Table of Content:

1. Credit Risk Terms Explained

Credit

- Credit Card and Home loans are examples of credit given to a borrower by a lender
- Money in a credit card is not ours, we need to pay it back. If we fail to pay it, we need to repay with interest.
- Home loans are another type of credit given. For this we have a collateral, i.e. home itself, this could be used to recover money if the customer fails to pay back.
- Asset financing is another good example of credit. Organizations don't buy the assets at one go instead they finance it and pay it over the time.

Credit Risk: Likelihood that the borrower wouldn't repay their loan to the lender is credit risk.

Collection costs are the costs incurred in recovering back the money that was not collected.

Default Event: the event of a borrower not being able to repay their debt is called default.

Risk Based Pricing:

- Lenders need to assess the credit risk associated with every loan they are giving to the borrower.
- To ensure that the borrower pays back the amount he has taken, lenders could ask for collators or to increase the interest on the loan

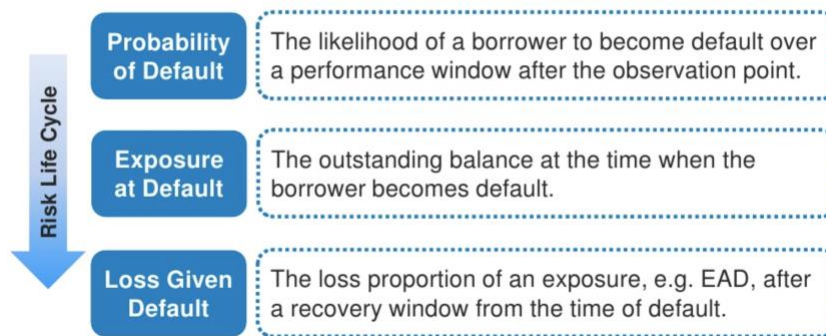**Main reasons for serious finacial crisis**

- Lending to borrowers with a high probability of default
- Ex: Global Financial Crisis and Fall of Leeman Brothers

2. Expected Loss and it's components

Expected Loss

- Definition: The amount a lender might lose by lending to a borrower

- Components

    o PD - Probability of Default

    o LGD - Loss Given Default

    o EAD - Exposure at Default

- **Factors of expected loss**

    o Borrower-specific factors

    o The economic environment
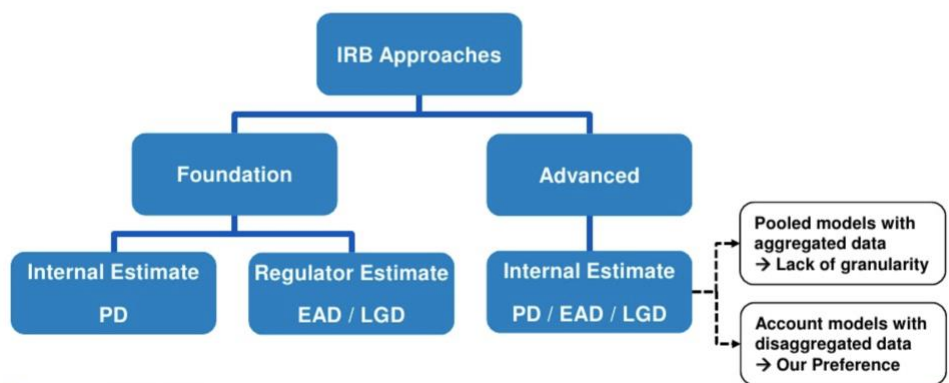
- **What exactly are credit risk parameters in consumer banking?**

Risk Life Cycle		
Probability of Default	The likelihood of a borrower to become default over a performance window after the observation point.	
Exposure at Default	The outstanding balance at the time when the borrower becomes default.	
Loss Given Default	The loss proportion of an exposure, e.g. EAD, after a recovery window from the time of default.	

- **Historical Data Requirement:**
    - at least 5 years' worth of data for the model development

- **Modeling Approaches**

```
                    IRB Approaches
                   /              \
             Foundation          Advanced
            /        \              |
   Internal      Regulator     Internal
   Estimate      Estimate      Estimate
     PD          EAD / LGD     PD / EAD / LGD
```

Pooled models with aggregated data
→ Lack of granularity

Account models with disaggregated data
→ Our Preference

So lets have a look at a Case example

1. Cost of House - $500,000
2. Lender Funds 80% Loan to Value (LTV)
3. So loan amount - $400,000

Since borrower only pays back $40,000, which is less than loan amount of $400,000, Borrower Defaults here, the remaining amount to be recovered,

Exposure at default is   40,000-400,000=-$360,000

assume we have an empirical evidence, 1 of 4 homeowners having default

   P(Default)=0.25

After the default event, bank sold house at $342,000

   Exposure at Default = $360,000 - $342,000 = $18,000

   Loss Given Default = $18,000/$360,000 = 5%

Expected Loss

   = PD x LGD x EAD

   = 25% x 5% x $360,000   = $4,500

3. Capital requirement and BASEL II accord

When Banking System is suffered, it impacts the overall functioning of the government and stability of Economic System. People wouldn't deposit money in their banks if it is not safe Consequently there would be less liquidity

Regulators Rules:

    1. Regulate bank operations and hence reduce risky behaviour

    2. Guarantee to the public that the banking sector is in good health

Loan Defaults:

Firms may default because of two possible reasons

    1. Poor corporate management

    2. Bad product performance

    3. Also, if there is a global economic downturn

Capital Requirement or Capital Adequacy or Regulatory Capital:

Banks are required to have sufficient moeny to absorb losses

Risk Weighted Assets

Every loan that bank gives is an asset to bank. This loan is associated with risk.

Capital Adequacy Ratio should be greater than a certain percentage

BASEL II Accord

    - How much capital banks need to have?

    - How capital is defined?

    - How Capital is compared against risk-weighted assets?

BASEL II Accord defines the capital amount a bank needs, more risk a bank lead to more capital on hold.

BASEL II Accord has three pillars

1. Minimum Capital Requirement

- Credit Risk

- Operational Risk

  o Internal Ratings Based Approach (IRB)

    • Foundational IRB Approach

    • Advanced IRB Approach

- Market Risk

2. Supervisory Review

3. Market Discipline

4. BASEL II Approaches

BASEL II Accord has three pillars

1. Minimum Capital Requirement

- Credit Risk

- Market Risk

- Operational Risk

- Internal Ratings Based Approach (IRB)

  o Foundational IRB Approach

  o Advanced IRB Approach

2. Supervisory Review

3. Market Discipline

From this we have three options to model the credit risk

1. Standardised Approach

2. Foundational IRB Approach

3. Advanced IRB Approach

by Paula Madalinska

Credit Risk
is the risk of losses arising from the counterparty failure

The Basel Committee presents 2 Methodologies for calculating capital

The Standardised Approach

- Will be to measure credit risk in a standardised manner, supported by external credit assessments
- As a result of the global financial crisis only 'eligible agencies' pointed by regulators may prepare credit assessments
- Banks may use a risk-weighting schedule for measuring credit exposure (please look at exposure classes under Basel II)
- May be used for non-material portfolios

DICTIONARY
- **PB – Probability of Default** – the likelihood of a default over a particular time horizon
- **LDG – Loss Given Default** – estimated amount of loss expected if a credit facility defaults
- **EAD – Exposure at default** - the total value that a bank is **exposed** to at the time of **default**.
- **RWA – Risk Weighted Assets** - bank's **assets** or off-balance-sheet exposures, **weighted** according to **risk**.

The Internal Ratings-based Approach

- A subject to the explicit approval of the bank's supervisor
- Banks can use their internal rating system for calculating credit risk weighted assets

Foundation IRB

- Banks provide their own estimates of **PD**
- Other risk components (EADs, LGDs and maturities) are provided by the supervisory framework

Advanced IRB

- Banks can use their own estimates of **PD, LGD, EAD** and their own calculation of M (subject to minimum standards)

	Foundation IRB	**Advanced IRB**
PD	Internal bank calculation	Internal bank calculation
LDG	Provided by regulators	Internal bank calculation
EAD	Provided by regulators	Internal bank calculation

Capital Requirement is calculated differently under these three approach

1. Standardised Approach -- Fixed % of the total exposure

       FICO

       Moody's etc do credit risk rating

       In India - CRISIL

       S&P do it for Firms and Countries ex: AAA, AAA-, BBB etc

       Under this approach,

       There is a table for which there is a certain % of total amount is held

       Ex:

       AAA to AAA- rated companies -- 20%

       A+ to A- -- 50% should be held as capital

       Retail, Credit Card and Consumer loans - 75% of the loan given

       Home Loans - 35%

2. Foundational IRB & Advanced IRB Approach

When banks give out the loans they collect data and this data could be used for calculation

This data can be used under IRB approach

Banks would like to move from SA to F-IRB to A-IRB

Because holding as much as 75% of the data of the loan is too much

If a bank gets a proper risk profile of an individual, they would need to hold less amount of money

More Precise estimation of Capital ==> More new business with SAME capital

IRB Approach allow banks to do their own credit rating
- Hence bank ccan allocate more resources to cover losses

5. Different Asset class

Individuals

Credit Cards   -- 75%

Consumer Loans   -- 75%

Mortgages   -- 35%

Firms

- SME

- Large Corporations

Large Corporations are very less to have a statistical data to model

SME contains enough data to build statistical models

Reatil loans are also plenty to get the data

PD - Logistic Regression

LGD - Beta Regression

EAD - Beta Regression

For different classes of customers we may have different data available

Individuals:

- Any Demographics or Social informations Available

- external credit risk agency data

- No. of inquiries made for credit

- Interest Rate

Credit Card

- Credit Limit

    o Credit Limit Utilization can be used to build model

Mortgage Loan

- Loan To Value Ratio

Corporate Loans

- Firm's Size

Years in business

- Line of Operation

- Target Market focus

- Financial Statements

- Return on Assets -   Net income/Total Assets

- Return on Equity -   Net Income/Shareholder's equity

- Current Ratio - Current Assets/Current Liabilities

- Debt Ratio - Total Liabilities/ Total Assets

The data are available at

- before the application

- collected after the loan is granted and under a period of observation

Two models could be made from the information

1. Application Model

       If the loan is risky it would have a higher interest rate

2. Behaviour Model

       Whether to grant an additional loan or not;

       e.g. using the credit card details bank may use for building the model

PD - Logistic Regression (Binomial Logistic Regression)

LGD and EAD - Beta Regression