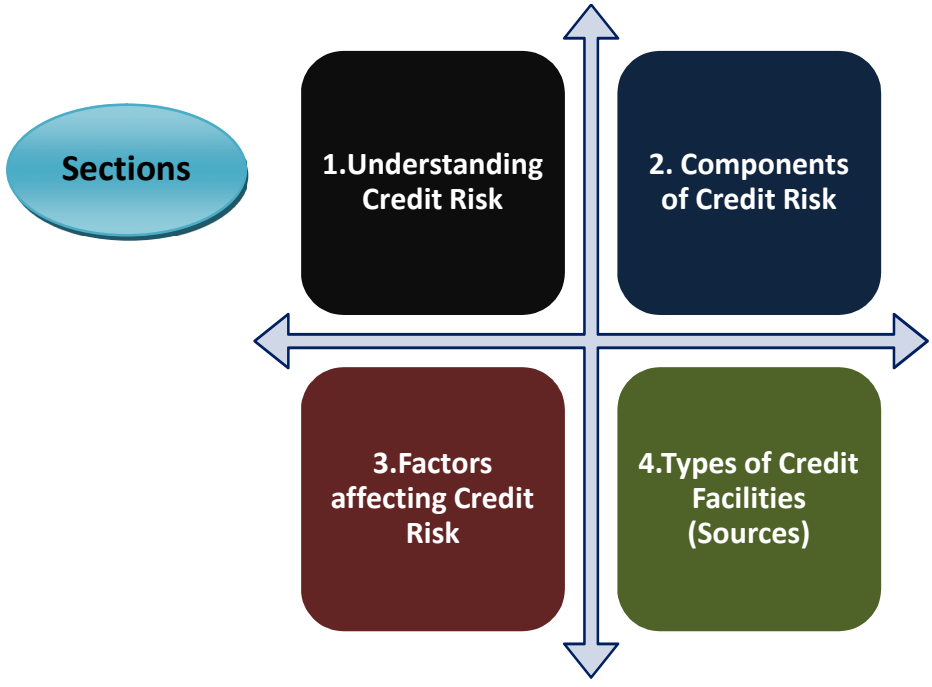
Lecture Note 11

Credit Risk

Part I : Basics	Part II : Day to Day Operations	Part III : Top Down Views

Part I : Basics



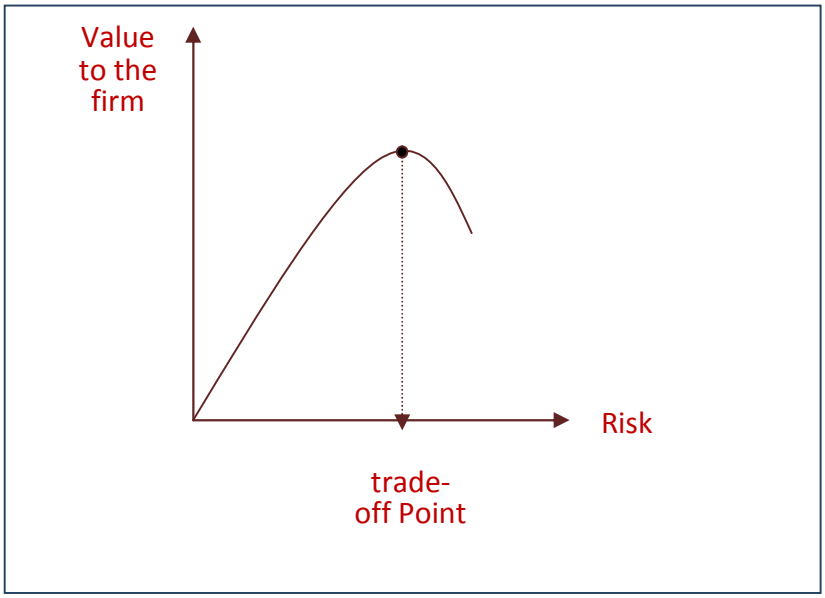
Section 1 : Understanding Credit Risk

i. Definition : Credit risk - Counterparty failure.

- **Situations :**
  - ✓ Bank lending
  - ✓ Credit risk in bonds
  - ✓ Credit Sale including Export Credit
  - ✓ Counterparty credit risk in OTC Derivatives(In case of **OTC derivatives**, credit risk is **bilateral,** in case of forward contracts or swaps. However in case of options, credit risk is faced only by option **buyer**.)

ii. Two-Way Risks (Surprising) : Even the borrower suffers the risk that bank may withdraw credit facility. Even the purchaser of goods on credit is afraid that seller may halt supply resulting in production stoppage.

iii. Risk-Return Trade-off : Bank's Credit department must strike a balance between Risk and Return.



- Set the limit for overall credit risk to be taken
- Incorporate credit risk in loan pricing
- Avoid concentration risk in geography/Sector/borrower .

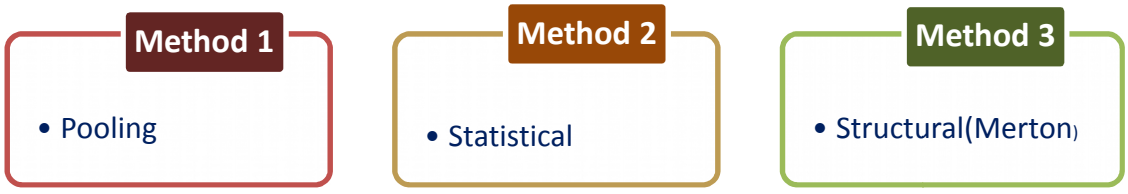
iv. Credit Risk in Capital markets :

- We will study **lending risk** faced by banks - treat it as an umbrella.
- Two types of lending by banks - **Retail and Wholesale.**

Section 2 : Components of Credit Risk

i. Default Risk (i.e. PD) or Default Intensity or Hazard Rate (say 5%)

Method of Calculating PD



Method 1

Pooling : Divide the loan portfolio of the bank into homogeneous pools (say AAA rated power sector Loans, housing loans with a FICO score of more than 700 etc.). For each pool, calculate average past default rate-

Default Rate = [Number of loans in the pool which defaulted/ Total Number of loans]

Take PD as past average default rate.

Method 2

Statistical: This is based on logistic regression. It has 2 applications –

Case 1 : Credit Scoring Models for Consumer Credit (Retail Lending)

This is section 10 of ICAI Mat. Although a statistical understanding of Credit Scoring Models is not required for the exam, the same would help a lot in intellectual satisfaction that everybody craves for.

Credit Scoring models like FICO Score, CIBIL Score, Vantage, FAKO score, etc. are widely used in the consumer finance industry for deciding upon the eligibility and terms of consumer credit. Do remember that when it comes to Consumer credit, we have a large number of small exposures. So, detailed and customized individual scanning of the consumer is not economical. Instead, a scoreboard system is used.

Intuition behind the Credit Scoring Models :

It involves a regression analysis : $\hat{y} = b_0 + b_1x_1 + b_2x.....b_kx_k$

wherex_1, x_2.....represent explanatory factors like average income, number of years of current residence, average bank balance, etc. Based on this regression analysis, we transform $\hat{y}$ into PD using statistical techniques. PD obviously lies between O and 1. Finally, we decide a range for the score (say 300-850 for FICO and 360-840 for FAKO). Accordingly, PD is mapped in that range.

Note – Just as we saw several index in Country Risk Analysis (Chapter 5) like Corruption Index, Ginni Coefficient, etc. and acknowledged that it is an arbitrage opportunity in an Open Book exam if they ask for details of the same. The same holds good for the various credit scoring models.

Case 2 : Altman Z Score

ALTMAN Z-Score is based on discriminant analysis, i.e., a technique designed to discriminate between potentially good and bad corporate customers.

$$Z = 1.2 X 1 + 1.4 X 2 + 3.3 X 3 + 0.6 X 4 + 1.0 X 5.$$

Where,

X1 = working capital / total assets - Measures liquid assets in relation to the size of the company.

X2 = retained earnings / total assets -Measures profitability that reflects the company's age andearning power.

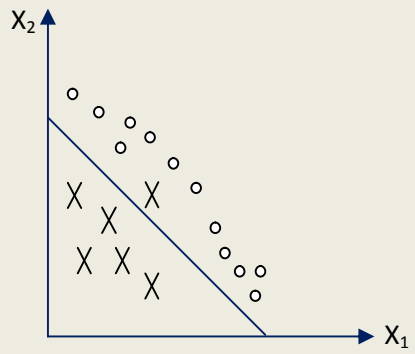
X3 = earnings before interest and taxes / total assets - Measures operating efficiency apart from tax and leveraging factors. It recognizes operating earnings as being important to long-term viability.

X4 = market value of equity / book value of total liabilities - Adds market dimension that can show up security price fluctuation as a possible red flag.

X5 = sales / total assets - Standard measure for total asset turnover (varies greatly from industry to industry).

What is Discriminant Analysis?

A 2 factor discriminant analysis would be of the type - z = ax + by, say x = current ratio, y = ROI we calculate data on 10 customers - 5 good (represent by 0) and 5 bad(represented by x). The parameters Z, a and b are decided in such a manner that there is least number of misclassifications.



Refer to this idea to think about - Machine Learning last part of the Operational Risk Chapter

Range for Altman Z-Score:

- Z-Score < 1.8 - **Red zone** i.e. Company is on the verge of bankruptcy
- Z-Score between 1.8 and 3 - **Grey Zone** i.e., can't say – closely monitor.
- Z-Score > 3 - **Green Zone** : Potentially Healthy.

Note : Altman's original Z-Score was for publicly held manufacturers - later Altman designed Z'-score for privately held companies and Z"-Score for non-manufacturing companies.

Method 3

Structural (MERTON model) : Equity can be looked upon as a call option on the Assets of the firm with strike price equal to Redemption value of the firm's liabilities.

Example
X Ltd. has a single 5 year ZCB of face value 800crores. **Case I : After 5 years, value of the assets ≤ 800 crores. So, shareholder's pay-off = 0 (lottery ticket wasted)** **Case II : After 5 years : Value of asset > 800 crores - say 900 or 1100 or 1500 crore, pay-off for shareholders = 100 or 300 or 700.**

Merton therefore used a modified version of Black Scholes Model (BSM) of option pricing-

$$C_0 = S_0 N(d_1) - \frac{XN(d_2)}{e^{rt}} = \text{Original BSM}$$

Instead, in Merton model we have –

$$S_0 = A_0 N(d_1) - \frac{DN(d_2)}{e^{rt}}$$

S_0 = Market value of equity

A_0 = Market value of asset

D = Redemption value of debt

r = Rf

T = time to maturity of the firms debt

PD = $n(-d_2)$, i.e., 1 - $n(d_2)$

if reflects the probability that assets of the firm at "t" will be less than "D"

[A_T< D]

Note – Of course, all this knowledge is not required for the exam. However, if Structural Model is mentioned in ICAI study mat, we have to understand atleast the crux of it.

Note :

There are two types of PD

- **Expected PD – This is used to calculate expected loss.**
- **Worst Case PD** : This is the max.possible PD i.e., PD during recession.

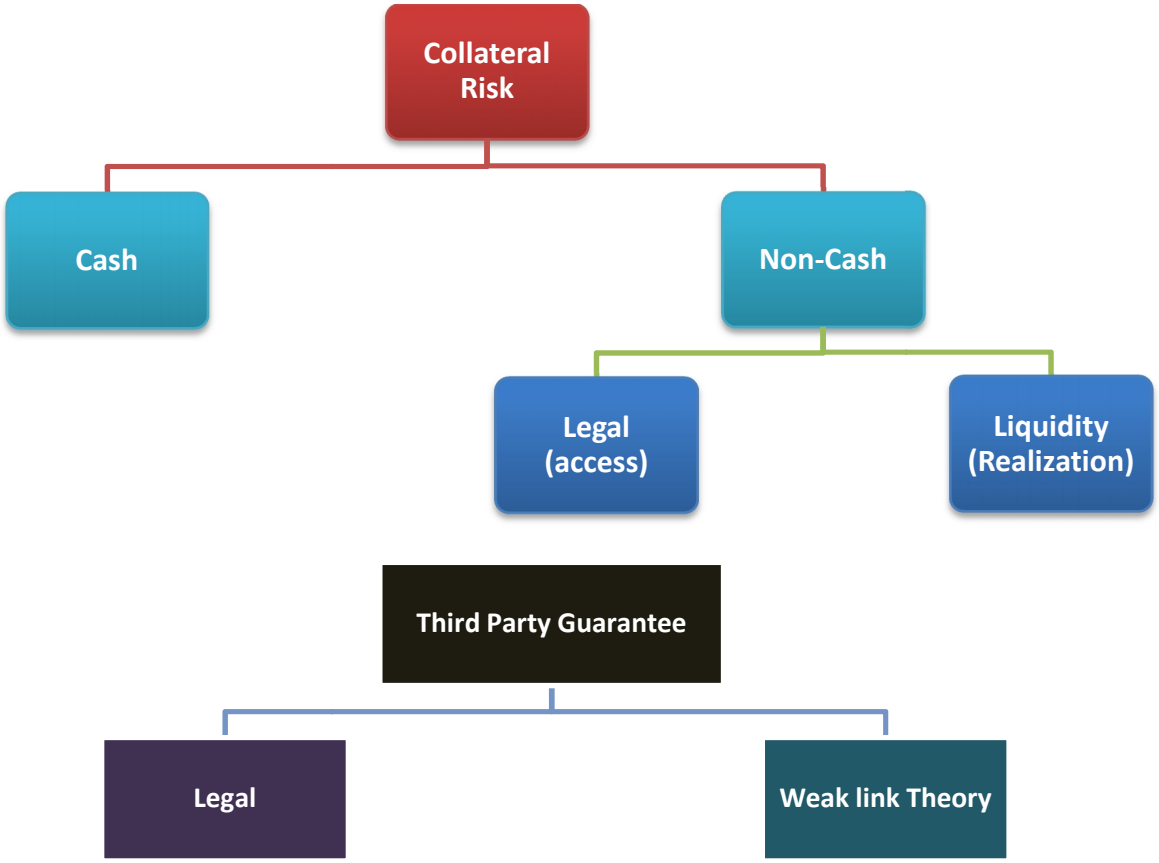
  Worst Case PD is used to compute Capital Charge for Credit Risk under IRB foundation and advanced approach in BASEL II framework.

Note - there is a concept of Expected PD and Worst Case PD (WCPD). Expected PD is used to calculate EL, while, WCPD is used to calculate Capital Charge under the IRB Foundation and Advanced Approach of the BASEL II framework.

ii. Loss Given Default (LGD) or Recovery Risk - Depends on -

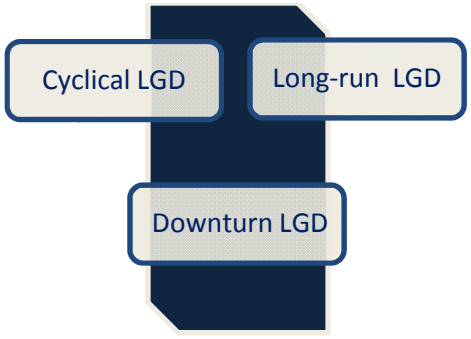
a. **Collateral**

b. **Third Party Guarantee**



(Suppose LGD = 80% - Therefore, recovery rate = 20%)

There are three types of LGD



- **Cyclical LGD (Point in Time – PIT approach)** :This reflects LGD at a point on the business cycle.
- **Long run LGD (Through the cycle – TTC approach)** : It reflects LGD over an average cycle.
- **Downturn LGD** : This is the max. possible LGD i.e., LGD during recession.

Note – Downturn LGD is used to compute Capital Charge for Credit Risk under IRB foundation and advanced approach in BASEL II framework.

iii. Exposure Risk : i.e., EAD - Exposure at Default

Examples
➢ O/D limit = 50 lakhs
➢ Current limit utilized = 10 lakhs
➢ Expected percentage utilization of unutilized limit = 70%
➢ Therefore EAD = 10 + (50 -10)70% = 38 Lakhs

Expected loss **= PD × LGD × EAD**

= 0.05 × 0.8 × 38 = ₹ 1.52 lakhs

Note : Capital is NOT required to be maintained for expected loss. This is because expected loss is supposed to be captured by loan pricing and provisioning.

"Capital is required as a cushion against unexpected losses"

Section 3 : Factors affecting Credit Risk

a. Internal Factors	b. External Factors
✓ Geographical Concentration ✓ Industry Concentration ✓ Poor loan appraisal system ✓ Poor recovery mechanism ✓ Amount is being used for some other purpose as compared to what was initially decided.	✓ Interest Rate Risk ✓ Currency Risk ✓ Regulatory Risk ✓ Political Risk ✓ Country Risk

Section 4 : Types of Credit Facilities (Sources)

A. Retail **B. Wholesale**

Retail

- Personal Loan
- Mortgage/Home Loan
- Credit Card

Wholesale

- Working Capital Loan (MPBF, OD, CC, BD, Packing Credit, Factoring)
- Demand Loan - extremely rare
- Term Loan
- Project/Infrastructure Loan
- Micro-finance Loan
- Real Estate construction Loan
- Agri Loan

Working Capital Loans :

i. **Theme :**Regulators are concerned about the tendency of corporates to raise excessive amount of working capital bank finance and use it to fund fixed assets. This will result in a gross asset liability mismatch.

ii. **Tandon Committee**norms on **Maximum Permissible Banking Finance Company (MPBF)** for working capital :

Method I : MPBF = 75% of (CA - CL) = Minimum Current Ratio = 1

Method II : MPBF = (75% of CA) - CL = Minimum Current Ratio = 1.33

Method III : MPBF = 75% of (CA - CCA) - CL = Minimum Current Ratio = 1.5

(Where CCA = Core Current Assets)

iii. **Forms or types of working capital financing :**

a. **Bank Overdraft** | Both are essentially demand

b. **Cash Credit** | Loans where interest is levied on the actual amount utilized.

The difference is that for CC, you do not require a current account. Also, the text says that security deposit is required in case of CC.

c. **Bill Discounting**

d. **Pre-Shipment Credit :** Concessional financing provided to exporters for all activities prior to the shipment of goods

e. **Post-Shipment Credit** :Concessional financing provided to exporters after shipment till the date of realization of the exports proceeds.

d + e = Combined called Packing Credit

f. **Factoring :**Bank buys the receivables of a firm by charging commission. In case of recourse/non-recourse factoring, bad debt loss shall be borne by the company bank.