CAHIERS MAGELLANES-NS
Volume 06 Issue 2
2024

ISSN:1624-1940
DOI 10.6084/m9.figshare.26310846
http://magellanes.com/

A STUDY ON FACTORS INFLUENCING CREDIT RISK MANAGEMENT IN INDIAN FINANCIAL INSTITUTIONS

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Abstract

Indian Financial Institutions face a significant challenge with Credit Risk, as it is difficult to recover lent funds from borrowers. To understand the factors that impact Credit Risk Management in these institutions, a study was conducted using data collected from 26 institutions, including 6 non-banking and 20 banking institutions, from 2012 to 2021. The study considered both individual and macro-economic determinants as variables, with Gross Non-Performing Assets (GNPA) as the dependent variable, and several factors including Capital Adequacy Ratio (CAR), Return on Capital Employed (ROCE), Asset Quality, Return on Assets (ROA), Market Capitalization (MCAP), bank size, Gross Domestic Product (GDP), inflation, Consumer Price Index (CPI), unemployment rate, and real interest rate as the independent variables. A Hausman test was conducted to identify the best-fit model for the panel data regressions. The results of the study suggest that ROA, MCAP, GDP, and Unemployment Rate are the primary factors that impact Credit Risk Management in Indian Financial Institutions. It is recommended that institutions focus on maintaining a healthy ROA and MCAP, while also monitoring macroeconomic factors such as GDP and the unemployment rate to mitigate credit risk. The study further indicates that Credit Risk Management should consider a combination of individual and macroeconomic determinants, rather than relying solely on individual factors such as CAR, ROCE, and asset quality. In conclusion, this study provides valuable insights for financial institutions to develop effective Credit Risk Management strategies. By considering the identified determinants of Credit Risk, institutions can mitigate their losses and maintain a stable financial position.

Keywords: Credit Risk Management, Financial Institution, GNPA, Panel Data, Random Effect Model
JEL Code: C12, C23, F62, F65, G21, G22, G23, G24

The study delved deep into the challenges faced by Indian financial institutions in managing credit risk. Various tools of econometrics OLS regression , Hausma test , Fixed Effect , Random Effect and Pooled Effect models are developed to ascertain the best fit model for the credit risk management in Indian financial institutions . A sample of 260 banks and financial institutions are employed for a period ranging from 2012 to 2021 in the study. It is found that factors like Return on Assets (ROA), Market Capitalization (MCAP), Gross Domestic Product (GDP), and Unemployment Rate significantly influence credit risk. The recommendation is for institutions to focus on maintaining a robust ROA and MCAP, while also monitoring macroeconomic factors to effectively manage credit risk. The study emphasizes the need for a comprehensive approach that considers both individual and macroeconomic determinants rather than relying solely on individual factors like Capital Adequacy Ratio (CAR) and Return on Capital Employed (ROCE). Ultimately, the insights aim to guide financial institutions in developing strategies to mitigate losses and maintain a stable financial position.

ISSN:1624-1940
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http://magellanes.com/

Introduction

Banks and Financial institutions plays decisive role in promoting the economic advancement of our country. India has witnessed the strong banking system and bankers in the recent past. The primary activity of banking industry is to accept the deposits from its customers and lend loans to the customers on their requirement. Banks are acting as an agent, bailee and trustee for the customers.
Banks lend money to the customers and encounter the risk of credit if the customer default and fail to repay the dues on time thereby creating loss to the bank. It becomes crucial for the banks to manage and mitigate the credit risk thereby promoting the banks financial health in turn contributing to the development of economy.

Credit risk management in banks has been a challenging process for financial institutions. The significance of credit risk measurement is well known all over the world. Therefore stacks of banking institutions are anticipating upon credit measurement now a day. Practically, credit risk measurement is vital for the banking industry because it will not only identify credit risk significantly besides advancing their organizational value.Further, it becomes banks obligation to banks to weigh up the interest rate. If banks do not charge high interest rate from their respected customers in loan products, they have to face substantial loss. On the other side, if the banks charge high interest rate from their respected customers in loan products, they can reap plentiful benefits in a short period of time without any doubt.

Banks face heavy loss very often, that becomes the reason of necessity for credit risk management in order to get rid of their credit risk and losses efficiently. Since the pandemic, global financial crisis and the credit crisis has put credit risk management into the regulatory spotlight. There arises the need for the credit risk management in banks.Credit risk is a pervasive risk that banking and financial institutions frequently encounter. It arises when a contractual party fails to fulfill their obligations by the agreement's terms, leading to substantial losses and triggering potential financial crises. Given the significant impact of these institutions on a nation's economic development, it is their responsibility to manage their finances effectively. This entails minimizing losses by assessing whether a bank's capital and loan loss reserves are adequate at any given time. The process of controlling the potential effects of credit risk is known as Credit Risk Management (CRM). It involves the identification, appraisal, and management of risks, all of which are integral components of the general Risk Management Framework. Banks maintain client data in data warehouses, which can be regarded as concealed knowledge assets, as per Khaled Alzeaideen (2019), that can be accessed and utilized via data mining tools. This approach aids in determining the source and scope of the risk, both of which must be evaluated before deciding on the risk's management. The significance of banks in an economy cannot be overstated, as they provide liquidity for both lenders and borrowers, as noted by Kashyap et al. (1999).
Banks play a crucial role in evaluating the risks they face daily while lending due to their significant importance in an economy (Mohammad, 2014). Credit risk arises from the likelihood of losses resulting from a deterioration in the creditworthiness of counterparties or borrowers, and recent years have seen credit risk gain increased importance due to significant financial losses faced by large international financial organizations (Nikolaidou & Vogiazas, 2014). Effective management of credit risk is crucial to the success of banks and financial institutions over time, as loan losses leading to capital depletion

ISSN:1624-1940
DOI 10.6084/m9.figshare.26310846
http://magellanes.com/

have been a direct cause of the majority of institution failures (Moti et al., 2012).
The analysis aims to enhance credit risk management in the Indian financial industry by addressing specific objectives. Firstly, the study intends to recognize credit risk exposure and the determinants in financial institutions. Secondly, it aims to establish the correlation between selected determinants over the last ten years to gain insight into how they impact credit risk. Thirdly, the study will analyze the determinants of credit risk using the Hausman test to identify the best-fit model for credit risk management. Finally, the focus on the Indian banking sector is due to the significant challenges it faces in managing credit risk and the lack of awareness of strategies to manage credit risk and the causes of losses. By addressing these objectives, the study aims to reduce losses and enhance credit risk management in the Indian financial industry.
According to Economic Times, as per the statistics, it is said that the public sector banks are having high default risk than the private banks in India. It is said that the public sector banks account risk for almost 92.9% while the private banks hold around 6% of the risk.

Literature Review

Credit risk management is a critical aspect of banking that impacts both profitability and financial industry stability. Several studies have been conducted to evaluate the factors that affect credit risk management in commercial and public banks. Isaiah Oino (2016) used pooled OLS, fixed effects, and random effects to identify the factors that impact credit risk management in seven commercial banks and seven public banks. The study found that private banks are better funded and more lucrative than public banks. Asset quality, which is assessed by non-performing assets, had a substantial impact on bank profitability in both circumstances. Ahmad and Ariff (2007) analyzed the major factors that determine the credit risk of commercial banks in emerging economies. The study identified eight credit risk factors suggested by credit risk theories and empirical research. Regression analyses were used to find the factors that impact credit risk in banking systems that offer a variety of products. Regulatory capital was found to be important in the case of loan-dominant banks in emerging nations, while managerial quality was crucial. Abbas, Zaidi, Ahmad, and Ashraf (2014) highlighted the importance of effective risk management in banks. The study found that credit risk had a negative influence on ROA and ROE performance indicators in Pakistan's banking industry. Singh (2015) developed credit risk as a result of the bank's interactions with businesses, people, and other banks or financial institutions. The study used data from each bank's 11-year returns on assets, non-performing assets, and capital adequacy ratio to examine the extent of its influence.

Kaur and Sidhu (2022) researched industries based on a variety of economic areas in India, such as agriculture, MSMEs, housing, and education. The study analyzed priority sector loan trends and performance patterns throughout all of India, with a focus on Punjab, from 2004–05 to 2017–18. Raveendra Saradhi and Areej A. Siddiqui (2022) examined the NPA crisis that Indian public sector banks experienced following the 2008 financial crisis. The study found that credit risk has a detrimental effect on banks' profitability, with the latter measured in terms of gross non-performing asset ratio. Middi Appala Raju (2021) discussed the factors that affect banking profitability using secondary data.

ISSN:1624-1940
DOI 10.6084/m9.figshare.26310846
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The study found that many independent elements influence banking profitability. Overall, the literature suggests that effective credit risk management is crucial for financial industry stability and bank profitability, with several factors such as asset quality, regulatory capital, and managerial quality playing important roles.

Faisal Abbas, Shahid Iqbal & Bilal Aziz (2019) also stated and discussed about the comparison of the impact in bank capital, bank liquidity, and credit risk on commercial bank profitability in Asian developed economies between 2011 and 2017 to the banking industry in the United States. The findings demonstrate that liquidity has a greater impact on profitability than capital, but the direction of the coefficients is identical for large, small, and medium-sized businesses. Sufi Faizan Ahmed, Qaisar Ali Malik* (2015) has discusses some of the loan performance that impact the credit risk management using credit terms, client evaluation, collection policy, and credit risk control as the main aspects of credit risk management practises by which the findings demonstrate that credit conditions and client assessment have a positive and large influence on loan performance, but collection policy and credit risk control have a favourable but negligible impact. Toshpulatov Davron Akromovich (2022) states that the scientific literature examines the perspectives of local and international experts on the evaluation and management of credit risks in banks. Azam Ali , Saghir Pervaiz Ghauri (2013) defines to say that because of the industry's high levels of openness and commitment to a stringent code of business conduct and management efficiency, banks have a better chance of emerging from the crisis stronger than their conventional counterparts. Anas Ali Al Qudah · Allam Hamdan · Manaf Al Okaily · Lara Alhaddad (2021)says that the ratio of green loans, like the return on equity, has a negative impact on the NPL ratio, but credit quality, inefficiency, and bank size have a favourable impact Khaled Alzeaideen (2019) elaborates that loan sanction decisions are made mostly on the basis of the credit officer's intuition, as well as a mix of the credit officer's judgement and typical credit scoring formulas. Mohammed Bayyoud & Nermeen Sayyad (2015) states the there is not much difference in the CRM and the profitability between the commercial banks and the investment banks with analyses of the data taken and related tests made. Sah Bittu and Amit Kumar Dwivedi (2012) states that macroeconomic factor(s) – gross domestic product (GDP) – has a significant impact on bank credit risk management, with the direction of causality established from GDP to NPA and no evidence of reverse causation using panel data regression. Monika Gupta and Tarika Singh Sikarwar (2020) confesses to say that the impact of CRM is based on the 'capital sufficiency,' 'leverage,' and the 'debt-equity ratio' on Indian banks' profitability by which the model was confirmed using more time series analysis to get the exact results Laxmi Koju, Ram Koju and Shouyang Wang (2018) tries to say that the "operational efficiency," "diversification," and "too large to fail" hypotheses, indicating that profitability, banking supervision, high credit standards, and strong investment strategies are the primary drivers of credit quality in the banking industry. Olaf Weber (2011) describes to say how the environment affects the credit risk being proactive when it comes to environmental loan inspections and that greater accounting-related reporting on environmental risk management. Sirus Sharifi, Arunima Haldar and S.V.D. Nageswara Rao (2021)mainly states that the size of Indian banks is connected to the amount of surplus capital they have on hand to manage credit risk. The positive association suggests that major banks have more surplus capital than the Basel minimum requirement. Umer Qazi, Adnan Ahmad, Mirwais Khan and

ISSN:1624-1940
DOI 10.6084/m9.figshare.26310846
http://magellanes.com/

Riffat Aisha (2022) elaborated to say that the banking sector must develop appropriate CRM strategies and policies based on a thorough credit appraisal; an appropriate CRM mechanism must be developed, and the credit awards system must be thoroughly reviewed, properly informed, and used to repay loans. Banks will devise and execute ways to increase their performance and competitiveness while also limiting their exposure to lending risk is a must.

METHODOLOGY

Sample	Banking and Non-Banking Financial Institutions listed under the Stock Exchange
Research focus	Factors Influencing Credit Risk Management in Indian Financial Institutions
Sample Size	260 (26 Financial Institutions*10' years of data)
Data collection	Secondary Data
Test applied	Descriptive statistics, Correlation, OLS Regression, Hausman test, Wald Test, Random effect Model
Toots utilized	E-views

Table-I: Research Design

Financial Institutions being considered for the study:

1. Axis Bank Ltd.	14. IndusInd Bank Ltd.
2. Bajaj Finance Ltd.	15. Federal Bank Ltd.
3. Bajaj Finserv Ltd.	16. City Union Bank Ltd.
4. Cholamadalam Investment and Financing Company Ltd.	17. IDBI Bank Ltd.
	18. Canara Bank
5. HDFC Bank Ltd.	19. RBL Bank Ltd.
6. ICICI Bank Ltd.	20. Karur Vysya Bank Ltd.
7. Kotak Mahindra Bank Ltd.	21. Dhanalaxmi Bank Ltd.
8. Muthoot Finance Ltd.	22. Bank of India
9. Power Finance Corporation Ltd.	23. Central Bank of India
	24. Indian Overseas Bank
10. Shriram Transport Finance Co. Ltd.	25. UCO Bank
	26. Karnataka Bank Ltd.
11. State Bank of India	
12. Punjab National Bank	
13. Union Bank of India	

ISSN:1624-1940
DOI 10.6084/m9.figshare.26310846
http://magellanes.com/

Table II: List of Financial Institutions

Individual Determinants	Macro-Economic Determinants
Gross Non-Performing Assets	Gross Domestic Product (GDP)
Capital Adequacy Ratio (CAR)	Inflation
Return on Capital Employed (ROCE)	Consumer Price Index (CPI)
Asset Quality	Unemployment Rates
Return on Assets (ROA)	Real Interest Rates
Market Capitalization	
Bank Size	

Table III: Factors Considered

The dependent variable taken is Gross Non-Performing Assets, while all other variables are the independent variables.

Hypothesis Test

Sl No.	Hypothesis variable	H0	H1	P Value	Accept/Reject
1	Δ GNPA	$\beta1 = 0$	$\beta1 \neq 0$	1.000000	Null
2	Δ CAR	$\beta2 = 0$	$\beta1 \neq 0$	-0.085244	Reject
3	Δ ROCE	$\beta3 = 0$	$\beta1 \neq 0$	-0.193949	Reject
4	Δ Asset Quality	$\beta4 = 0$	$\beta1 \neq 0$	-0.146929	Reject
5	Δ ROA	$\beta5 = 0$	$\beta1 \neq 0$	-0.591657	Reject
6	Δ MCAP	$\beta6 = 0$	$\beta1 \neq 0$	0.612473	Accept
7	Δ Bank Size	$\beta7 = 0$	$\beta1 \neq 0$	0.065889	Accept
8	Δ GDP	$\beta8 = 0$	$\beta1 \neq 0$	0.379429	Accept
9	Δ Inflation	$\beta9 = 0$	$\beta1 \neq 0$	-0.258715	Reject
10	Δ CPI	$\beta10 = 0$	$\beta1 \neq 0$	-0.207860	Reject
11	Δ Unemployment Rate	$\beta11 = 0$	$\beta1 \neq 0$	0.082017	Accept
12	Δ Real Interest Rate	$\beta12 = 0$	$\beta1 \neq 0$	0.038151	Reject

ISSN:1624-1940
DOI 10.6084/m9.figshare.26310846
http://magellanes.com/

Table IV: Hypothesis variable

Credit risk management is a crucial aspect of banking operations, and the Indian banking sector has faced various challenges in managing credit risks. To understand the determinants of credit risk management in the Indian banking sector, several hypotheses have been tested using statistical analysis.

The first hypothesis tested the relationship between Gross Non-Performing Assets (GNPA) and their value. The results show that there is no significant relationship between GNPA and its own e, as the p-value of 1.000 leads to accepting the null hypothesis. This suggests that GNPA as an independent variable does not have a significant impact on its own value as a dependent variable.

The second hypothesis tested the relationship between GNPA as a dependent variable and Capital Adequacy Ratio (CAR) as an independent variable. The results show a significant negative relationship between these two variables, as the p-value of -0.085244 leads to rejecting the null hypothesis. This suggests that there is a significant relationship between CAR and GNPA, and that CAR has a significant impact on GNPA.

The third hypothesis tested the relationship between GNPA as a dependent variable and Return on Capital Employed (ROCE) as an independent variable. The results show no significant relationship between these two variables, as the p-value of -0.193949 leads to rejecting the null hypothesis. This suggests that there is no significant relationship between ROCE and GNPA and that ROCE does not have a significant impact on GNPA.

The fourth hypothesis tested the relationship between GNPA as a dependent variable and Net Interest Margin (NIM) as an independent variable. The results show a negative correlation between these two variables, as the p-value of -0.146929 leads to rejecting the null hypothesis. This suggests that there is a significant relationship between NIM and GNPA and that NIM has a significant impact on GNPA.

The fifth hypothesis tested the relationship between GNPA as a dependent variable and Return on Assets (ROA) as an independent variable. The results show no significant relationship between these two variables, as the p-value of -0.591657 leads to rejecting the null hypothesis. This suggests that there is no significant relationship between ROA and GNPA and that ROA does not have a significant impact on GNPA.

The sixth hypothesis tested the relationship between GNPA as a dependent variable and Credit Deposit Ratio (CDR) as an independent variable. The results show a significant positive relationship between these two variables, as the p-value of 0.612473 leads to accepting the null hypothesis. This suggests that there is no significant relationship between CDR and GNPA and that CDR does not have a significant impact on GNPA.

The seventh hypothesis tested the relationship between GNPA as a dependent variable and Bank Size

ISSN:1624-1940
DOI 10.6084/m9.figshare.26310846
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as an independent variable. The results show no significant relationship between these two variables, as the p-value of 0.065889 leads to accepting the null hypothesis. This suggests that there is no significant relationship between Bank Size and GNPA and that Bank Size does not have a significant impact on GNPA.

The eighth hypothesis tested the relationship between GNPA as a dependent variable and Cost of Funds as an independent variable. The results show no significant relationship between these two variables, as the p-value of 0.379429 leads to accepting the null hypothesis. This suggests that there is no significant relationship between the Cost of Funds and GNPA, and the hat Cost of Funds does not have a significant impact on GNPA.

The ninth hypothesis tested the relationship between GNPA as a dependent variable and inflation as an independent variable. The results show no significant relationship between these two variables, as the p-value of -0.258715 leads to accepting the null hypothesis. This suggests that there is no significant relationship between inflation and GNPA and that inflation.

The lack of a significant relationship between GNPA and CPI (Consumer Price Index) suggests that inflation does not have a significant impact on credit risk in the Indian banking sector. This could indicate that banks have effectively managed inflation-related risks or that other factors have a greater influence on credit risk.

The acceptance of the null hypothesis for the test of $\beta 11 = 0$ implies that there is no significant relationship between credit risk (GNPA) and exchange rates. This suggests that exchange rates may not be a significant factor influencing credit risk in the Indian banking sector.

The rejection of the null hypothesis for the test of the relationship between GNPA and real interest rates suggests that there is a significant relationship between the two variables. This could indicate that changes in real interest rates may impact credit risk in the Indian banking sector, perhaps by affecting borrowers' ability to repay loans or banks' willingness to lend.

Overall, the tests indicate that various factors have a significant impact on credit risk management in the Indian banking sector. These factors include CAR, RE, and the Real Interest Rate. Other factors, such as Bank Size, Liquidity, and NIM, do not have a significant impact on credit risk management.

Descriptive Statistics

Descriptive statistics help to describe and understand the characteristics of specific data by providing short summaries of the data sample and measurements. Descriptive statistics are broken down into central tendency measurements and variability measurements. Descriptive statistics provide simple summaries of the sample and measurements are provided with simple graphical analysis.

ISSN:1624-1940
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	GNPA	CAR	ROCE	ASSET_Q...	ROA	MCAP	BANK_SIZE
Mean	5.92	2920.86	3.74	0.25	1.08	1177.96	31967524
Median	3.95	15.00	2.30	0.05	0.84	490.55	7217805
Maximum	28.00	52393.25	36.90	10.22	18.52	16436.99	45344296
Minimum	0.42	3.00	-0.68	0.00	-4.71	6.45	11798.89
Std. Dev.	5.73	8122.62	5.13	0.98	1.94	2315.47	61056950
Skewness	1.64	3.68	3.86	6.92	3.10	4.53	3.94
Kurtosis	5.46	17.15	19.64	57.72	28.22	26.32	22.11
Jarque-Bera	183.34	2760.01	3645.70	34519.52	7308.06	6784.96	4632.83
Probability	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Observation	260	260	260	260	260	260	260

	GDP	INFLATION	CPI	UNEMPLO...	REAL_INT...
Mean	18857416	6.24	6.57	5.91	5.12
Median	19202901	5.71	6.09	5.58	5.42
Maximum	24819115	10.91	11.17	8.00	7.56
Minimum	14274421	2.46	2.21	5.27	2.47
Std. Dev.	3392247	2.34	2.60	0.85	1.48
Skewness	0.15	0.53	0.26	1.61	-0.16
Kurtosis	1.80	2.62	2.29	4.02	2.10
Jarque-Bera	16.36	14.04	8.31	124.13	9.72
Probability	0.00	0.00	0.01	0.00	0.00
Observation	260	260	260	260	260

Table-V Descriptive Statistics
(Source: Authors Original Contribution)

The variables includes financial ratios such as GNPA (Gross Non-Performing Assets), CAR (Capital Adequacy Ratio), ROCE (Return on Capital Employed), ASSET_Q (Asset Quality), ROA (Return on Assets), MCAP (Market Capitalization), and BANK_SIZE, the macroeconomic indicators such as GDP (Gross Domestic Product), INFLATION, CPI (Consumer Price Index), UNEMPLO (Unemployment Rate), and REAL_INT (Real Interest Rate).

For the financial ratios, the mean and median values are presented, along with the maximum and minimum values, standard deviation, skewness, kurtosis, Jarque-Bera statistic, and probability. The mean GNPA is 5.92, indicating that on average, a bank has 5.92% of its assets classified as non-performing. The mean CAR is 2920.86, indicating that banks, on average, have a capital adequacy ratio of 29.2%. The mean ROCE is 3.74, indicating that, on average, for every rupee of capital employed, the bank earns a return of 3.74 rupees. The mean ASSET_Q is 0.25, indicating that, on average, 25% of a bank's assets are classified as low quality. The mean ROA is 1.08, indicating that, on average, for every rupee of assets, the bank earns a profit of 1.08 rupees. The mean MCAP is 1177.96, indicating that, on average, the market capitalization of banks is Rs 1177.96 crores. The mean BANK_SIZE is

ISSN:1624-1940
DOI 10.6084/m9.figshare.26310846
http://magellanes.com/

31967524, indicating that, on average, banks have 31,967,524 crores in assets.

For the macroeconomic variables, the mean and median values are presented, along with the maximum and minimum values, standard deviation, skewness, kurtosis, Jarque-Bera statistic, and probability. The mean GDP is 18857416, indicating that, on average, the GDP of the economy is Rs 18857416 crores. The mean INFLATION is 6.24, indicating that, on average, the inflation rate is 6.24%. The mean CPI is 6.57, indicating that, on average, the consumer price index is 6.57%. The mean UNEMPLO is 5.91, indicating that, on average, the unemployment rate is 5.91%. The mean REAL_INT is 5.12, indicating that, on average, the real interest rate is 5.12%.
The skewness and kurtosis values indicate that most of the variables have distributions that are not perfectly normal. The Jarque-Bera statistic and probability values indicate that some of the variables do not follow a normal distribution at all.
Overall, descriptive statistics provide a useful summary of the data and can help in understanding the distribution of the variables and their central tendency, as well as identify outliers and potential issues with data quality.

Correlation

Correlation helps in determining the type of relationship between two variables. It is the determination of the linear relationship between the distinct variable. The correlation can be positive (+) negative (-) or neutral. They can be divided into two ranges namely the high range and the low range. The high Range is valued close to +1 which is said to be a positive relationship and Low Range is valued close to -1 which is a strong negative correlation. When the correlation is 0, we can say no correlation or neutral. The relationship between two same variables will result in 1 where we shall not consider the diagonal value. If one positive factor rises its relationship factor will also rise. If one negative factor rises its relationship factor will fall and vice-versa.

	GNPA	CAR	ROCE	ASSETQUALITY	ROA	MCAP	BKSIZE	GDP	INFLATION	CPI	UNEMPLOYMENT_RATE	REAL_INT
GNPA	1.00											
CAR	-0.09	1.00										
ROCE	-0.19	0.46	1.00									
Ast	-	0.01	0.10	1.00								

ISSN:1624-1940
DOI 10.6084/m9.figshare.26310846
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Qua	0.15											
ROA	-0.59	0.30	0.56	0.39	1.00							
MCAP	0.61	-0.01	-0.12	-0.08	-0.37	1.00						
Bank Sz	0.07	-0.09	-0.11	-0.10	-0.11	-0.01	1.00					
GDP	0.38	0.14	0.23	-0.04	-0.07	0.29	0.18	1.00				
Inflation	-0.26	-0.07	-0.11	-0.04	0.07	-0.10	-0.10	-0.62	1.00			
CPI	-0.21	-0.06	-0.08	-0.06	0.06	-0.10	-0.08	-0.47	0.73	1.00		
Unemp	0.08	0.11	0.18	-0.04	0.05	0.27	0.13	0.49	-0.20	-0.06	1.00	
Real Int. Rate	0.04	-0.02	-0.09	0.03	-0.06	-0.10	-0.02	-0.03	-0.38	-0.56	-0.46	1.00

Table-VI Correlation of each factor
(Source: Authors Original Contribution)

Table VI shows the correlation matrix between various variables. Each cell represents the correlation between two variables. The correlation coefficient ranges from -1 to +1. A correlation coefficient of +1 represents a perfect positive correlation, while a coefficient of -1 represents a perfect negative correlation. A coefficient of 0 represents no correlation.

There is a strong negative correlation (-0.59) between GNPA and ROA, which suggests that higher gross non-performing assets (GNPA) are associated with a lower return on assets (ROA). There is also a strong positive correlation (0.61) between MCAP and ROA, which suggests that higher market capitalization (MCAP) is associated with a higher return on assets (ROA).

Other notable correlations include a positive correlation between GDP and MCAP (0.29), a negative correlation between inflation and CPI (-0.62), and a negative correlation between real interest rate and CPI (-0.47). It's important to note that correlation does not imply causation, meaning that just because two variables are correlated, it does not necessarily mean that one variable causes the other.

OLS (Ordinary Least Squares) regression is a statistical technique used to analyze the linear relationship between a dependent variable and one or more independent variables. In the given regression results,

ISSN:1624-1940
DOI 10.6084/m9.figshare.26310846
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the variables and their corresponding coefficients are as follows:

C: The intercept term, which represents the constant value of the dependent variable when all independent variables are equal to zero. The coefficient value is 5.908863, which means that the expected value of the dependent variable when all independent variables are zero is 5.908863.

CAR: The coefficient value is 1.874891, indicating that a one-unit increase in the CAR variable leads to a 1.874891 increase in the dependent variable, holding all other variables constant.

ROCE: The coefficient value is 0.094457, indicating that a one-unit increase in the ROCE variable leads to a 0.094457 increase in the dependent variable, holding all other variables constant.

Asset_Quality: The coefficient value is 0.428910, indicating that a one-unit increase in the Asset_Quality variable leads to a 0.428910 increase in the dependent variable, holding all other variables constant.

ROA: The coefficient value is -1.443792, indicating that a one-unit increase in the ROA variable leads to a 1.443792 decrease in the dependent variable, holding all other variables constant.

MCAP: The coefficient value is 0.001016, indicating that a one-unit increase in the MCAP variable leads to a 0.001016 increase in the dependent variable, holding all other variables constant.

BANK_SIZE: The coefficient value is 9.267782, indicating that a one-unit increase in the BANK_SIZE variable leads to a 9.267782 increase in the dependent variable, holding all other variables constant.

GDP: The coefficient value is 4.337887, indicating that a one-unit increase in the GDP variable leads to a 4.337887 increase in the dependent variable, holding all other variables constant.

Inflation: The coefficient value is -0.166649, indicating that a one-unit increase in the Inflation variable leads to a 0.166649 decrease in the dependent variable, holding all other variables constant.

CPI: The coefficient value is 0.029991, indicating that a one-unit increase in the CPI variable leads to a 0.029991 increase in the dependent variable, holding all other variables constant.

Unemployment_Rate: The coefficient value is -1.136804, indicating that a one-unit increase in the Unemployment_Rate variable leads to a 1.136804 decrease in the dependent variable, holding all other variables constant.

Real_Interest_Rates: The coefficient value is -0.137044, indicating that a one-unit increase in the Real_Interest_Rates variable leads to a 0.137044 decrease in the dependent variable, holding all other variables constant.

The standard error measures the standard deviation of the coefficient estimate. The t-statistic measures how many standard errors the coefficient estimate is away from zero. The probability value (p-value) measures the probability of obtaining a t-statistic as extreme or more extreme than the one observed, assuming that the null hypothesis is true. The null hypothesis is that the coefficient is zero, indicating no relationship between the independent variable and the dependent variable. A low p-value (less than 0.05) indicates that the coefficient is statistically significant, while a high p-value (greater than 0.05) indicates that the coefficient is not statistically significant.

Discussion

Based on the aforementioned results, the correlation between the independent variables and the dependent variable (ΔGNPA) - non-performing loans of banks and non-banking financial institutions, was analysed. The individual factors, such as (ΔCAR), (ΔROCE), (ΔAsset Quality), (ΔROA),

ISSN:1624-1940
DOI 10.6084/m9.figshare.26310846
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(ΔMCAP), and (ΔBank Size), were taken into consideration along with the macro-economic factors, such as (ΔGDP), (ΔInflation), (ΔCPI), (ΔUnemployment rate), and (ΔReal Interest Rate). While the individual factors affect the banking and NBFCs individually, the macro-economic factors have a broader impact on the entire economy. All of these factors directly or indirectly impact the credit risk management in Indian financial institutions, posing a significant challenge to overcome.

Conclusion

Based on the analysis provided, it is clear that Credit Risk Management is a significant challenge for financial institutions in India. The unpredictability of macro-economic factors, coupled with financial policies and regulations, makes it difficult for financial institutions to manage credit risk effectively. However, analyzing the NPA levels of various banks over the years from 2012 to 2021 shows that there has been a gradual decrease in the GNPA levels, indicating that efforts are being made to manage credit risk.

The analysis also reveals that individual and macro-economic factors such as ROA, MCAP, GDP, and Unemployment Rate have a significant impact on the GNPA levels. This underscores the importance of financial institutions conducting thorough analyses of these factors before lending out funds and monitoring the repayment capacity of borrowers regularly.

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