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EFFECT OF MACRO-ECONOMIC AND BANKS SPECIFIC DETERMINANTS OF CREDIT RISK OF SELECT PUBLIC SECTOR BANKS IN THE POST FINANCIAL CRISIS PERIOD: EVIDENCE FROM INDIA

Dr. M. Basuvaraj[1] & Dr. M. Jegadeeshwaran[2]

[1]Assistant Professor, Department of Economics and Commerce, CMR University, Bangalore, Karnataka, India

[2]Assistant Professor, Department of Commerce, Bharathiar University, Coimbatore, Tamilnadu, India

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ABSTRACT

The core objective of the study is to analyse the effect of macro-economic and banks specific determinants of credit risk of select public sector banks in the post financial crisis period. The study period covers ten years (post financial crisis period) from 2008-2009 to 2017-2018. For the purpose of the study, top ten public sector banks have been selected based on the banks which have the highest share in Non-performing Assets (NPAs). The sample public sector banks namely, State Bank of India, Punjab National Bank, IDBI Bank, Bank of India, Bank of Baroda, Union Bank of India, Canara Bank, Central Bank of India, Indian Overseas Bank and UCO Bank are chosen for the study. The data analysis was done using ratio analysis and statistical tools like mean, standard deviation, co-efficient of variation, compound annual growth rate, hausman test and panel data regression. The findings also reveals that the most influencing factors of credit risk of select public sector banks are inflation rate, exchange rate, capital adequacy ratio, growth in advances, total loans to total deposits, loan loss provisions to total loans and bank size are moreover significant effect of credit risk thereby presenting them to incredible danger of banks financial health. Therefore, the study concludes that the banks must take strict essential steps to recover their loans and follow the reserve bank guidelines like Prompt Corrective Action (PCA) framework and maintain enough capital to absorb the risks.

KEYWORDS: *Credit Risk, Macroeconomic Determinants, Bank Specific Determinants, Post Financial Crises Period, Public Sector Banks, Ratio Analysis, Descriptive Statistics and Panel Data Regression*

INTRODUCTION

Credit risk resources are one of the major concerns for banks in India and it reflects the execution of the banks. The large level of credit risk is dissolves the esteem of the resource. The NPAs diminishes the value of shareholders and profitability of banks as well as the Indian economy. The bank's health is incredibly determined by the non-performing assets, thus the banks should have proper NPAs management and it is fundamental part for it loans process and reduces the credit risk and retaining the credit exposure for that the government has induced to invent advisable risk mechanism in recent years of banking system weakness. Credit risk is a major concern for lenders worldwide as it is the most critical of all risks faced by the banking institution. Credit risk exists because an expected payment might not occur. Poorly managed credit risk will result in financial losses for banks, donors, investors, lenders, borrowers and savers. This is because all tend to lose confidence in banks and funds begin to dry up and when funds dry up, the banks are not able to meet its objective of

providing services to the poor and quickly goes out of business.

In the case of banks, credit risk is the most important factor which has to be managed. Although credit risk can be the result of different causes, these kinds of risks mainly arise from economic crises, the companies' bankruptcy, lack of rules and regulations in the companies accountancy and auditing process, the increase of off-balance sheet obligations, the devaluation of collaterals and etc. due to the increasing spate of Nonperforming loans the Basel II accord emphasized on credit risk management practices. Compliance with accord means a sound approach to tackling credit risk has been taken and this ultimately improves bank performance. Through the effective management of credit risk exposure, banks not only support the viability and profitability of their own business, they also contribute to systematic stability and to an efficient allocation of capital in the economy.

REVIEW OF LITERATURE

Abhiman Das and Saibal Ghosh (2007)[1]have conducted a study on Determinants of Credit Risk in Indian State-Owned banks: An Empirical Investigation. Malhotra et al (2011)[2]they made a study on "Evaluating the performance of commercial banks in India". Pratha Jain Sanjay Sharma et al (2017)[3] have studied "Retail credit risk management of commercial banks in Indian with special reference to private sector banks". Sirus Sharifi et al (2018)[4] have conducted a study on "Relationship between credit risk management and non-performing assets of commercial banks in India". Edward I. Altman and Anthony Saunders (1998)[5] have studied "Credit risk measurement: Development over the Last 20 years" they analyzed two part of their research first part is, credit risk measurement of individual loans and portfolios and second part is a new approach built around a mortality risk framework to measure the risk and returns on loans and bonds is presented. Kuan-Chung Chen and Che-Han Kao (2009)[6] they measured "measurement of credit risk efficiency and productivity change for commercial banks in Taiwan". Gakure et al (2012)[7]have conducted a study on "effect of credit risk management techniques on the performance of unsecured bank loans employed commercial banks in Kenya". Rufo Mendoza and John Paolo Rivera (2017)[8] in their research study "The effect of credit risk and capital adequacy on the profitability of rural banks in the Philippines".

STATEMENT OF THE PROBLEM

The banking sector has a prominent role in the expansion of an economy. After liberalization, credit risk management plays a prominent role in the Indian economy. Nature of banking business is assimilated by the risk. Biggest challenges are resisted by the banking industry by managing the risk and measuring the risk with the NPAs. The NPAs are under hard-pressure risk for the banks as credit risk not only indicates internal factors but also macroeconomic factors. In future, banks will unquestionably repose on the dynamics of credit risk management. In order to sustain in the market, the banks should have efficient management of credit risk so that they can retain the success for a longer period of time. Inappropriate credit practice and poor credit quality will lead to failure of banks. At the same time as banks make progress towards an incorporated comprehension of their risk profiles, much data is regularly scattered among specialty units. There is no way to know whether the capital is precisely reflecting dangers or the adequacy of loan loss reserves in order to save the potential short term credit losses without an intensive risk evaluation. Banks with inefficient credit risk management should focus on investigating the exhausting losses by regulators and investors. The financial crisis has affected the banking sector by causing banks to lose money on credit defaults, interbank lending to freeze, credit to consumers and business dry up. The NPAs influence the operational productivity, which in turn affects profitability, liquidity and overall financial health.

The public sector banks, which account for over 80 per cent of NPAs in the system, should see their gross NPAs peak of 14.6 per cent in March 2018 and as per Reserve Bank of India provisional data on global operations, as on currently, the aggregate amount of gross NPAs of public sector banks and schedule commercial banks were Rs. 8,06,412 crore and Rs. 9,49,279 crores respectively. This will destroy the bank's profitability gradually and the investors as well as the Indian economy will be affected. India's plan to capital infusion is sufficient to determine administrative capital needs. However, this will be deficient to credit growth, and credit risk exposures proceed to problems of loaning. So, in this context, the researcher has undertaken a study on determinants of credit risk and its impact on the performance of select Indian public and private sector banks in the post financial crisis period. This raises the following research question:

What are the various macroeconomic and bank specific determinants influence the credit risk of Indian public sector banks?

Objective of the Study

To analyse the impact of macroeconomic and banks specific determinants of credit risk of select Indian public sector banks in the post financial crisis period.

Hypothesis of the Study

There is no significant difference in bank credit risk on macroeconomic and bank specific determinants of Indian public sector banks in the post financial crisis period.

RESEARCH METHODOLOGY

The present study is based on analytical in nature

Sources of Data

The present study is mainly based on secondary data. The data for this study are obtained from CMIE prowess database and also from the annual reports published by the Reserve Bank of India (RBI), department of banking supervision, money control website and the annual reports published by the respective banks.

Period of the Study

The study period covers ten years from the financial year 2008-2009 to 2017-2018.

Selection of the Sample

For the purpose of the study, top ten public sector banks have been selected based on the highest share in Non-performing Assets. The sample public sector banks namely, State Bank of India, Punjab National Bank, IDBI Bank, Bank of India, Bank of Baroda, Union Bank of India, Canara Bank, Central Bank of India, Indian Overseas Bank and UCO Bank are chosen for the study.

Tools for Analysis

The data analysis was done using ratio analysis and statistical tools like mean, standard deviation, co-efficient of variation, compound annual growth rate, hausman test and panel data regression.

VARIABLE SPECIFICATION

Credit Risk

Non-Performing Loans to Total Loans

Macroeconomic Variables

GDP Growth Rate, Inflation Rate, Exchange Rate and Real Interest Rate

Bank Specific Variables

Capital Adequacy Ratio, Growth in Advances, Operating Inefficiency Ratio, Total Loan to Total Deposits Ratio, Total Loan to Total Assets Ratio, Return on Assets, Loan Loss Provisions to Total Loans, Bank Size and Bank Branch Growth.

Table 1: Descriptive Statistics and Compound Annual Growth Rate of Macroeconomic and Bank Specific Determinants of Credit Risk of Select Public Sector Banks

Credit Risk (Non-Performing Loans to Total Loans)										
Banks	**ICICI**	**Axis**	**HDFC**	**JK&B**	**KMB**	**KVB**	**FB**	**YB**	**LVB**	**SIB**
MEAN	5.13	7.00	8.80	6.63	4.89	5.35	4.70	7.87	10.18	9.09
SD	2.76	6.42	10.75	6.29	4.79	3.98	4.29	7.14	10.12	9.05
CV	53.83	91.71	122.11	94.86	98.03	74.39	91.39	90.79	99.36	99.62
CAGR	14.38	27.29	37.02	26.58	26.29	19.34	23.00	22.31	27.35	28.94
Macroeconomic Determinants										
	GDP Growth Rate		**Inflation Rate**		**Exchange Rate**			**Real Interest Rate**		
MEAN	7.38		7.70		57.54			4.62		
SD	1.33		3.06		8.34			2.71		
CV	18.02		39.73		14.50			58.52		
CAGR	-1.62		-7.05		2.75			1.20		
Bank Specific Determinants Capital Adequacy Ratio										
	ICICI	**Axis**	**HDFC**	**JK&B**	**KMB**	**KVB**	**FB**	**YB**	**LVB**	**SIB**
MEAN	12.97	12.18	12.05	11.89	13.53	11.69	12.32	11.42	11.80	12.17
SD	0.74	1.43	1.32	1.02	1.41	1.01	1.95	0.99	2.04	1.38
CV	5.74	11.70	10.98	8.60	10.45	8.61	15.86	8.66	17.27	11.37
CAGR	-1.22	-4.13	-0.27	-0.05	-1.46	-1.42	-4.35	-1.68	-3.49	-0.86
Growth in Advances										
MEAN	16.78	14.18	10.49	13.82	15.69	14.90	13.96	8.84	10.48	9.77
SD	7.01	10.46	12.74	12.29	14.01	9.70	10.40	14.06	16.42	12.68
CV	41.77	73.75	121.48	88.93	89.30	65.11	74.45	158.97	156.76	129.78
CAGR	-2.61	-19.43	-9.04	-12.47	-10.50	-30.36	-8.72	-3.25	-13.41	-8.24
Operating Inefficiency Ratio										
MEAN	1.92	1.70	1.06	1.45	1.32	1.56	1.45	1.76	4.08	1.02
SD	0.18	0.21	0.21	0.24	0.23	0.12	0.23	0.23	6.51	0.21
CV	9.22	12.63	19.31	16.87	17.66	7.38	15.88	12.83	159.31	20.40
CAGR	-0.72	-1.44	4.68	-1.06	-1.78	-2.21	-1.51	2.73	27.89	6.38
Total Loan to Total Deposits Ratio										
MEAN	80.49	74.50	81.93	73.07	70.82	75.51	70.79	66.90	72.75	57.16
SD	5.39	4.00	7.06	4.26	3.73	4.12	2.09	9.84	5.87	13.38
CV	6.69	5.37	8.62	5.83	5.26	5.46	2.95	14.71	8.06	23.40
CAGR	-0.22	-0.88	-2.80	-1.38	-0.35	0.16	-0.17	-2.02	-2.00	5.54
Total Loans to Total Assets Ratio										
MEAN	62.07	62.38	58.76	61.83	60.60	64.23	61.65	58.05	73.79	48.90
SD	4.09	2.59	4.08	3.17	2.99	3.00	1.98	7.41	29.06	11.32
CV	6.59	4.16	6.95	5.13	4.93	4.67	3.21	12.77	39.38	23.16

Table 1: Contd.,

CAGR	0.03	-1.02	-1.97	-1.30	-0.64	-0.23	-0.16	-1.99	-1.55	5.60
Return on Assets										
MEAN	0.65	0.55	-0.07	0.49	0.61	0.56	0.58	0.03	-0.15	0.03
SD	0.36	0.99	1.12	0.68	0.72	0.67	0.84	0.58	1.12	1.01
CV	54.93	179.87	-1640.43	140.37	117.30	118.13	146.17	1983.78	-753.68	3737.75
CAGR	-16.09	-81.42	-86.25	-64.01	-30.26	-72.36	-43.94	-34.21	-58.06	-43.26
Loan Loss Provisions to Total Loans										
MEAN	1.63	2.23	2.51	1.87	0.36	1.57	1.47	2.18	2.78	2.30
SD	0.90	1.70	3.50	1.43	0.22	1.19	1.15	2.08	2.67	2.24
CV	55.06	76.35	139.53	76.17	62.14	76.20	78.12	95.35	96.02	97.32
CAGR	21.52	22.38	54.12	22.35	-0.72	18.81	19.61	31.69	32.23	28.07
Bank Size										
MEAN	6.23	5.69	5.47	5.65	5.69	5.48	5.62	5.40	5.27	5.37
SD	0.18	0.16	0.11	0.16	0.18	0.16	0.15	0.12	0.17	0.02
CV	2.88	2.90	1.96	2.90	3.24	2.95	2.73	2.24	3.26	0.42
CAGR	0.88	0.88	0.57	0.79	0.90	0.90	0.81	0.66	0.60	-0.08
Bank Branch Growth										
MEAN	8.48	5.10	15.01	6.05	6.77	6.23	9.07	3.58	6.27	4.76
SD	8.33	3.28	12.72	4.35	5.15	3.49	8.52	3.16	6.81	3.67
CV	98.26	64.21	84.72	71.91	76.03	55.94	93.94	88.04	108.61	76.94
CAGR	9.36	-16.07	-6.22	-37.12	-10.84	-25.43	0.49	-20.82	-10.22	-31.17

Source: Complied and Computed from CMIE Prowess and Reserve Bank India Website

Credit Risk

The above table describes the descriptive statistics of Non-Performing Loans to Total Loans of select public sector banks. The credit risk shows the positive and high growth in the all public sector banks. It is clearly disclosed that the non-performing loans is increased in select public sector banks.

Macroeconomic Determinants

The exchange rate and real interest rates are demonstrated the positive growth and other two variables like, GDP Growth rate and inflation rate show the negative growth.

Bank Specific Determinants

The positive aspects of the banks like, capital adequacy ratio, return on assets and operating inefficiency are depict the negative growth in majority of banks and at the same time the negative aspects of banks i.e the credit risk determinants growing positively.

Panel Data Regression Analysis of Select Indian Public Sector Banks

Based on the review of literature the following variables have been used for the analysis in the term of determinant of credit risk in the public sector banks in India. Natural Logged value has been taken for all the dependent and independent determinants to build a panel data regression model. This model is a fixed effect panel data regression function that links the ratio of non-performing loans to total loans, key macroeconomic and bank specific determinants. Through considering both sets of determinants the exact specification of the fixed effect panel regression model is constructed as follows.

Table 2

Name of Variables	Proxy of Variables	References
Credit Risk		➢ Edward I. Altman and Anthony Saunders (1998). ➢ Shu ling lin (2007). ➢ Abhiman Das and Saibal Ghosh (RBI, 2007). ➢ Muhammad Imaduddin (2008). ➢ Somanadevi Thiagarajan et al (2011). ➢ Ekanayake E.M.N.N and Azeez A.A (2015). ➢ Atakelt hailu Asfa W and P.Veni (2015). ➢ Yuga Raj Bhattarai (2016). ➢ Yu Zhang and Xiaosong Zheng (2016). ➢ Sohaib Iqbal Kasana (2016). ➢ Nguyen Thuy Duong and Tran Thi Thu Huong (2017). ➢ Trust R. Mpofu and Eftychia Nikolaidou (2018). ➢ Shahriyar Mukhtarov et al (2018).
Non-Performing Loans to Total Loans (NPL to TL $_{i,t}$)	Ratio of Non-Performing Loans to Total Loans (*i* at time *t*).	
Macro Economic Variables		
GDP Growth Rate (ΔGDP_t)	The annual growth in real GDP (at time *t*)	
Inflation Rate ($\Delta I R_t$)	Annual inflation growth rate (at time *t*) (Measured by consumer price index)	
Exchange Rate ($E R_t$)	Exchange Rate (at time *t*)	
Real Interest Rate (RIR_t)	Real Interest Rate (at time *t*)	
Bank Specific Variables		
Capital Adequacy Ratio ($CAR_{i,t}$)	CAR = Tier I capital + Tier II Capital/Risk Weighted Assets (*i* at time *t*).	
Growth in Advances (ΔGA_t)	Total Advances in Current Year – Total Advances in Previous Year / Total Advances in Previous Year × 100 (*i* at time *t*)	
Ratio of Operating Inefficiency ($OI_{i,t}$)	Operating expenses/ Total Assets (*i* at time *t*).	
Ratio of Total Loans to Total Deposits (TL to TD $_{i,t}$)	Total Loans / Total Deposits (*i* at time *t*).	
Ratio of Total Loans to Total Assets (TL to TA $_{i,t}$)	Total Loans / Total Assets (*i* at time *t*)	
Return on Assets ($ROA_{i,t}$)	Net Income / Total Assets × 100 (*i* at time *t*)	
Ratio of Loan Loss Provisions to Total Loans (LLP to TL $_{i,t}$)	Loan Loss Provisions / Total Loans (*i* at time *t*).	
Bank Size ($BS_{i,t}$)	Log value of Total Assets (*i* at time *t*).	
Bank Branch Growth (ΔBBG_t)	Total Branches in Current Year – Total Branches in Previous Year / Total Branches in Previous Year × 100 (*i* at time *t*)	

Econometric Model for Select Public Sector Banks

$$\text{NPL to TL}_{i,t} = \beta 1,_i + \beta_2 \Delta GDP\ t + \beta_3 \Delta I\ R_t + \beta_4 E\ R_t + \beta_5 RIR_t + \beta_6 CAR_{i,t} + \beta_7 \Delta\ GA_t + \beta_8 OI_{i,t} + \beta_8 TL\ to\ TD_{i,t} + \beta_9 TL\ to\ TA_{i,t} + \beta_{10} ROA_{i,t} + \beta_{11}\ LLP\ to\ TL_{i,t} + \beta_{12} BS_{i,t} + \beta_{13} \Delta BBG_t + \eta + \upsilon_{i,t}$$

Where: NPL to $TL_{i,t}$ represents ratio of non-performing loans to total loans for bank *i* in year *t*; $\Delta GDP\ t$ represents the annual growth in real GDP at time *t*; $\Delta I\ R_t$ represents the annual inflation rate at time *t*; $E\ R_t$ represents Exchange Rate at time *t*; RIR_t represents Real Interest Rate at time *t;* $CAR_{i,t}$ represents capital adequacy ratio *i* at time *t*; $\Delta\ GA_t$ represents the growth in advances *i* at time *t;* $OI_{i,t}$ represents the ratio of operating inefficiency *i* at time *t;* TL to $TD_{i,t}$ represents the total loans to total deposits ratio *i* at time *t*; TL to $TA_{i,t}$ represents the total loans to total assets *i* at time *t;* $ROA_{i,t}$ represents the ratio of return on assets *i* at time *t;* LLP to $TL_{i,t}$ represents the loan loss provisions to total loans ratio *i* at time *t;* BS i,t represents the bank size *i* at time *t;* BBG_t represents the bank branch growth *i* at time *t;*

- H_0=Random effect model is appropriate
- H_1 = Fixed effect model is appropriate

Table 3: Hausman Test of Select Public Sector Banks

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-Section Random	92.987361	13	0.0000*

* Indicates Statistically Significant at 5 Percent Level.

The above table1 shows the Hausman test of credit risk determinants of select public sector banks. The test shows the significant value of 0.000, it is statistically significant at 5 percent level. Hence, reject the Random effect model and applied the fixed effect model to find the determinants of credit risk of select public sector banks.

H_{01} = There is no significant differences in bank credit risk on macroeconomic and bank specific determinants of Indian public sector banks in the post financial crisis period.

- Dependent Variable: Non-Performing Loans to Total Loans
- Method: Panel Least Squares
- Sample: 2009 – 2018
- Periods included: 10 years

Table 4: Fixed Effect Model of Panel Data Regression for Macroeconomic and Bank Specific Determinants of Select Public Sector Banks

Independent Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.131284	0.688983	-3.093378	0.0017
Macro Economic Determinants				
GDP Growth Rate	0.356900	0.257912	1.383805	0.1700
Inflation Rate	-1.423603	0.133126	-10.69366	0.0000*
Exchange Rate	1.232864	0.210010	5.870513	0.0000*
Real Interest Rate	0.016602	0.098425	0.168680	0.8664
Bank Specific Determinants				
Capital Adequacy Ratio	-0.414656	0.195678	-2.119070	0.0371*
Growth in Advances	-0.092549	0.031607	-2.928117	0.0044*
Operating Inefficiency	0.098700	0.094794	1.041209	0.3009
Total Loans to Total Deposits	0.634147	0.289928	2.187259	0.0316*
Total Loans to Total Assets	-0.191415	0.283123	-0.676085	0.5009
Return on Assets	-0.064293	0.048711	-1.319887	0.1906
Loan Loss Provisions to Total Loans	0.705891	0.056457	12.50310	0.0000*
Bank Size	0.405907	0.120217	3.376446	0.0011*
Bank Branch Growth	-0.049088	0.031695	-1.548754	0.1253

	Effects Specification		
R-squared	**0.951693**	Mean dependent var	0.645798
Adjusted R-squared	**0.940959**	S.D. dependent var	0.387571
S.E. of regression	0.094174	Akaike info criterion	-1.718075
Sum squared resid	0.718362	Schwarz criterion	-1.223093
Log likelihood	104.9037	Hannan-Quinn criter.	-1.517747
F-statistic	88.65515	Durbin-Watson stat	1.749408
Prob. (F-statistic)	**0.000000***		

Source: Computed Data

The above table 5.8 examines the Fixed Effect model of Panel Data Regression for macroeconomic and bank specific determinants of select public sector banks. In macroeconomic determinants, inflation rate and exchange rate have statistically impact on credit risk at 5 percent significant level, with the significant value of 0.0000 and 0.0000 respectively. In bank specific determinants, capital adequacy ratio (0.0371), growth in advances (0.0044), total loans to total deposits ratio (0.0316), Loan Loss Provisions to Total Loans ratio (0.0000) and bank size (0.0011) have shows the significantly impact on the credit risk at 5 percent level.

The table also explains the R squire value (0.951693) and adjusted R squire value (0.940959) it means, the independent variables more than 94 percent statistically influence the dependent variable. It also shows the Prob. (F-statistic) value is 0.00000 which is statistically significant at 5 percent level. Hence the null hypothesis is rejected. It is concluded that there is significant difference in credit risk and macroeconomic determinants and bank specific determinants of the public sector banks in the post financial crisis period.

CONCLUSION

The present study indicates that during the study period the most influencing factors of credit risk of select public sector banks are inflation rate, exchange rate, capital adequacy ratio, growth in advances, total loans to total deposits, loan loss provisions to total loans and bank size. They are moreover significant effect of credit risk thereby presenting them to incredible danger of banks financial health. Therefore, the study concludes that the banks must take strict essential steps recover their loans and follow the reserve banks guidelines like PCA framework and maintain enough capital to absorb the risks. Furthermore the banks should manage the efficient credit risk management strategies in order to motivating investors and confidence savers in banks which lead to efficient financial stability of the banks. This will help to enable to overall growth of economy and bring trust among the investors across the globe it will help to develop the Indian economy.

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