A STUDY ON THE IMPACT OF CREDIT RISK ON PROFITABILITY OF THE BANK

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Abstract- The aim of this study is to investigate Credit risk faced by the bank and to investigate the profitability of bank and then to investigate the impact of Credit risk on the profitability of the bank. Through extensive literature review, it is found that the Credit risk can be investigated using Capital Adequacy Ratio (CAR), Leverage Ratio and Liquidity Coverage Ratio (LCR), Nonperforming Asset Ratio (NPA), Loan to Deposit Ratio (LDR), Cost per Loan Ratio (CLR), and the Profitability can be investigated using ROE and ROA based DuPont Model. The explanations of the ratios used were given in this paper. And a model has been proposed to find the impact of Credit risk on profitability of the bank.

Keywords: **Bank, Basel, Credit risk, Profitability, DuPont, CAR, NPA, CLR, LCR, LDR, Leverage Ratio, ROA, ROE.**

I. INTRODUCTION

Banking system has a very important role in the economy of India. The Banking system in India has a number of magnificent achievements in credit, because it not restricted only to the metropolitans, but has reached even to the remote corners of the country. The main function of banks are accepting deposits and lending loans. The Major risks faced by the banks are Credit risk, Market risk, Operational risk. Among those risks exposure of bank to credit risk is large, and it causes major loss for the bank. Credit risk is the probability that a borrower may default on a debt by failing to make required payment and the lender may lose the principal of the loan or the interest. Credit risk arises because borrowers expect to use future cash flows to pay current debts. Through effective Credit risk management Credit risk can be mitigated. The credit risk management means increasing the risk adjusted rate of return of the bank by maintaining credit risk exposure of the bank within reasonable limit. Profitability of the bank is greatly affected by the Credit risk than other risks faced by the bank. This empirical study is conducted to find the impact of Credit risk on Profitability of the bank and a model will be proposed in this paper to find the impact of Credit risk on Profitability.

II. LITERATURE REVIEW

(Li & Zou, 2014) said among the various risks faced by the bank Credit risk is the most significant risk that could adversely affect the bank. And defined Credit risk management as a planned tactics of management of uncertainty by evaluation of the risk, formulation of

strategies to handle the risk and lessening of risk by means of managerial assets. They used Capital Adequacy ratio and Nonperforming loan ratio as the measures of credit risk management. They defined Profitability as a gauge of capability of the bank to bear risk and/or raise the capital of bank and it implies effectiveness of the bank and gauges the excellence of management. They used Return on Asset and Return on Equity as the measure of profitability as per DuPont system. They investigated to find if there is an association between credit risk management and profitability by taking 47 largest commercials banks in Europe as sample and calculated the ratios for the period of 2007 to 2012 and also investigated whether the relationship is stable or fluctuating. They used descriptive statistics, multiple regression analysis technique to find whether the association exists and they calculated mean and standard deviation to find whether the relationship is stable or fluctuating. The study revealed that the credit risk management does not have positive effect on profitability of commercial banks. And also they found that the relationships between all the proxies are not stable but fluctuating.

(Gizaw, Kebede, & Sujata, 2015) They examined the influence of credit risk on profitability of 8 commercial banks in Ethiopia for the period of 2003 to 2014. The data was analysed using descriptive statistics and panel data regression. The study revealed that the Credit risk measured by nonperforming loan, loan loss provisions and capital adequacy have significant impact on the profitability measured by ROA of 8 commercial banks in Ethiopia.

(poudel, 2012) The author tried to discover various factors relevant to credit risk management and its influence on the financial performance of the 31 banks in Nepal for the period of 2001-2011. Used default

rate, cost per loan assets and capital adequacy ratio as the measure of Credit risk management and ROA as a measure of profitability. They used descriptive statistics, correlation and regression to analyse the data. Findings revealed that measures of credit risk management have an inverse effect on financial performance of the bank.

(Bayyoud & Sayyad, 2015) They studied the association between credit risk management and profitability of Palestine investment and commercial banks. They used Nonperforming Loan Ratio as a measure of credit risk management and ROE as the measure of profitability. Regression was used to analyse the data. From the findings it is inferred that there is no effect of credit risk on profitability of Palestine commercial and investment banks. From the findings it is inferred that the relationship between the Palestinian commercial and investment banks is null.

(Kaaya & Pastory, 2013) The study was conducted to find the association between the credit risk measured by NPLR and bank performance measured by ROA of 11 banks in Tanzania. They used regression to analyse the data. The findings of the study revealed that the indicator of credit risk has negative correlation which means, if the credit risk is higher, then the bank performance will be lower.

(Abiola & Olausi, 2014) They investigated the effect of credit risk management on the performance of commercial banks for the period of 2005 – 2011 in Nigeria. The panel regression model was used for the analysis of data. The findings revealed that credit risk management measured by Non-Performing Loans (NPL) and Capital Adequacy Ratio (CAR) has a significant impact on the profitability measured by Return on Equity (ROE) and Return on Asset (ROA) of commercial banks' in Nigeria.

(JAIN, 2011) The author studied the management of Credit risk in South Indian bank. The first aim of the study is to find the capital adequacy ratio of South Indian Bank. The findings showed that Capital adequacy ratio for the period 2006 to 2011 has fell off representing unsuccessful management of credit risk. Also the author studied the influence of asset quality on management of credit risk of the bank. The findings showed that asset quality measured by Net NPA to total assets, and Net NPA to total advances for the period 2006 to 2011 has declined which shows good asset quality and efficient credit risk management. And the author also analysed actual credit risk exposure of the bank. The finding showed that Credit risk exposure measured by Earning per Non Performing Asset for the period 2006 to 2011 declined which means efficient credit rik management. The recommended the bank to maintatin CAR as per Basel norms, good quality of asset, good propositon of deposit mix to minimise the credit risk.

(Cherian, 2011) The author studied the management of Credit risk in Federal bank. The first aim of the study is to find the capital adequacy ratio of Federal Bank. The findings showed that Capital adequacy ratio for the period 2004 to 2010 has fell off representing unsuccessful management of credit risk. And also the author studied the influence of asset quality on management of credit risk of the bank. The findings showed that asset quality measured by Net NPA to total assets, and Net NPA to total advances for the period 2004 to 2010 has declined which shows good asset quality and efficient credit risk management. And also the author analysed actual credit risk exposure of the bank. The finding showed that Credit risk exposure measured by Earning per Non Performing Asset for the period 2004 to 2010 declined

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(Samuel, 2013) studied the effect of credit risk on the performance of top five Nigerian commercial banks. The need for that study was driven by the negative consequences of the credit risk that affects profitability of the bank and their outcomes functioned as the base to deliver policy measures to the stakeholders on how to deal with the credit risk permissible to improve the value of assets of the bank and diminish bank risk. They used Non-performing loan and loan & Advances ratios as the measure of credit risk and ROA as a measure of profitability. The result showed that the ratio of Non-performing loan to loan & Advances and loan and advances to total deposit negatively impact the profitability .This study showed that there is a major association between bank performance and credit risk management.

(Alshatti, 2015) The author examined the influence of management of credit risk on financial performance of 13 commercial banks in Jordanian for the period of 2005 to 2013. Non-performing loans to Gross loans, Provision for facilities loss to Net facilities and the leverage ratio were used as a measure of management of credit risk. ROA and ROE were used as a measure of financial performance. Two mathematical models were developed and regression was used to find the relationship. Findings concluded that the indicators of credit risk management have an influence on financial performance of commercial banks in Jordanian.

A. Credit Risk

RISE & RISE OF STRESSED LOANS

The RBI's projections show the gross NPA of banking sector could go up to 8.5 % by March 2017

(in %)	Net NPA	Gross NPA	Stressed assets*
March 2013	-	3.4	9.2
September 2013	2.3	4.2	10.2
March 2014	2.2	4.1	10
September 2014	2.5	4.5	10.7
March 2015	2.5	4.6	11.1
September 2015	2.8	5.1	11.3
March 2016	4.6	7.6	11.5

The stress in the banking sector, which mirrors in the corporate sector, has to be dealt with in order to revive credit growth — RAGHURAM RAJAN, RBI Governor

Fig 2: Nonperforming Asset of Banking Sector

Source: The Hindu-Business Economy-Bank-NPAs

As per RBI, Gross NPA has increased to 7.6 in March 2016 which was 5.1 in September 2015 and 4.6 in March 2015. The RBI projection shows that the Gross NPA could go up to 8.5% by March 2017. The rise in NPA is due to increased Credit risk which affects the profit of banking sector. Among the various risk (Credit risk, Operational risk, reputation risk, market risk, legal risk)faced by the bank, Credit risk is the most significant risk faced by the bank considering that granting Credit is one of the major source of income for the bank.

Credit is an agreement where a borrower receives money now and will pay back the lender at a prescribed date in the future, with interest. Risk is the uncertainty that involves vulnerability to loss of money. Credit risk is the probability that a bank borrower may default on a debt by failing to make required payment in as per the agreed terms and the lender may lose the principal of the loan or the interest.

Credit risk is related with transactions occurring outside the bank like loans, acceptances, interbank transactions, trade financing, foreign exchange transactions, financial futures, swaps, bonds, equities, options, and in the extension of commitments and guarantees, and the settlement of transactions. Credit risk related with a borrower are determined by the factors like unsteady income, low credit score, employment type, collateral assets and others. If the transaction at one end is successful but unsuccessful at the other end, loss occurs. If the transaction at one end is settled but there are delays in settlement at the other end, there might be loss in the investment opportunities. Credit risk of the bank is worsened by insufficient institutional capacity, ineffective credit guidelines, ineffective board of directors, low liquidity ratio and capital adequacy ratio, compulsory quota lending due to government intrusion and lack of adequate supervision by the central bank.

B. Proxies of credit risk:

As per BASEL III norms and its frequency of its occurrence in the previous research, Capital Adequacy Ratio (CAR), Leverage Ratio and Liquidity Coverage Ratio (LCR) were chosen as the indicators of Credit Risk. Nonperforming Asset Ratio (NPA), Loan to Deposit Ratio (LDR), Cost Per Loan Ratio (CLR), were used as the proxies of credit risk based on their properties associated with credit risk and frequency of its occurrence in the previous research.

1) Capital Adequacy Ratio (CAR):

Capital adequacy ratio is the minimum capital requirement of the bank that safeguards the bank from insolvency and thus guarding the depositors and other lenders. Capital adequacy ratio stops the bank from taking surplus quantity of leverage as it would crucially raise the risk of insolvency. Capital adequacy ratio acts like an air bag in the car, which will save the bank from insolvency in case of any loss.

Capital adequacy ratio is defined as the ratio of total capital to the risk weighted sum of bank's assets.

$$CAR = \frac{Total\ capital}{Riskweighted\ asset}$$

Total capital = Tier 1 capital + Tier 2 capital

Tier 1 Capital: It is used to absorb the losses by not ending trading.

Tier 2 capital: It is used to absorb losses while winding up of the bank and provides lesser degree of protection to the depositors.

Risk weighted asset is the asset of the bank weighted against the risk.

The minimum Capital Adequacy Ratio has to be $\geq$ 10.5% (including Capital conservation buffer).

Maintaining CAR at $\geq$ 10.5% indicates financial strength of the bank which in turn indicates effective credit risk management and a decrease in the level of CAR below 10.5% indicates financial weakness of the bank which in turn indicates ineffective credit risk management.

2) Leverage Ratio

If the bank keeps all its deposits as cash in bank treasury, it will have a large quantity of liquid capital. Every time a customer comes to demand the deposits back, the bank can go to the bank treasury and pay the deposit back. This is known as conservative method of banking. The bank need not to worry about a decrease in the value of assets or loans not paid back. Yet, conservative method of banking is not very profitable as keeping capital reserves in the bank treasury won't earn any money. As an alternative the bank will lend a percentage of its deposits to customers who wish to take loan. This makes the bank to earn a better rate of return on its deposits. The more the bank loans, the higher is the potential to earn profit. This is known as leverage.

Leverage ratio can be computed by dividing tier1 capital to total exposure of the bank. And as per Basel III norms, Leverage ratio has to be greater than or equal to 3%.

$$Leverage\ ratio = \frac{Tier\ 1\ capital}{total\ exposure} \geq 3\%$$

Higher leverage ratio decreases the profitability of bank and by increasing the leverage ratio the bank can have more capital reserves and can more easily survive a financial crisis.

Lower leverage ratio can increase the profitability of bank, and by decreasing the leverage ratio the bank can have less capital reserves and the bank cannot survive a financial crisis.

3) Liquidity Coverage Ratio (LCR)

The Liquidity Coverage Ratio is used to find whether the bank holds adequate high-quality liquid assets to cover total net outflows of cash over 30 days i.e., to meet short-term debt. The Liquidity Coverage ratio is a stress test that is used to anticipate the market-wide shocks.

$$LCR = \frac{High\ quality\ liquid\ assets}{Total\ net\ liquidity\ outflow\ over\ 30\ days} \geq 100\%$$

The liquidity coverage ratio is the significant part of the Basel Accords, which requires the bank to hold high-quality liquid assets necessary to cover 100% of its stressed net cash needs over 30 days by January 2019. And As per RBI, Banks have to hold 70% LCR at present. The intention of this requirement is to confirm that the bank could manage the stressed market condition, under which the bank is expected to undergo large outflows of the cash formerly deposited with it.

4) Nonperforming Asset Ratio (NPA):

Nonperforming Asset are the banks nonperforming loans in addition to real property possessed by the bank as a result of foreclosures. NPA is the loan asset, which terminated to engender any revenue for a bank for more than 90 days (or 3 months) or a consumer

loan of more than 180 days whether in the form of interest or principal repayment.

Nonperforming loan ratio is defined as the ratio of nonperforming loan to total loans.

$$\text{NPAR} = \frac{\text{Nonperforming Assets}}{\text{Total loans}}$$

Higher NPAR indicates increasing bad quality of loans and inefficient credit risk management.

5) Loan To Deposit Ratio (LDR)

Loan to deposit ratio is used as a measure to find the liquidity (money needed is immediately available) of the bank. Loan to deposit ratio indicates in how efficiently the bank made use of depositors fund on credit activity which is to be expected to risk of default. Loan to deposit ratio is used to find the ability of the bank to survive the deposit withdrawal made by its customers and readiness of bank to meet the loan demand by reducing their cash assets.

Loan to deposit ratio is calculated by dividing total loans by total advances.

$$\text{LDR} = \frac{\text{Total loans}}{\text{Total Deposits}}$$

Loans are the investments or assets for a bank. Deposits are considered as debt because the individual depositors grant their money to the bank with a return equal to the deposit rates and that can be withdrawn at any time.

LDR < 1, it means the bank uses its own deposits to provide loans to its customers, without any outside borrowing.

LDR >1, it means the bank borrows money to provide loans to its customers at higher rates, rather than relying entirely on its own deposits and it indicates that the bank might not have enough liquidity to cover any unforeseen funding requirements or economic crises.

As per Forbes, good loan to deposit ratio for a bank has to be between 80% and 90%. An 80 percent ratio means for every Rs.1 a bank receives in deposits it loans 80 paisa to businesses or consumers. A 90 percent ratio means for every Rs.1 a bank receives in deposits it loans 90 paisa to businesses or consumers.

6) Cost Per Loan Ratio (CLR)

CPL is a currency number, which represents bank's cost in disbursing (making) one (unit of) loan. Cost per loan asset is the average cost per loan advanced to customer in monetary terms. Cost per loan asset indicates the efficiency in distributing loans to customers. Cost per loan ratio is computed as the ratio of total operating cost to total amount of loans.

$$\text{CLA} = \frac{\text{Total operating cost}}{\text{Total amount of loans disbursed}}$$

Ratio has to be analysed over a period of time, to find whether the operating costs are increasing or decreasing as more amount of loans are made. A decreasing Cost per Loan Ratio is considered positive.

C. Profitability Of Bank

Profitability indicates the capacity of the bank to carry risk and/or increase their capital. It represents the effectiveness of the bank and quantifies the quality of management. ROE and ROA ratios were taken as the indicators of profitability. The reason for using ratios as indicator of profitability is that they are inflation invariant so that they won't be influenced by variations in price level. In addition, since banks are multi-products firms and banks use ratio measures to exclude problems related with cross-subsidization among products and services. Since it is crucial to find the suitable indicators to get accuracy, DuPont analysis is used, which is broadly accepted as an effective tool in the financial analysis literature.

D. DuPont model

E. The name DuPont model (also known as the DuPont identity, DuPont equation, DuPont Analysis or the DuPont method) came from the DuPont

Corporation that began to use this formula in the 1920s. DuPont analysis is a method of performance measurement.

DuPont Analysis is an expression which breaks ROE (return on equity) into three parts.

ROE = Profit margin × Asset turnover × Equity multiplier

$$= ROA \times Equity\ multiplier$$

$$= \frac{Net\ Income}{Total\ Assets} \times \frac{Total\ Assets}{Total\ Equity\ Capital}$$

$$= \frac{Net\ Income}{Total\ Equity\ Capital}$$

Where:

ROA is the Return on assets (a measure of profitability linked to the asset of the bank)

EM is the Equity multiplier (a measure of leverage of the bank)

Net income is the profit after tax

Total Equity Capital is Shareholder's equity

ROA = Profit margin × Asset turnover

$$= \frac{Net\ income}{Total\ operating\ income} \times \frac{Total\ operating\ income}{Total\ assets}$$

$$= \frac{Net\ income}{Total\ asset}$$

Where:

Profit Margin is Net income generated per Rupee of total operating income.

Asset Turnover is Amount of interest and noninterest income generated per Rupee of total assets

ROE is divided into ROA (Net Income/Total Assets) and equity multiplier (Total Assets/Total Equity Capital). Then ROA is divided into net profit margin and total asset turnover. The Net profit margin is used measure the income statement. And total assets turnover is used to evaluate the assets in the left-hand side of the balance sheet. Equity multiplier is used to evaluate liabilities and equity of owner in the right hand side of balance sheet. Based on this model the level of financial structure of the bank can be projected. Therefore, based on the DuPont model, ROE and ROA were chosen as the indicators of profitability.

1) Return On Equity (ROE)

Return on equity is used to measure how much profit the bank makes with the money invested by the shareholders. ROE is computed by dividing fiscal year net income (after preferred stock dividends, before common stock dividends), by the total equity (Shareholder's equity excluding preferred shares), expressed as percentage.

$$ROE = \frac{Net\ income}{Total\ equity\ capital}$$

If the value of the shareholders' equity decreases, ROE increases. The increasing ROE indicates that the bank is increasing its ability to make profit without requiring as much capital and also indicates the increasing risk i.e., if the total equity capital decreases relative to net income, ROE will increase. A drop in equity capital will result in the violation of minimum regulatory capital standards and increases the risk of insolvency for the bank.

ROE of 15-20% are generally considered good.

2) Return On Asset (ROA)

Return on assets (ROA) is used to measure how profitable the bank is relative to its total assets. ROA measures how efficient the bank is at using its assets to generate earnings. Calculated by dividing a company's annual earnings (Earning after interest and tax) by its total assets (both debt and equity), ROA is displayed as a percentage.

$$ROA = \frac{Net\ income}{Total\ asset}$$

The higher ROA is considered better, because the bank could earn more money on less investment. ROAs over 5% are generally considered good.

III. PROPOSED MODEL
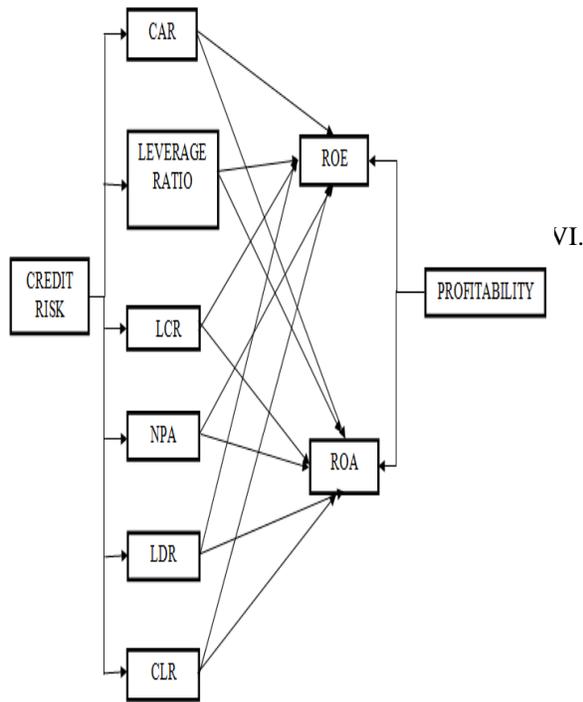
IV. MATHEMATICAL MODEL:

ROE= $\beta 0 + \beta 1$CAR+$\beta 2$LEVERAGE RATIO+$\beta 3$LCR+$\beta 4$NPA+$\beta 5$LDR+$\beta 6$CLR+e (1.1)

ROA= $\beta 0 + \beta 1$CAR+$\beta 2$LEVERAGE RATIO+$\beta 3$LCR+$\beta 4$NPA+$\beta 5$LDR+$\beta 6$CLR+e (1.2)

$\beta 0$ - Constant term

$\beta 1, \beta 2, \beta 3, \beta 4, \beta 5, \beta 6$ - Coefficients of independent variables

e – Error term

V. CONCLUSION:

Explanation about Credit risk and profitability were given in this paper. Through extensive literature review, indicators of credit risk and profitability were identified. Capital Adequacy Ratio (CAR), Leverage Ratio and Liquidity Coverage Ratio (LCR), Nonperforming Asset Ratio (NPA), Loan to Deposit Ratio (LDR), Cost per Loan Ratio (CLR), were identified as the indicators of Credit risk and ROE and ROA based DuPont Model were identified as the indicators of profitability. Explanations of the ratios used were given in this paper. And a model has been proposed to find the impact of Credit risk on Profitability.

VI. SUGGESTION FOR THE FUTURE RESEARCH

Based on the previous research, we used some ratios to represent credit risk and used ROE and ROA based on DuPont model as profitability indicators. Except those indicators we involved in our research, there are other indicators of credit risk and profitability. We recommend including more indicators of credit risk and profitability to test the relationship in future.

We focused only on credit risk and profitability of banks. Except the credit risk there are other risks faced by the bank and profitability is not only one aspect of financial performance bank. In future research, we recommend including other risks faced by the bank and also we recommend exploring the other aspects of financial performance.

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