MERGERS IN PUBLIC SECTOR BANKS IN INDIA: AN IMPACT STUDY WITH CAMEL RATING MODEL

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ABSTRACT:
Mergers and amalgamations in the banking space are quite frequent aiming at achieving economies of scale, cost rationalisation and capital adequacy. Public sector banks in India also underwent mergers since 1993. The latest merger process effected by Government of India in 2020 involved ten public sector banks and the four acquirer banks are Punjab National Bank, Canara Bank, Union Bank of India and Indian Bank. As four financial years have since passed by March 2024, it is desired that performance of these four bigger banks needs an analytical examination, with an effective technique like CAMEL rating model, to find out whether the desired objectives of the mergers are realised. Ratios under CAMEL model as considered apt for assessment of performance of the banks are chosen by the authors and weightage to the five components, viz. Capital Adequacy, Asset Quality, Management Efficiency, Earnings Ability and Liquidity Position is also assigned as appropriate in Indian banking context. Paired t-test (two-tailed) is employed for testing the hypotheses at a significance level of 0.05. This unique study indicated that there is no relative variation in the overall performance among the said four banks, on account of the merger process, during the four-year period after mergers.

1. Introduction

The Indian financial system has been exhibiting resilience over the years and is supported by strong macroeconomic fundamentals. Reserve Bank of India (RBI) instilled an effective regulatory and supervisory framework resulting in a level playing field for both the public sector banks and private sector banks.

Mergers in Public Sector Banks were initiated in India by Government of India (GoI) with the avowed objectives of realisation of economies of scale, cost rationalisation and capital adequacy. The latest such exercise took place on 01.04.2020 with the merger of ten public sector banks into four bigger banks as mentioned hereunder in Table 1.

As four financial years have since passed by 31st March 2024, the performance of the four bigger banks needs a critical analysis to find out whether the desired objectives of the merger got achieved. In other words, the performance of the banks under reference during the post-merger period over the pre-merger period needs an analytical examination, preferably by an effective tool like CAMEL rating model.

Table 1: List of public sector banks involved in merger in 2020

Pre-merger Banks	Post-merger Banks
1. Punjab National Bank	1. Punjab National Bank
2. Oriental Bank of Commerce	
3. United Bank of India	
4. Canara Bank	2. Canara Bank
5. Syndicate Bank	
6. Union Bank of India	3. Union Bank of India
7. Andhra Bank	
8. Corporation Bank	
9. Indian Bank	4. Indian Bank
10. Allahabad Bank	

(Source: Authors' own compilation)

The CAMEL rating system was introduced in the United States in 1979 by the Federal Financial Institutions Examination Council (FFIEC). It stands for Capital Adequacy, Asset Quality, Management Efficiency, Earnings Ability and Liquidity Position. The model got expanded as CAMELS in United States in 1997, with 'S' representing Sensitivity to Market Risk. RBI adopted the CAMEL model in 1996 in India and the same was refined as CAMELS also subsequently.

2. LITERATURE REVIEW

The CAMEL rating model for assessment of performance of banks has been of interest for researchers across many countries. An attempt is made to review a few such important works undertaken in our country during the past decade and described in the following paragraphs.

Gupta, R. (2014) attempted to evaluate the performance of all the 26 public sector banks using the CAMEL approach covering a period of five years, 2009-13. The researcher applied one-way ANOVA test and observed that there was significant difference in performance among all the public sector banks as assessed by the CAMEL model [4]. **Sharma, G., & Arora, A.K. (2016)** also attempted to study the performance of Indian banks with CAMEL model and provide composite ranks, covering eight public sector banks and seven private sector banks. But the study period was limited to one financial year, i.e. 2014-15 only [14]. **Srinivasan, & Saminathan, Y.P. (2016)** in a detailed study included foreign sector banks also, which are seldom covered by researchers, in addition to public and private sector banks in India. The authors selected 25 public sector, 18 private sector and 8 foreign banks and the data period was FY2012-FY2014. Different weights were assigned to different ratios chosen under each parameter and to each component of CAMEL model for arriving at the ranks [18]. **Samuel, E.M. (2018)** attempted to broaden the coverage of the model and adopted CAMELS model, thus including 'S' representing sensitivity for market risk. The researcher considered only three public sector banks for study for five-year period, 2011-16 and brought out the composite ranks of the banks under study [12].

Sharma, S., & Chopra, I.P. (2018) in a distinct study on comparative assessment of performance of public sector and private sector banks with CAMEL model, took a larger sample, i.e. 15 public sector and 15 private sector banks. The study covering four-year period, FY 2014 – FY2017, employed both parametric and non-parametric hypothesis testing tools and concluded that the performance of private sector banks is better than that of public sector banks during the select period [15]. **Biswas, S., & Bhattacharya, M. (2020)** focussed on the financial performance of all the ten new generation private sector banks in India and conducted a study adopting CAMEL model for five-year period, FY2015-FY2019. The researchers while providing the composite ranks for all the ten banks opined that the findings would be beneficial for investors while making sound investment decision amongst the banks covered under study [2]. **Shelly, & Singhal, P.K. (2020)** evaluated the performance of 21 public sector banks for ten-year period, FY2009-FY2019 and assigned composite ratings for the banks, using CAMEL rating model. Based on the findings of their study, the authors advised that all banks should strive toward achieving more than the required level of capital [16]. **Mayakkannan, R., & Jayasankar, C. (2020)** also evaluated the comparative performance of top ten public sector and private sector banks, with CAMEL model and the study covered five-year period, FY2016-FY2020. The authors noted that the private sector banks are growing at a faster pace than public sector banks [9].

Arora, G.S., & Jain, A. (2021) conducted financial performance analysis of five public sector and five private sector banks based on CAMEL method, but confining the data analysis to only one select year, i.e. 2019-20. The study with independent sample test noted that there was a significant difference in the performance of public and private sector banks chosen for study [1]. **Mihir Dash (2021)** in a novel study on dimensionality of the CAMELS model used exploratory factor analysis using a sample of 19 public sector banks and 17 private sector banks in India, over the study period 2007-11. The author suggested that the CAMELS framework should be reorganised, with same underlying variables, grouped through factor analysis and prioritised by variance explained [10]. **Raghavendra Rao, R., & Srinivasa Rao, Ch. (2022)** in a limited study conducted on three public sector banks and three private sector banks for a longer period of ten years, i.e. 2011-20 noted that the two of the three private sector banks had fared better than other banks in terms of the composite CAMEL ranking [11]. **Gupta, S., & Singhal, J. (2022)** attempted to evaluate the performance of five select private sector banks using CAMEL model and covered five-year period, 2016-2021 and assigned composite ranks for them [5].

Suman & Swati (2022) had undertaken performance assessment of 7 public sector banks and 5 private sector banks covering five-year period, FY2014-FY2018, adopting CAMEL model and gave composite ranks to the banks chosen for study. The results indicated better performance of private sector banks over the public sector banks during the selected period of study [19]. **Sengupta, R., & Patil, A. (2022)** adopted CAMEL model for making a comparative assessment of performance between pre-

merger and post-merger of four public sector banks. The study considered FY2020 as pre-merger period and FY2021 as post-merger period and composite ratings are assigned. The authors attempted to find out whether there was any statistically significant difference between the pre- and post- merger periods of banks under study, though the study period is limited to one year on either side of the merger [13]. **Goyal, P., & Anand, M. (2023)** did an exclusive study on the performance of top five private sector banks, selected based on market capitalization, with CAMEL model for five-year period, FY2016-2020 and derived that market capitalization did not depict the financial performance of the banks during the period selected for study [3]. **Koshti, J.R., & Rathod., Sh. B. (2023)** in a pioneering work in the adoption of CAMEL model for assessment of performance of banks, conducted multiple regression analysis to find out the impact of the five CAMEL parameters on the cost to income ratio treating it as an efficiency ratio. The study covered four public sector and four private sector banks but much longer period of 17 years, FY2006-FY2022 was considered [8].

Kanchan, & Chowdary, R. (2023) attempted to analyse the financial performance of listed small finance banks in India using CAMEL model. The study covered four such banks for a five-year period, FY2018-2022 [6]. **Singh, Y., & Milan, R. (2023)** conducted a detailed study on the financial performance of public sector banks employing CAMEL model and going beyond the common composite ratings. The study covered a longer period of 11 years, FY2009-2019 and 26 banks and tools like Generalised Method of Moments (GMM) and Canonical Correlation Analysis (CCA) are also considered for the study. The authors made a bold statement that banking sector reforms were insignificantly related to the performance of banks under study [17]. **Tarsem Lal & Arjun Gupta (2023)** attempted to measure the impact of the six CAMELS parameters on the performance of Indian commercial banks as reckoned by RoA and RoE. The researchers did an elaborate study, with panel ordinal least square regression and the work was confined to four public sector and four private sector banks covering fiscal years 2016-2021 [20]. **Kantharaju, G. *et al.* (2024)** in a longitudinal study on performance of select banks using CAMELS model limited to two each from public sector and private sector banks covered a longer period of ten years, FY2012–FY2021. The hypothesis testing indicated that there was no difference between the performance of public sector and private sector banks during the said period of study [7].

3 RESEARCH METHODOLOGY

3.1 Statement of the Problem

The mergers in Public Sector Banks had been undertaken to have much bigger banks that could effectively compete with their private sector counterparts. But the financial performance of the acquirer banks post-merger was not so impressive in respect of earlier mergers in the country and the key financial ratios remained more or less the same. Hence, analysis of the post-merger performance of the

four acquirer banks, viz. Punjab National Bank (PNB), Canara Bank (CB), Union Bank of India (UBI) and Indian Bank (IB), in the merger process effected on 1st April 2020 needs to be undertaken.

3.2 Research Gap

Review of concerned literature indicated many a study on mergers and amalgamations in Indian banking sector during the past three decades. As the mergers in 2020 are very recent, studies on the performance of the four acquirer banks mentioned in the Statement of the Problem above are not adequate and thus this research gap is identified. It is pertinent to mention that **Sengupta, R., & Patil, A. (2022)** attempted to study the performance in a much initial period, i.e. only one year after merger and the analysis was also undertaken for all the four acquirer banks together, but not bank-wise [13].

3.3 Research Design

Descriptive Research design has been considered for this research work.

3.4 Objective of the study

To analyse the performance of the four acquirer public sector banks involved in the merger process in 2020.

3.5 Sample Size

The four acquirer public sector banks, viz. Punjab National Bank (PNB), Canara Bank (CB), Union Bank of India (UBI) and Indian Bank (IB), involved in the merger process effected in 2020, are considered for the study.

3.6 Period of Study

The total period of study is eight years, out of which the pre-merger period of four years is FY 2016-17 to FY 2019-20 and the post-merger period of four years is FY 2020-21 to FY 2023-24.

3.7 Data Collection

The data is collected from the 'Statistical Tables Related to Banks in India' published by Reserve Bank of India in 'Database on Indian Economy (DBIE)'[data.rbi.org.in] and the published annual reports of the select banks for the study period.

3.8 Statistical Techniques and Tools

(i) The CAMEL rating model is a ratio-based technique and is considered for the study.

(ii) paired t-test (two tailed) with a significance level of 0.05 is conducted with SPSS 26.0.

3.9 CAMEL Rating Model

The ratios chosen by different researchers cited in the literature review for different components of the CAMEL rating model are examined and the following ratios are adopted finally, considering them as the most apt for this distinct study by the authors. In this context, the research works of Mihir Dash (2021) [10], Sengupta, R., & Patil, A. (2022) [13], Suman & Swati (2022) [19], Koshti, J.R., & Rathod., Sh. B. (2023) [8], Tarsem Lal & Arjun Gupta (2023) [20] and Kantharaju, G. *et al.* (2024) [7] are found to be more relevant. The weightage to the different ratios and the five components of CAMEL model assigned by the authors, as appropriate for assessing the performance of banks under study, are given in Table 2.

Table 2: Weights assigned to CAMEL ratios

S.No.	CAMEL Component	Ratio	Weight assigned	Composite Weight assigned
I	Capital Adequacy	1. CRAR	0.50	
		2. Tier I – CRAR	0.25	
		3. Tier II – CRAR	0.25	
				0.25
II	Asset Quality	1. Net NPAs to Net Advances Ratio	0.50	
		2. Gross NPAs to Total Advances Ratio	0.35	
		3. Secured Advances to Total Advances Ratio	0.15	
				0.20
III	Management Efficiency	1. Business per Employee	0.30	
		2. Total Income per Employee	0.30	
		3. Operating Profit per Employee	0.40	
				0.15
IV	Earnings Ability	1. Return on Assets	0.40	
		2. Return on Equity	0.40	
		3. Net Interest Income to Total Assets Ratio	0.20	
				0.15
V	Liquidity Position	1. Credit to Deposits Ratio	0.40	
		2. Liquid Assets to Total Deposits Ratio	0.40	
		3. G-Sec. to Total Investments Ratio	0.20	
				0.25
	Grand Total			**1.00**

(Source: Authors' own compilation)

Capital Adequacy, as represented by Capital to Risk Weighted Assets Ratio (CRAR), is not only a regulatory requirement for banks but also determines the limits for credit expansion. Thus, capital

management assumes high importance at the top management level and hence accorded higher weightage of 0.25 is assigned. Liquidity Management of any bank is so crucial that any slippage may lead to inability to honour the payment demands of the depositors. As such, this component is also given higher weightage of 0.25 in our rating model. Management of Non-Performing Assets (NPAs) has always been on the top agenda for any bank, as NPAs will drain out the income earned in the form of derecognition of interest booked and also heavy provisioning as per mandatory Income Recognition and Asset Classification (IRAC) norms to banks in India. Thus, the next weightage of 0.20 is allotted to Asset Quality. The remaining two components, i.e. Management Efficiency and Earnings Ability are assigned weightage of 0.15 each.

The proportion of weights for the three ratios chosen under each of the five components of CAMEL rating model are also assigned by the authors having regard to the relative importance in its contribution to the component.

3.10 Hypothesis:

The following null hypotheses are formulated for the study:

H_0^1: The change in CRAR between the pre-merger and post-merger periods for the selected bank is not statistically significant

H_0^2: The change in Tier-I CRAR between the pre-merger and post-merger periods for the selected bank is not statistically significant

H_0^3: The change in Tier-II CRAR between the pre-merger and post-merger periods for the selected bank is not statistically significant

H_0^4: The change in Net NPAs to Net Advances Ratio between the pre-merger and post-merger periods for the selected bank is not statistically significant

H_0^5: The change in Gross NPAs to Total Advances Ratio between the pre-merger and post-merger periods for the selected bank is not statistically significant

H_0^6: The change in Secured Advances to Total Advances Ratio between the pre-merger and post-merger periods for the selected bank is not statistically significant

H_0^7: The change in Business per Employee between the pre-merger and post-merger periods for the selected bank is not statistically significant

H_0^8: The change in Total Income per Employee between the pre-merger and post-merger periods for the selected bank is not statistically significant

H_0^9: The change in Operating Profit per Employee between the pre-merger and post-merger periods for the selected bank is not statistically significant

H_0^{10}: The change in Return on Assets between the pre-merger and post-merger periods for the selected bank is not statistically significant

H_0^{11}: The change in Return on Equity between the pre-merger and post-merger periods for the selected bank is not statistically significant

H_0^{12}: The change in Net Interest Income to Total Assets Ratio between the pre-merger and post-merger periods for the selected bank is not statistically significant

H_0^{13}: The change in Credit to Deposits Ratio between the pre-merger and post-merger periods for the selected bank is not statistically significant

H_0^{14}: The change in Liquid Assets to Total Deposits Ratio between the pre-merger and post-merger periods for the selected bank is not statistically significant

H_0^{15}: The change in G-Sec. to Total Investments Ratio between the pre-merger and post-merger periods for the selected bank is not statistically significant

4. DATA ANALYSIS & DISCUSSION

4.1 CAMEL ratings

The mean values of the chosen ratios are arranged in ascending order, if higher value indicates better performance of the bank and the four banks under study are assigned ranks with the one with highest value is given rank 1. Similarly, the mean values of the chosen ratios during the pre-merger period and the post-merger period are arranged in descending order, if lower value indicates better performance of the bank and the four banks under study are assigned ranks with lowest value is given rank 1. Compilation of data is done for all the fifteen ratios for the pre-merger period and the post-merger period separately.

The weightage given to the three ratios under each component of the CAMEL rating model is applied to the ranks so assigned and the rank of each of the banks under study is thus arrived at for each component, viz. C, A, M, E and L, for the pre-merger period and the post-merger period separately.

Similarly, the weightage given to the five components is also applied and the composite rank of each of the banks under study is thus arrived at, for the pre-merger period and the post-merger period separately. The results are tabulated hereunder in Table 3.

Table 3: Component-wise Ranks and Composite Rank – Bank-wise

Bank	C		A		M		E		L		Composite Rank	
	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-
PNB	4	4	4	4	3	4	4	4	1	2	**4**	**4**
CB	2	2	2	2	4	3	2	2	2	1	**2**	**2**
UBI	3	3	3	3	2	2	3	3	3	3	**3**	**3**
IB	1	1	1	1	1	1	1	1	4	4	**1**	**1**

(Source: Authors' own computation)

The above study indicated no change in the composite ranks secured between the pre-merger period of four years, i.e. FY2016-17 to FY2019-20 and the post-merger period of four years, i.e. FY2020-21 to FY2023-24. Indian Bank secured 1st rank, followed by Canara Bank, Union Bank of India and Punjab National Bank at 2nd, 3rd and 4th positions respectively.

However, the ranks secured under the five different components of the CAMEL model analysis varied from the pre-merger period to the post-merger period as detailed component-wise hereunder:

1. Capital Adequacy: There is no change in the ranks of all the four banks under study between the pre-merger period and the post-merger period. Indian Bank retained the 1st rank followed by Canara Bank, Union Bank of India and Punjab National Bank in the 2nd, 3rd and 4th positions respectively.

2. Asset Quality: There is no change in the ranks of all the four banks under study between the pre-merger period and the post-merger period. Indian Bank retained the 1st rank followed by Canara Bank, Union Bank of India and Punjab National Bank in the 2nd, 3rd and 4th positions respectively.

3. Management Efficiency: Indian Bank and Union Bank of India retained their positions with 1st rank and 2nd rank respectively between the pre-merger period and the post-merger period. Canara Bank moved from 4th position to 3rd position and Punjab National Bank slipped from 3rd position to 4th position.

4. Earnings Ability: There is no change in the ranks of all the four banks under study between the pre-merger period and the post-merger period. Indian Bank retained the 1st rank followed by Canara Bank, Union Bank of India and Punjab National Bank in the 2nd, 3rd and 4th positions respectively.

5. Liquidity Position: Union Bank of India and Indian Bank retained their positions with 3rd and 4th ranks respectively. Canara Bank moved from 2nd position to 1st position and Punjab National Bank slipped from 1st position to 2nd position.

4.2 Paired t-test (two-tailed)

Paired t-test (two-tailed) is conducted for all the chosen fifteen ratios for study and the hypotheses are tested bank-wise. The results of the statistical analysis are presented ratio-wise and bank-wise in detail hereunder:

I. Capital Adequacy

I-1 CRAR:

Table 4: Paired t-test on Ratio: CRAR

Bank	Period	Mean	Std. Deviation	t- stat	p-value	Result
PNB	Pre-	11.1850	2.2415	-4.0030	0.0280	Significant
	Post-	15.0725	0.7921			
CB	Pre-	12.9075	0.7452	-2.5090	0.0870	Not Significant
	Post-	15.2600	1.5824			
UBI	Pre-	11.9600	0.5870	-3.7820	0.0320	Significant
	Post-	15.0150	1.9173			
IB	Pre-	13.3800	0.6665	-7.6160	0.0050	Significant
	Post-	16.4250	0.5239			

(Source: Data Analysis with SPSS 26.0)

The mean values of CRAR (%) increased in respect of all the four banks under study, which is indicative of improved performance in the post-merger period over the pre-merger period.

PNB: As the p-value of 0.0280 is less than 0.05, the null hypothesis (H_0^1) is rejected. Thus, the increase in CRAR is considered as statistically significant.

CB: As the p-value of 0.0870 is more than 0.05, the null hypothesis (H_0^1) is accepted. Thus, the increase in CRAR is considered as not statistically significant.

UBI: As the p-value of 0.0320 is less than 0.05, the null hypothesis (H_0^1) is rejected. Thus, the increase in CRAR is considered as statistically significant.

IB: As the p-value of 0.0050 is less than 0.05, the null hypothesis (H_0^1) is rejected. Thus, the increase in CRAR is considered as statistically significant.

I-2 Tier – I CRAR:

Table 5: Paired t-test on Ratio: Tier – I CRAR

Bank	Period	Mean	Std. Deviation	t- stat	p-value	Result
PNB	Pre-	8.8575	2.1763	-3.7470	0.0330	Significant
	Post-	12.2700	0.7929			
CB	Pre-	9.8075	0.5569	-2.5890	0.0810	Not Significant
	Post-	12.4300	1.8189			
UBI	Pre-	9.5700	0.8153	-4.6340	0.0190	Significant
	Post-	12.8625	2.0310			
IB	Pre-	11.7250	0.4819	-2.4390	0.0930	Not Significant
	Post-	13.3950	1.2622			

(Source: Data Analysis with SPSS 26.0)

The mean values of Tier-I CRAR (%) increased in respect of all the four banks under study, which is indicative of improved performance in the post-merger period over the pre-merger period.

PNB: As the p-value of 0.0330 is less than 0.05, the null hypothesis (H_0^2) is rejected. Thus, the increase in Tier-I CRAR is considered as statistically significant.

CB: As the p-value of 0.0810 is more than 0.05, the null hypothesis (H_0^2) is accepted. Thus, the increase in Tier-I CRAR is considered as not statistically significant.

UBI: As the p-value of 0.0190 is less than 0.05, the null hypothesis (H_0^2) is rejected. Thus, the increase in Tier-I CRAR is considered as statistically significant.

IB: As the p-value of 0.0930 is more than 0.05, the null hypothesis (H_0^2) is accepted. Thus, the increase in Tier-I CRAR is considered as not statistically significant.

I-3 Tier-II CRAR:

Table 6: Paired t-test on Ratio: Tier – II CRAR

Bank	Period	Mean	Std. Deviation	t- stat	p-value	Result
PNB	Pre-	2.3275	0.2915	-3.5200	0.0390	Significant
	Post-	2.8025	0.0250			
CB	Pre-	3.1000	0.3027	0.8700	0.4480	Not Significant
	Post-	2.8300	0.3432			
UBI	Pre-	2.3900	0.2960	2.1040	0.1260	Not Significant
	Post-	2.1575	0.1472			
IB	Pre-	1.6550	0.3889	-3.2160	0.0490	Significant
	Post-	3.1400	0.5796			

(Source: Data Analysis with SPSS 26.0)

The mean values of Tier-II CRAR (%) decreased in respect of Canara Bank and Union Bank of India, which is indicative of improved performance in the post-merger period over the pre-merger period. However, the mean values increased in respect of the other two banks, i.e. Punjab National Bank and Indian Bank which is not the desired performance.

PNB: As the p-value of 0.0390 is less than 0.05, the null hypothesis (H_0^3) is rejected. Thus, the increase in Tier-II CRAR is considered as statistically significant.

CB: As the p-value of 0.4480 is more than 0.05, the null hypothesis (H_0^3) is accepted. Thus, the decrease in Tier-II CRAR is considered as not statistically significant.

UBI: As the p-value of 0.1260 is more than 0.05, the null hypothesis (H_0^3) is accepted. Thus, the decrease in Tier-II CRAR is considered as not statistically significant.

IB: As the p-value of 0.0490 is less than 0.05, the null hypothesis (H_0^3) is rejected. Thus, the increase in Tier-II CRAR is considered as statistically significant.

II. Asset Quality

II-1 Net NPA to Net Advances:

Table 7: Paired t-test on Ratio: Net NPA to Net Advances

Bank	Period	Mean	Std. Deviation	t- stat	p-value	Result
PNB	Pre-	7.8475	2.4112	4.7050	0.0180	Significant
	Post-	3.4950	2.2319			
CB	Pre-	5.8500	1.3874	6.8850	0.0060	Significant
	Post-	2.3675	1.1255			
UBI	Pre-	6.8325	1.2099	5.6410	0.0110	Significant
	Post-	2.7575	1.6755			
IB	Pre-	3.7700	0.5151	4.5510	0.0200	Significant
	Post-	1.7425	1.3366			

(Source: Data Analysis with SPSS 26.0)

The mean values of Net NPA to Net Advances Ratio (%) decreased in respect of all the four banks under study, which is indicative of improved performance in the post-merger period over the pre-merger period.

PNB: As the p-value of 0.0180 is less than 0.05, the null hypothesis (H_0^4) is rejected. Thus, the decrease in Net NPA to Net Advances Ratio is considered as statistically significant.

CB: As the p-value of 0.0060 is less than 0.05, the null hypothesis (H_0^4) is rejected. Thus, the decrease in Net NPA to Net Advances Ratio is considered as statistically significant.

UBI: As the p-value of 0.0110 is less than 0.05, the null hypothesis (H_0^4) is rejected. Thus, the decrease in Net NPA to Net Advances Ratio is considered as statistically significant.

IB: As the p-value of 0.0200 is less than 0.05, the null hypothesis (H_0^4) is rejected. Thus, the decrease in Net NPA to Net Advances Ratio is considered as statistically significant.

II-2 Gross NPA to Total Advances:

The mean values of Gross NPA to Total Advances Ratio (%) decreased in respect of all the four banks under study, which is indicative of improved performance in the post-merger period over the pre-merger period.

PNB: As the p-value of 0.1110 is more than 0.05, the null hypothesis (H_0^5) is accepted. Thus, the decrease in Gross NPA to Total Advances Ratio is considered as not statistically significant.

Table 8: Paired t-test on Ratio: Gross NPA to Total Advances

Bank	Period	Mean	Std. Deviation	t- stat	p-value	Result
PNB	Pre-	15.1550	2.4700	2.2420	0.1110	Not Significant
	Post-	10.0925	3.6482			
CB	Pre-	9.6275	1.5854	3.7800	0.0320	Significant
	Post-	6.5050	2.1134			
UBI	Pre-	14.4000	2.1817	1.8190	0.1660	Not Significant
	Post-	9.2850	3.9468			
IB	Pre-	7.2050	0.2700	0.1270	0.9070	Not Significant
	Post-	7.0550	2.6252			

(Source: Data Analysis with SPSS 26.0)

CB: As the p-value of 0.0320 is less than 0.05, the null hypothesis (H_0^5) is rejected. Thus, the decrease in Gross NPA to Total Advances Ratio is considered as statistically significant.

UBI: As the p-value of 0.1660 is more than 0.05, the null hypothesis (H_0^5) is accepted. Thus, the decrease in Gross NPA to Total Advances Ratio is considered as not statistically significant.

IB: As the p-value of 0.9070 is more than 0.05, the null hypothesis (H_0^5) is accepted. Thus, the decrease in Gross NPA to Total Advances Ratio is considered as not statistically significant.

II-3 Secured Advances to Total Advances:

Table 9: Paired t-test on Ratio: Secured Advances to Total Advances

Bank	Period	Mean	Std. Deviation	t- stat	p-value	Result
PNB	Pre-	83.4379	4.5908	2.0800	0.1290	Not Significant
	Post-	79.3340	2.2448			
CB	Pre-	83.8930	0.4229	5.4350	0.0120	Significant
	Post-	77.3732	2.6868			
UBI	Pre-	90.3253	2.1356	3.7470	0.0330	Significant
	Post-	84.4706	2.8028			
IB	Pre-	83.8038	2.0841	-5.1240	0.0140	Significant
	Post-	92.6267	1.7511			

(Source: Data Analysis with SPSS 26.0)

The mean values of Secured Advances to Total Advances Ratio (%) increased in respect of Indian Bank only, which is indicative of improved performance in the post-merger period over the pre-merger period. However, the mean values decreased in respect of all the three banks, i.e. Punjab National Bank, Canara Bank and Union Bank of India which is not the desired performance.

PNB: As the p-value of 0.1290 is more than 0.05, the null hypothesis (H_0^6) is accepted. Thus, the decrease in Secured Advances to Total Advances Ratio is considered as not statistically significant.

CB: As the p-value of 0.0120 is less than 0.05, the null hypothesis (H_0^6) is rejected. Thus, the decrease in Secured Advances to Total Advances Ratio is considered as statistically significant.

UBI: As the p-value of 0.0330 is less than 0.05, the null hypothesis (H_0^6) is rejected. Thus, the decrease in Secured Advances to Total Advances Ratio is considered as statistically significant.

IB: As the p-value of 0.0140 is less than 0.05, the null hypothesis (H_0^6) is rejected. Thus, the increase in Secured Advances to Total Advances Ratio is considered as statistically significant.

III. Management Efficiency

III-1 Business per Employee:

Table 10: Paired t-test on Ratio: Business per Employee

Bank	Period	Mean	Std. Deviation	t- stat	p-value	Result
PNB	Pre-	16.1050	1.6684	-14.6690	0.0010	Significant
	Post-	20.9350	2.2810			
CB	Pre-	16.0772	1.4863	-5.3400	0.0130	Significant
	Post-	21.6175	3.3983			
UBI	Pre-	18.6275	1.0568	-3.9340	0.0290	Significant
	Post-	22.0550	2.7463			
IB	Pre-	20.8696	2.9143	-8.1630	0.0040	Significant
	Post-	25.9575	3.1883			

(Source: Data Analysis with SPSS 26.0)

The mean values of Business per Employee (Rs. Crore) increased in respect of all the four banks under study, which is indicative of improved performance in the post-merger period over the pre-merger period.

PNB: As the p-value of 0.0010 is less than 0.05, the null hypothesis (H_0^7) is rejected. Thus, the increase in Business per Employee is considered as statistically significant.

CB: As the p-value of 0.0130 is less than 0.05, the null hypothesis (H_0^7) is rejected. Thus, the increase in Business per Employee is considered as statistically significant.

UBI: As the p-value of 0.0290 is less than 0.05, the null hypothesis (H_0^7) is rejected. Thus, the increase in Business per Employee is considered as statistically significant.

IB: As the p-value of 0.0040 is less than 0.05, the null hypothesis (H_0^7) is rejected. Thus, the increase in Business per Employee is considered as statistically significant.

III-2 Total Income per Employee:

Table 11: Paired t-test on Ratio: Total Income per Employee

Bank	Period	Mean	Std. Deviation	t- stat	p-value	Result
PNB	Pre-	81.6475	7.4443	-2.3840	0.0970	Not Significant
	Post-	94.2275	15.8739			
CB	Pre-	89.5025	6.2655	-2.5760	0.0820	Not Significant
	Post-	117.5500	27.1794			
UBI	Pre-	104.9300	6.0807	-2.0220	0.1360	Not Significant
	Post-	122.2100	22.7150			
IB	Pre-	106.2100	18.9438	-10.9420	0.0020	Significant
	Post-	127.2425	21.8251			

(Source: Data Analysis with SPSS 26.0)

The mean values of Total Income per Employee (Rs. Crore) increased in respect of all the four banks under study, which is indicative of improved performance in the post-merger period over the pre-merger period.

PNB: As the p-value of 0.0970 is more than 0.05, the null hypothesis (H_0^8) is accepted. Thus, the increase in Total Income per Employee is considered as not statistically significant.

CB: As the p-value of 0.0820 is more than 0.05, the null hypothesis (H_0^8) is accepted. Thus, the increase in Total Income per Employee is considered as not statistically significant.

UBI: As the p-value of 0.1360 is more than 0.05, the null hypothesis (H_0^8) is accepted. Thus, the increase in Total Income per Employee is considered as not statistically significant.

IB: As the p-value of 0.0020 is less than 0.05, the null hypothesis (H_0^8) is rejected. Thus, the increase in Total Income per Employee is considered as statistically significant.

III-3 Operating Profit per Employee:

Table 12: Paired t-test on Ratio: Operating Profit per Employee

Bank	Period	Mean	Std. Deviation	t- stat	p-value	Result
PNB	Pre-	18.3050	3.2940	-3.8960	0.0300	Significant
	Post-	21.9750	1.7556			
CB	Pre-	16.5825	1.0521	-4.4540	0.0210	Significant
	Post-	29.2725	5.9668			
UBI	Pre-	21.2825	2.2117	-5.1490	0.0140	Significant
	Post-	31.2775	5.2596			
IB	Pre-	25.9650	6.4246	-6.1190	0.0090	Significant
	Post-	34.3950	6.7236			

(Source: Data Analysis with SPSS 26.0)

The mean values of Operating Profit per Employee (Rs. Crore) increased in respect of all the four banks under study, which is indicative of improved performance in the post-merger period over the pre-merger period.

PNB: As the p-value of 0.0300 is less than 0.05, the null hypothesis (H_0^9) is rejected. Thus, the increase in Operating Profit per Employee is considered as statistically significant.

CB: As the p-value of 0.0210 is less than 0.05, the null hypothesis (H_0^9) is rejected. Thus, the increase in Operating Profit per Employee is considered as statistically significant.

UBI: As the p-value of 0.0140 is less than 0.05, the null hypothesis (H_0^9) is rejected. Thus, the increase in Operating Profit per Employee is considered as statistically significant.

IB: As the p-value of 0.0090 is less than 0.05, the null hypothesis (H_0^9) is rejected. Thus, the increase in Operating Profit per Employee is considered as statistically significant.

IV. Earnings Ability

IV-1 Return on Assets:

Table 13: Paired t-test on Ratio: Return on Assets

Bank	Period	Mean	Std. Deviation	t- stat	p-value	Result
PNB	Pre-	-0.6550	0.9026	-2.1700	0.1180	Not Significant
	Post-	0.2825	0.1778			
CB	Pre-	-0.2025	0.4260	-2.8140	0.0670	Not Significant
	Post-	0.6325	0.3460			
UBI	Pre-	-0.5150	0.4932	-3.3620	0.0440	Significant
	Post-	0.6150	0.3255			
IB	Pre-	0.3950	0.2501	-1.5110	0.2280	Not Significant
	Post-	0.7425	0.2445			

(Source: Data Analysis with SPSS 26.0)

The mean values of Return on Assets (%) increased in respect of all the four banks under study, which is indicative of improved performance in the post-merger period over the pre-merger period.

PNB: As the p-value of 0.1180 is more than 0.05, the null hypothesis (H_0^{10}) is accepted. Thus, the increase in Return on Assets is considered as not statistically significant.

CB: As the p-value of 0.0670 is more than 0.05, the null hypothesis (H_0^{10}) is accepted. Thus, the increase in Return on Assets is considered as not statistically significant.

UBI: As the p-value of 0.0440 is less than 0.05, the null hypothesis (H_0^{10}) is rejected. Thus, the increase in Return on Assets is considered as statistically significant.

IB: As the p-value of 0.2280 is more than 0.05, the null hypothesis (H_0^{10}) is accepted. Thus, the increase in Return on Assets is considered as not statistically significant.

IV-2 Return on Equity:

Table 14: Paired t-test on Ratio: Return on Equity

Bank	Period	Mean	Std. Deviation	t- stat	p-value	Result
PNB	Pre-	-12.2123	16.6030	-2.2590	0.1090	Not Significant
	Post-	5.0559	4.4454			
CB	Pre-	-3.4270	7.0568	-2.8210	0.0670	Not Significant
	Post-	12.7366	7.5733			
UBI	Pre-	-9.7650	10.1709	-3.1420	0.0520	Not Significant
	Post-	9.8332	4.6967			
IB	Pre-	5.2043	3.0827	-1.9390	0.1480	Not Significant
	Post-	12.1458	4.9200			

(Source: Data Analysis with SPSS 26.0)

The mean values of Return on Equity (%) increased in respect of all the four banks under study, which is indicative of improved performance in the post-merger period over the pre-merger period.

PNB: As the p-value of 0.1090 is more than 0.05, the null hypothesis (H_0^{11}) is accepted. Thus, the increase in Return on Equity is considered as not statistically significant.

CB: As the p-value of 0.0670 is more than 0.05, the null hypothesis (H_0^{11}) is accepted. Thus, the increase in Return on Equity is considered as not statistically significant.

UBI: As the p-value of 0.0520 is more than 0.05, the null hypothesis (H_0^{11}) is accepted. Thus, the increase in Return on Equity is considered as not statistically significant.

IB: As the p-value of 0.1480 is more than 0.05, the null hypothesis (H_0^{11}) is accepted. Thus, the increase in Return on Equity is considered as not statistically significant.

IV-3 Net Interest Income to Total Assets:

The mean values of Net Interest Income to Total Assets Ratio (%) increased in respect of all the four banks under study, which is indicative of improved performance in the post-merger period over the pre-merger period.

PNB: As the p-value of 0.0050 is less than 0.05, the null hypothesis (H_0^{12}) is rejected. Thus, the increase in Net Interest Income to Total Assets Ratio is considered as statistically significant.

CB: As the p-value of 0.0310 is less than 0.05, the null hypothesis (H_0^{12}) is rejected. Thus, the increase in Net Interest Income to Total Assets Ratio is considered as statistically significant.

Table 15: Paired t-test on Ratio: Net Interest Income to Total Assets

Bank	Period	Mean	Std. Deviation	t- stat	p-value	Result
PNB	Pre-	2.1420	0.0937	-7.5540	0.0050	Significant
	Post-	2.4275	0.1440			
CB	Pre-	1.9554	0.2059	-3.8370	0.0310	Significant
	Post-	2.3242	0.1424			
UBI	Pre-	2.0819	0.0857	-7.2140	0.0050	Significant
	Post-	2.5244	0.1415			
IB	Pre-	2.5786	0.0986	-2.0010	0.1390	Not Significant
	Post-	2.7693	0.1883			

(Source: Data Analysis with SPSS 26.0)

UBI: As the p-value of 0.0050 is less than 0.05, the null hypothesis (H_0^{12}) is rejected. Thus, the increase in Net Interest Income to Total Assets Ratio is considered as statistically significant.

IB: As the p-value of 0.1390 is more than 0.05, the null hypothesis (H_0^{12}) is accepted. Thus, the increase in Net Interest Income to Total Assets Ratio is considered as not statistically significant.

V. Liquidity Position

V-1 Credit to Deposits Ratio:

Table 16: Paired t-test on Ratio: Credit to Deposits

Bank	Period	Mean	Std. Deviation	t- stat	p-value	Result
PNB	Pre-	67.4579	0.3119	0.8950	0.4370	Not Significant
	Post-	65.2806	4.6393			
CB	Pre-	70.5758	1.8092	1.4350	0.2470	Not Significant
	Post-	67.3528	3.9395			
UBI	Pre-	72.0489	2.8385	1.0870	0.3570	Not Significant
	Post-	67.9525	5.4938			
IB	Pre-	74.0146	2.7424	2.0940	0.1270	Not Significant
	Post-	70.0333	4.2930			

(Source: Data Analysis with SPSS 26.0)

The mean values of Credit to Deposits Ratio (%) decreased in respect of all the four banks under study, which is indicative of improved performance in the post-merger period over the pre-merger period.

PNB: As the p-value of 0.4370 is more than 0.05, the null hypothesis (H_0^{13}) is accepted. Thus, the decrease in Credit to Deposits Ratio is considered as not statistically significant.

CB: As the p-value of 0.2470 is more than 0.05, the null hypothesis (H_0^{13}) is accepted. Thus, the decrease in Credit to Deposits Ratio is considered as not statistically significant.

UBI: As the p-value of 0.3570 is more than 0.05, the null hypothesis (H_0^{13}) is accepted. Thus, the decrease in Credit to Deposits Ratio is considered as not statistically significant.

IB: As the p-value of 0.1270 is more than 0.05, the null hypothesis (H_0^{13}) is accepted. Thus, the decrease in Credit to Deposits Ratio is considered as not statistically significant.

V-2 Liquid Assets to Total Deposits:

Table 17: Paired t-test on Ratio: Liquid Assets to Total Deposits

Bank	Period	Mean	Std. Deviation	t- stat	p-value	Result
PNB	Pre-	12.7515	2.0827	1.7250	0.1830	Not Significant
	Post-	10.7925	1.2561			
CB	Pre-	10.8373	0.9813	-2.1530	0.1200	Not Significant
	Post-	14.4717	3.1816			
UBI	Pre-	10.8530	1.6538	1.1840	0.3220	Not Significant
	Post-	10.1291	1.0348			
IB	Pre-	6.3325	1.3446	-1.7540	0.1780	Not Significant
	Post-	9.3046	3.1100			

(Source: Data Analysis with SPSS 26.0)

The mean values of Liquid Assets to Total Deposits Ratio (%) increased in respect of Canara Bank and Indian Bank, which is indicative of improved performance in the post-merger period over the pre-merger period. However, the mean values decreased in respect of the other two banks, i.e. Punjab National Bank and Union Bank of India which is not the desired performance.

PNB: As the p-value of 0.1830 is more than 0.05, the null hypothesis (H_0^{14}) is accepted. Thus, the decrease in Liquid Assets to Total Deposits Ratio is considered as not statistically significant.

CB: As the p-value of 0.1200 is more than 0.05, the null hypothesis (H_0^{14}) is accepted. Thus, the increase in Liquid Assets to Total Deposits Ratio is considered as not statistically significant.

UBI: As the p-value of 0.3220 is more than 0.05, the null hypothesis (H_0^{14}) is accepted. Thus, the decrease in Liquid Assets to Total Deposits Ratio is considered as not statistically significant.

IB: As the p-value of 0.1780 is more than 0.05, the null hypothesis (H_0^{14}) is accepted. Thus, the increase in Liquid Assets to Total Deposits Ratio is considered as not statistically significant.

V-3 G-Sec to Total Investments:

The mean values of G-Sec to Total Investments Ratio (%) increased in respect of all the four banks under study, which is indicative of improved performance in the post-merger period over the pre-merger period.

Table 18: Paired t-test on Ratio: G-Sec to Total Investments

Bank	Period	Mean	Std. Deviation	t- stat	p-value	Result
PNB	Pre-	80.3800	3.6241	-5.7490	0.0100	Significant
	Post-	88.6424	1.2909			
CB	Pre-	90.0625	1.1729	-4.8210	0.0170	Significant
	Post-	94.1178	1.6888			
UBI	Pre-	76.2975	4.2446	-0.1750	0.8720	Not Significant
	Post-	76.9557	3.5062			
IB	Pre-	85.6900	2.1138	-2.5250	0.0860	Not Significant
	Post-	89.6578	2.5796			

(Source: Data Analysis with SPSS 26.0)

PNB: As the p-value of 0.0100 is less than 0.05, the null hypothesis (H_0^{15}) is rejected. Thus, the increase in G-Sec to Total Investments Ratio is considered as statistically significant.

CB: As the p-value of 0.0170 is less than 0.05, the null hypothesis (H_0^{15}) is rejected. Thus, the increase in G-Sec to Total Investments Ratio is considered as statistically significant.

UBI: As the p-value of 0.8720 is more than 0.05, the null hypothesis (H_0^{15}) is accepted. Thus, the increase in G-Sec to Total Investments Ratio is considered as not statistically significant.

IB: As the p-value of 0.0860 is more than 0.05, the null hypothesis (H_0^{15}) is accepted. Thus, the increase in G-Sec to Total Investments Ratio is considered as not statistically significant.

5. CONCLUSIONS

The composite CAMEL ranks for all the four banks under study remained the same for both the pre-merger and post-merger periods, i.e. FY 2016-17 to FY 2019-20 and FY 2020-21 to FY 2023-24. It indicates that there is no relative variation in the overall performance among the said four banks, on account of the merger process, during the four-year period after mergers.

However, this exclusive study indicated that performance in respect of a few ratios considered under CAMEL rating model is not as desired in the post-merger period over that in the pre-merger period and such grey areas identified bank-wise are mentioned hereunder:

PNB: Tier-II CRAR, Secured Advances to Total Advances Ratio and Liquid Assets to Total Deposits Ratio

CB: Secured Advances to Total Advances Ratio

UBI: Secured Advances to Total Advances Ratio and Liquid Assets to Total Deposits Ratio

IB: Tier-II CRAR

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