

Credit Risk

Part III : Top-Down View

1. Economic Capital and Regulatory Capital as per Basel II - Capital charge for Credit Risk

- a. The term **credit risk** describes the risk that arises from nonpayment or rescheduling of any promised payment. It can also arise from credit migration – events related to changes in the credit quality of the borrower. These events have the potential to cause economic loss to the bank.

The **expected loss** is the amount a bank can expect to lose, on average, over a predetermined period when extending credits to its customers. Unexpected loss is the volatility of credit losses around its expected loss.

Once a bank determines its expected loss, it sets aside credit reserves in preparation. However, for **unexpected loss**, the bank must estimate the excess capital reserves needed subject to a predetermined confidence level. This excess capital needed to match the bank's estimate of unexpected loss is known as **Economic Capital**. Of course, regulators have their own estimate of this amount and we call it **Regulatory Capital**

*Note : Capital is required to act as a cushion against **unexpected losses**.*

What about expected loss, i.e., EL ?

$$EL = \text{Expected (PD)} \times \text{Expected (LGD)} \times EAD$$

EL is expected to be tackled with the help of **loan pricing** and **provisioning**.

Loan Pricing - It refers to interest rate charged on the loan. If the prospective borrower is riskier, bank charges a higher interest rate. Obviously all such borrowers do not default. The extra interest charged provides for the expected default and the consequent expected loss on few borrowers.

Provisioning - Special Mention Account classification (SMA accounts) – As per the RBI's framework for "Revitalising Distressed Assets in the Economy" issued in January 2014 has outlined a corrective plan that will incentivize early identification of problem account, timely restructuring of accounts which are considered to be viable, and taking prompt steps by lenders

for recovery or sale of unviable accounts. The Corrective action plan includes early recognition of stress and reporting the same to Central Repository of Information on Large Credits (CRILC). Before the loan turns non performing, banks / FIs will be required to indentify incipient stress in the account by creating a sub – asset category viz: Special Mention Account with the three sub categories as given below

SMA sub categories	Basis of classification
SMA – 0	Principal or interest payment not overdue for more than 30 days but account showing signs of incipient stress as illustrated in the annex to the framework of Jan 30, 2014
SMA-1	Principal or interest payment overdue between 31-60 days
SMA-2	Principal or interest payment overdue between 61-90 days

Every bank / FI after taking into account the degree of well – defined credit weaknesses and extent of dependence on collateral security for realization, classify its loans & advances into various classes. RBI in its Master Circular for Banks – Prudential Norms and asset classification have spelled out the following classes:

- **Standard Assets** – shall mean the asset in respect of which, no default in repayment of principal or payment of interest is perceived and which does not disclose any problem or carry more than normal risk attached to the business.
- **Sub – standard assets** – shall mean an asset which has been classified as non – performing asset for the period not exceeding 12 months.
- **Doubtful assets** – an asset which remains sub standard for a period not exceeding 12 months.
- **Loss Assets** – an asset which is adversely affected by a potential threat of non recoverability due to either erosion in the value of security or non availability of security or sue to fraudulent act or omission on the part of the borrower. Loss asset could be identified as such by the bank / FI or its internal or external auditor

Non Performing Asset (NPA) shall mean an asset, in respect of which, interest has remained overdue for a period of 3 months or more.

Banks write off assets which are non collectable removing it from their balance sheets. A reduction in the value of an asset or earnings by the amount of an expense or loss is called write off.

b. Thus, there are two types of capital

- **Regulatory Capital** : Capital required by regulators in line with Basel norms.
- **Economic Capital** : Bank's own internal estimate of capital to act as a cushion against unexpected losses. In other words, economic capital is the capital required for bank's survival under the worst circumstances.
- **Basel II** norms advocate 3 methods for calculating capital charge for credit risk.

Method I : Standardised Approach (Credit Rating and Risk Weight)

- It is Suitable for small banks whose internal risk models are not developed.
- Capital charge for credit risk \geq 8% of credit **RWA (Risk Weighted Asset)**
- RWA (Risk Weighted Asset) is calculated based on a credit matrix which features credit rating as well as borrower type.

Rating Type	Government	Banks/FIs	Corporates
AAA	✓	✓	✓
AA	✓	✓	✓
A	✓	✓	✓
BBB	✓	✓	✓
BB	✓	✓	✓
B	✓	✓	✓

Method II : Internal rating based foundation approach

We need to now focus on the entire loan portfolio of a bank. This portfolio is segregated into homogeneous pools (pooling)

$$\text{Capital Change} = \sum_{i=1}^n [\text{WCPD}_i \times (\text{LGD}_i) - \text{PDi} \times \text{LGD}_i] \times \text{EAD}_i$$

WCPD_i = worst case PD for the i^{th} pool

DTLGD_i = Down turn loss given default, i.e., it is the worst LGD which will happen in a cyclical downturn .

PDi = Expected PD

LGD_i = Long run LGD (though the cycle LGD)

EAD_i = Exposure at default of the i^{th} pool

Suppose for the i^{th} pool,

$\text{EAD} = 50,000$ crs, Expected PD = 5%, Normal LGD = 60%

Worst Case PD = 12%, Downturn LGD = 90%

Hence, capital change for the i^{th} pool

$$= [(0.12 \times 0.9) - (0.05 \times 0.6)] \times 50,000 = ₹ 3,900 \text{ crores.}$$

In this manner, calculation is done for other pools and then aggregated.

In the IRB foundation approach, bank is only allowed to provide estimate of PD. Regulator provides other estimates.

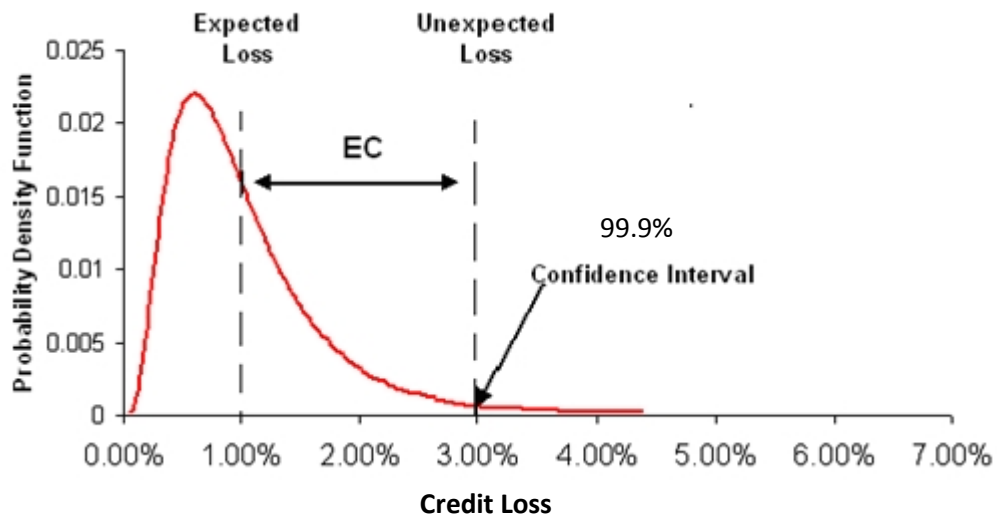
Method III : IRR Advance Approach

It is same as IRB foundation, but in this case, banks provide an estimate of all inputs.

Note 1 : Nothing about these approaches are mentioned in the study mat - only names are given.

Note 2 : In the risk models chapter, the VaR that we had done was basically VaR related to market risk, i.e., risk of Equity, Commodity, Interest Rate and Exchange rate. There, we learnt that Basel advocates 99% 10day(2 Weeks) VaR for the trading book.

In this chapter, we are focusing on the banking Book, where credit VaR is computed as 99.9% 1 year Credit VaR



Note 3 : In fact Basel II allows a deduction of capital charge if the bank is using credit Risk Mitigation such as Credit Insurance, CDS, Securitization

By mistake, credit mitigation has been mentioned in the study mat as one of the methods of calculating capital charge for credit risk under Basel -II. The wrong classification given by ICAI is produced here under.



2. Credit Risk Governance

1. Qualitative Techniques for credit risk management

- **Transaction Risk Management** : It refers to procedures for evaluating, monitoring and recovering each individual loan
- **Portfolio Risk Management** : It focuses on the entire credit portfolio of the bank, i.e., to avoid concentration.
- **Policies/Processes** : The BoD needs to set up policies and processes to keep Credit Risk under control.

2. Capital Allocation and Performance appraisal

- Since Capital is costly and scarce, it is necessary to allocate it efficiently across different business units. For this purpose, we require risk adjusted performance appraisal measures.

The Popular ones are

- Sharpe Ratio
- Alpha
- Beta
- R Squared

➤ **Sharpe Ratio** : $\frac{R_p - R_f}{\sigma_p}$

➤ **Alpha : Style 1 :**

It refers to excess return = $(R_p - R_B)$

(R_p = Return of Portfolio, R_B = Return on Benchmark)

Style 2 :

Jensen Alpha

R_p - (required return as per SML)

i.e., $R_p - (R_f + (R_m - R_f)B)$

- **Beta** - Its a measure of systematic risk. It is the sensitivity of stock return to market return.

$$\text{Beta} = \frac{\text{Covariance}(R_e, R_m)}{\text{Variance}(R_m)}$$

- **R-Squared** : Coefficient of determination i.e., what proportion of total risk is systematic risk.

$$\text{R Squared} = \frac{\text{Systematic Risk}}{\text{Total Risk}}$$

Apart from these, there are advanced risk adjusted performance measures used by banks. These are -

1. Return on **risk adjusted capital** (RORAC)
2. **Risk adjusted return** on capital (RAROC)

Return on Risk Adjusted Capital (RORAC)

The return on risk-adjusted capital (RORAC) is a rate of return measure commonly used in financial analysis, where various projects, endeavors, and investments are evaluated based on capital at risk. Projects with different risk profiles are easier to compare with each other once their individual RORAC values have been calculated.

The RORAC is similar to return on equity (ROE), except the denominator is adjusted to account for the risk of a project.

ICAI has provided the following formula for RORAC-

$$\text{RORAC} = \text{Net income} / \text{Allocated Risk Capital}$$

They have given a stupid example on RORAC -

Assume a firm is evaluating two projects it has engaged in over the previous year and needs to decide which one to eliminate. Project A had total revenues of ₹ 100,000 and total expenses of ₹ 50,000. The total risk-weighted assets involved in the project are ₹ 400,000. Project B had total revenues of ₹ 200,000 and total expenses of ₹ 100,000. The total risk-weighted assets involved in Project B are ₹ 900,000. The RORACs are calculated as below:

$$\text{Project A RORAC} = \frac{\text{₹}1,00,000 - \text{₹}50,000}{\text{₹}4,00,000} = 12.5\%$$

$$\text{Project B RORAC} = \frac{\text{₹}2,00,000 - \text{₹}100,000}{\text{₹}9,00,000} = 11.1\%$$

Even though Project B had twice as much revenue as Project A, once the risk-weighted capital of the projects are taken into account, it is clear that Project A has a better RORAC.

I cannot prevent myself from sharing a better example-

Example				
Particulars	Project A		Project B	
Outcome	Amount	RW	Outcome	RW
A1	2000	0.4		
A2	5000	0.7		
A3			6000	0.1
A4			8000	0.2

RWA of Project A = $(2000 \times 0.4) + (5000 \times 0.7) = 4300$.

RWA of Project B = $(6000 \times 0.1) + (8000 \times 0.2) = 2200$

Suppose Capital change = 8%

Therefore Risk adjusted capital of project A = 8% of 4300 = 344

RAC of project B = 8% of 2200 = 176

Now, suppose expected return = Project A : 50, Project B : 40 (in amount)

RORAC for project A = $\left(\frac{50}{344}\right) \times 100 = 11.63\%$

$$\text{RORAC for project B} = \left(\frac{40}{176} \times 100 \right) = 22.73\%$$

Self Note : So even though project B has cover return (in absolute terms and higher total assets, its RORAC is higher than that of A.

Risk – adjusted Return on Capital (RAROC)

Risk-adjusted return on capital (RAROC) is a risk-based profitability measurement framework for analysing risk-adjusted financial performance and providing a consistent view of profitability across businesses. The concept was developed by Bankers Trust and principal designer Dan Borge in the late 1970s.

$$\text{ICAI defines it as} = \left[\frac{\text{Expected Return}}{\text{Economic Capital}} \right] \text{ or } \left[\frac{\text{Expected Return}}{\text{VaR}} \right]$$

ICAI has not provided any illustrations on RAROC. Let me provide a perfect example on the same.

Example

Assume a \$1.0 billion corporate loan portfolio offers a return of 5.0% per annum. The bank (the lender) has a direct operating cost of \$6.0 million per annum and an effective tax rate of 25.0%. The portfolio is funded by \$1.0 billion in retail deposits with a transfer-priced interest rate charge of 1.40%. Risk analysis of the unexpected losses associated with the portfolio tell us we need to set aside economic capital of \$80.0 million against the portfolio; i.e., 8.0% of the loan amount. The bank's economic capital must be invested in risk-free securities and the risk-free rate on government securities is only 1.0%. The expected loss on the portfolio is assumed to be 1.0% per annum; i.e., \$10 million. Which is **nearest** to the risk-adjusted return on economic capital (RAROC)?

- A. 8.75%
- B. 13.00%
- C. 19.50%
- D. 25.25%

Answer : C 19.50%

RAROC = (after-tax expected risk-adjusted net income) / (economic capital). In this case.

- Expected revenue = \$ 1.0 billion loan portfolio × 5.0% = \$50.0 million
- Expected losses = \$1.0 billion loan portfolio × 1.0% = \$10.0 million
- Interest expense = \$1.0 billion borrowed funds × 1.40% = \$14.0 million
- Operating cost = \$6.0 million (given as an assumption)
- Return on economic capital (EC) = \$80.00 EC × 1.0% = \$0.80 million
- Tax rate = 0.25 (given as assumption)

Such that RAROC = [(\$50.0 - 10.0 - 14.0 - 6.0 + 0.80) × (1.0 - 0.25 tax rate)] / 80.0 = 19.50%

These are used for Performance Appraisal, Risk Management and Capital Allocation