## Introduction to credit risk

* Risk related to the borrower not paying any type of loan
* Includes businesses of any size: small,medium,large businesses
* NPA (Non-performing assets) -> if a company is NPA, it means that it had not been able to repay dues -> huge financial losses -> reduction of “i” on deposits -> loss for honest borrowers -> need of sufficient capital to protect against this risk
* 2008: financial crisis ->
  + Credit to low creditworthy customers (higher risk of default)
  + How to compensate? -> charge higher and higher interest
  + How to finance them? -> selling them through CDO (Collateralized debt obligations -> collateralized group of loans and other assets) on secondary markets to investors -> CDO considered as “low-risky instruments”
  + 2008 -> poor borrowers -> defaulting -> banks foreclose their properties (due to collateralized structure) -> decline in home prices + real estate bubble
  + Non-financial + financial firms suffered (or closed) -> why?
    - Impacted directly through direct investments in these funds
    - Impacted indirectly through low demand -> people had no money

## Basel Regulations

1974 -> committee set up by G10 central banks. Objective? Ensure banks are backed by minimum enough capital to give back depositors’ funds.

* BIS (Bank for international agreement) -> Basel, Switzerland
  + 27 jurisdictions (2009)
  + Supervisory boards (regularly) to discuss the matter
* 3 agreements:

1. Basel I (1988)
   1. introducing the idea of capital adequacy ratio (Capital To Risk Assets Ratio) -> ratio of a bank’s capital to its risk (needed to be around 8%)  
      In other words, capital should be at least more than 8% of the risk-weighted assets  
        
      Example:
      1. Mortgage: 5000$
      2. Risk weight: 50% (for mortgages, while 100% for non-mortgages: credit-card, auto loans, personal finance etc..)
      3. Risk weighted assets: $2500 (5000 \* 0.5)
      4. Minimum capital requirement: 200 (2500\*0.08)
   2. Capital division:
      1. Tier 1: primary funding source of the bank (shareholders’ equity + retained earnings)
      2. Tier 2: secondary funding source of the bank (subordinated loans, reserves, general provisions, etc..)
2. Basel II (2004)
   1. want to overcome limitations of basel I -> focus also on operational (fraud, system failure) and market risk (equity, currency, commodity), rather than only credit risk
   2. Introduced more complexity in estimating credit risk. In particular, we have now 3 different approaches:  
      1. Standardized approach
         1. Relies on certified credit rating agencies (CRAs) like S&P, Moody etc… to quantify required capital for credit risk
         2. Still fix weight, but more bins:
            1. 20% high-rated exposure
            2. 150% for low-rated exposure
            3. (Retail) 35% -> mortgage exposure
            4. (Retail) 75% -> non-mortgage exposure
         3. Example
            1. Exposure (corporate): 5.000.000
            2. Assessment (credit): AAA (low-risk -> high-rate)
            3. Risk-weight: 20%
            4. Risk-weighted assets: 1.000.000
            5. Min. Cap. Required: 80.000 (1.000K \* 0.08)
      2. IRB (Internal Ratings Based) approach
         1. Relies on internal credit rating estimation methodology to derive credit assessment and has 4 components:  
            1. PD (Probability of default) -> likelihood borrower will default on debt over a 1-year period
            2. Exposure at default (EAD) -> amount the borrower has to pay the bank at the time of default (what it remains to be paid)
            3. Loss given default (LGD) -> how much of the EAD we expect to lose (also defined as 1 - recovery rate). Using also the previous data, we can get the “expected loss”:

**Expected loss**: PD\*LGD\*EAD  
  
Example:  
  
Loan: $100K  
Outstanding (at default): $70K  
Foreclose + sold: $60K  
EAD: $70K  
LGD: ($70K-$60K)/($70K) = 14.3%  
  
If PD = 2%, EAD = $70K, LGD = 14.3%, the Expected Loss is given by: 2%\*14.3%\*$70K = 200.2$

* + - * 1. Effective maturity (M) -> duration used in reflecting standard bank practice (2.5 years or 1 year usually depending on the type of IRB used)
      1. IRB: there exists two different approaches:  
         1. **Foundation IRB (internal + external)**:

PD -> estimated internally

LGD & EAD -> given by regulators

* + - * 1. **Advanced IRB (internal)**:

PD -> estimated internally

LGD & EAD -> estimated internally

1. Basel III (Starting 2019)  
   1. Introduced several additional risk measures to counter issues identified in 2008 crisis!
      1. Capital standards (e.g: leverage ratios)
      2. Stress testing
      3. Tangible equity (greatest loss-absorbing capacity)
   2. New requirements have been set up:
      1. Shareholders equity + retained earnings -> from 2% to 4.5% of RWA
      2. Tier 1 (capital ratio) -> from 4% to 6% RWA
      3. Tier 2 (capital ratio) -> from 4% to 2% RWA
      4. Common equity (capital conservation) -> from 0% to 2.5% RWA
2. IFRS 9 (International Financial Reporting Standard)  
   1. Deals with accounting for financial instruments
   2. Focuses on expected loss modeling (covering also future losses)
   3. Idea:
      1. recognize 12-month loss allowance (initial recognition)
      2. lifetime loss allowance with huge increase in credit risk