, DEBTRAT, OPTOTA, BTOTA, BTOII, SATOTA and TLTOTA were dominants in the north- eastern region. Basedon discriminant function, 62.2% of the banks groups have been correctly classified. The findings indicate the percentage of correct classified cases, 73.0% for southern, 46.7% for western and 66.3% for north-eastern regions. A perceptual map is drawn using the standardized canonical discriminant Function coefficients and function at group centroids to see the financial ratios position for the different regions, it appears that the ratios NIITITA, OPTOTA, BTOTA, TRDTOTD, SATOTA and TLTOTA contributes for function 1 and ratios DEB, IETOTA, COF, DEBTRAT, IITOTA, OINCTTIN, BTOII, NIITOTA, OETOTA, CDRATIO, PCTOTA, LIQRAT and IEXPIEAR contributes for function 2. From the perceptual map it was observed that three regions have their unique position and also southern and north-eastern regions are associated to the function 1 and western region associated to function 2. The financial ratios NIITOTA, BTOTA, TRDTOTD and NIITITA are strongly contribute to the southern region. The ratios IEXPRIER, CDRATIO, PCTOTA, and OINCTTIN strongly contribute to the western region and for north-eastern region it was DEBTRAT, COF, TLTOTA, SATOTA, OPTOTA, OETOTA and IETOTA. Even though the variable IITOTA and DEBTRAT fall in dimension 2 it does not contribute much for the western region banks. From fisher linear discriminant and perpetual map it was observed that financial ratios TRDTOTD and NIITITA strongly contribute to the southern region, OINCTTIN, IEXPIEAR, PCTOTA and CDRATIO to western region and for north-eastern region financial ratios, COF, TLTOTA, OPTOTA, DEBTRAT and SATOTA.

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Appendix – A List of Financial Ratios and their Code

Ratio code	Financial ratio name
NIITITA	Net Interest Income (Spread) to Total Asset Ratio
IETOTA	Interest Expended to Total Asset Ratio
COF	Cost of Funds
DEBTRAT	Debt Ratio
OPTOTA	Operating Profits to Total Asset Ratio
IITOTA	Interest Income to Total Asset Ratio
OINCTTIN	Other Income to Total Income Ratio
NIITOTA	Non-interest Income to Total Asset Ratio
OETOTA	Operating Expenses to Total Asset Ratio
CDRATIO	Credit to Deposit Ratio
PCTOTA	Provisions and Contingencies to Total Asset Ratio
TRDTOTD	Term Deposits to Total Deposit Ratio
SATOTA	Secured Advances to Total Advance Ratio
TLTOTA	Term Loans to Total Advance Ratio
IEXPIEAR	Interest Expended to Interest Earned Ratio
DEB	Debt - Equity Ratio
BTOTA	Burden to Total Asset Ratio
BTOII	Burden to Interest Income Ratio
LIQRAT	Liquidity Ratio

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