**Expected Loss (EL)**: The amount of money a lender might lose by lending to a borrower. It includes:

EL = PD X LGD X EAD

**Probability of Default (PD)**: Borrower’s inability to pay full amount or pay on time. It’s an estimate that a borrower would default in a particular time horizon.

**Loss Given Default (LGD)**: Proportion of exposure that cannot be recovered by a lender once a borrower defaults.

**Exposure At Default (EAD)**: Total value that a lender is exposed to once a borrower defaults. It means maximum that a borrower would lose in case of a borrower defaulting.

Example: Someone takes $100,000 home loan from bank for purchase of flat. At the time of default, loan has an outstanding balance of $70,000. Bank foreclosed flat and sold it for $60,000. EAD is $70,000. LGD is calculated by dividing ($70,000 - $60,000)/$70,000 i.e. 14.3%.

Assuming that 1 in every 4 home loan borrower has defaulted in previous years so

Probability of Default (PD) would be **¼** = 0.25

Loss Given Default (LGD): ($70,000 - $60,000)/$70,000 i.e. 14.3%

Exposure at Default (EAD): $70,000

Expected Loss (EL) = PDXLGDXEAD = 0.25 X 0.143 X $70000 = $ 2502.5

**Capital Adequacy, Regulations and Basil II Accord**

**A]** **Capital Adequacy**

Banks are required to hold sufficient capital to absorb losses from default in their portfolios. It is also known as Regulatory Capital or Capital Requirement.

The capital a bank is supposed to have in its balance sheet is determined based on proportion of its Assets i.e. loans. Capital requirement must take into account risks associated with each Asset/portfolio. This is done by weighting each Asset with its associated Risks and the final result of this is called as **Risk Weighted Assets (RWA)**.

Capital requirement states that banks must hold capital which is equal or greater than certain percentage of its RWA. In other words, the ratio between of Capital bank holds/RWA must be greater than or equal to a certain percentage. Also called as **Capital Adequacy Ratio** (CAR).

BASEL II defines what a capital is, how much capital a bank needs to hold and how a capital is compared against RWA. It states that Capital allocation a bank carries out must be Risk sensitive i.e. greater risk a bank is exposed to, higher the amount of capital it must hold.

**B] BASEL II**

It has three pillars –

a) Minimum Capital Requirement b) Supervisory Review c) Market Discipline

a) Minimum Capital Requirement – 1.Credit Risk 2. Market Risk 3. Operational Risk

1. Credit Risk – i) Standard Approach ii) Internal Rating based (IRB)

ii) Internal Rating Based (IRB) – Foundation IRB and Advanced IRB

Capital Requirement under Standard Approach is held as percentage of the total exposure whereas under Internal Rating Based method we use PD, LGD and EAD.

Under Standard Approach banks are required to take data from external credit rating agencies to access credit risk.

Under Standard Approach 75 % capital requirement is held for all retail exposure (consumer loans) and 35% for all loans which are secured by real estate.

In F-IRB banks can model PD but LGD and EAD are provided by external credit risk agencies and under A-IRB banks can model all the three components (PD, LGD, EAD) by themselves.

Advantage of IRB is it allows banks to fine grain calculations about precise capital they must hold for each individual exposure. That way banks would be better able to allocate their resources to cover losses. Also they would be able to increase their business volume and make more profit.

**Different Facility Types (Asset Classes) & Credit Risk Modeling Approaches**

Fewer the data points for a borrower type or facility type more banks rely on qualitative judgement and aggregated external information from external rating agencies for estimating credit risk.

For Probability of Default (PD) we require an indicator whether a borrower defaulted or not. “Loan Status” column will help us with that.

LGD is percentage of exposure that was lost after borrower defaulted.

EAD is amount of exposure at the moment borrower defaulted.

For Loss Given Default (LGD) we need to find how much of the loan was recovered after borrower had defaulted. “Recoveries” column will help is in that.

For Exposure at Default (EAD) we need to find total exposure at the moment borrower defaulted compared to the total exposure in the past. “Total Recovered Principle” Column will help us in that.

**Weight of Evidence:**  To what extent an independent variable would predict about a dependant variable. In other words, it shows the degree to which each of the categories of an independent variable explains the dependant variable.

WoE**i**= Log **(% good i / % bad i)**

The formula means WoE is natural logarithm of ratio of the proportion of goods from total number of goods that fall into the category to the proportion of bad from the total number of bad that fall into a category. The further away from Zero a WoE is, better the category is in differentiating between two outcomes of a dependent variable.

**Coarse Classing:** Process of constructing new categories based on the initial ones. Usually we consider categories that have similar WoE to be bundled together. In this way we lower our dummy variables and improve our PD model.

**Information Value:** How much information the original independent variable brings with respect to explaining the dependent variable. Thus can be used to determine which original independent variables explain dependent variable best, hence helps in variable selection.

Information value range from 0-1. Greater value means original variable yields more information with respect to the outcome.  
IV< 0.02 – No Predictive Power  
0.02< IV < 0.1 – Weak Predictive Power  
0.1 < IV < 0.3 – Medium Predictive Power  
0.3 < IV < 0.5 – Strong Predictive Power  
0.5 < IV < 1 – Too Good to be True

When building LGD and EAD its wise to build models with data from borrowers that had enough time to repay part of the remaining debt. Hence we would make use of loan status “Charged off” and “Does not meet the credit policy. Status: Charged off” for building LGD and EAD models.

The independent variables we are going to use for LGD and EAD models will be same which we used for PD model. Also there is no need for fine and coarse classing for LGD and EAD models.

You can fill the missing values here with 0 for “mts\_since\_last\_delinq” and “mts\_since\_last\_record”.