

1. Input File: "Default Risk charge holdings.xls". Columns below:

- a) Issuer-Issuer of security
- b) Security-Security id i.e. holding identifier
- c) Long/Short: Signifies Long or Short of position
- d) Bucket: There are 3 buckets.
  - i. Corporates
  - ii. Sovereigns
  - iii. local governments and municipalities
- e) Seniority: Non Senior, Covered, Senior
- f) LGD%: Loss given default %.  
Note: LGD is based on Seniority. This should be a comment in python program
- g) Risk Weight  
Note: Risk Weight is based on Rating. Also a rating is associated with an issuer. This should be a comment in python program
- h) Position Type: Asset type i.e. Bond, Equity
- i) Notional: Notional of position
- j) Market value
- k) Rating
- l) Expected Maturity: maturity of position

2. Calculation of Gross JTD:

- a) Calculate PnL for each security: Market Value-Notional
- b) Calculate Gross JTD(Long/Short) for each security. For below calculations LGD needs to be divided by 100 because it is in %. Each security will either yield Gross JTD(Long) or Gross JTD(Short)
  - i. This is applicable for securities where Long/Short = Long  
$$\text{Gross JTD(Long)} = \max(\text{LGD} \times \text{Notional} + \text{PnL}, 0)$$
  - ii. This is applicable for securities where Long/Short = Short  
$$\text{Gross JTD(Short)} = \min(\text{LGD} \times \text{Notional} + \text{PnL}, 0)$$
  - iii. Calculate year fraction of expected maturity: Determine net maturity for each security based on expected maturity column. Reference date is Today. Today has to be dynamic, i.e., tomorrow's today should be tomorrow's date. So tenure is Expected Maturity-Today. If Tenure is greater than 1 Year then year fraction is simply 1 but if it is less than 1 year fraction has to be calculated. For example if tenure is 3 months then Year fraction is  $3/12 = 25\%$ . If tenure is 1 or 1.2 then year fraction is 1. If tenure is 9 months then year fraction is  $9/12 = 75\%$
  - iv. Scale each Gross JTD by year fraction: Multiply Gross JTD by year fraction. This is our final Gross JTD

3. Calculate Net JTD( $net JTD_{long}$  and  $net JTD_{short}$ ) from Gross JTD:
  - a) Determine issuers which have 2 or more positions i.e. securities in holdings file.
    - i. If 2 Gross JTD for same issuer are (+)ve then they can be simply added to get a net JTD for this issuer
    - ii. If 2 Gross JTD have different signs i.e. one (+)ve(Long exposure) and another (-)ve(Short) then check if the (-)ve(short) Gross JTD has lower seniority. Below is seniority hierarchy based on Seniority column with Covered being most senior.
      - a) Covered
      - b) Senior
      - c) Non Senior

If (-)ve Gross JTD has lower seniority than long exposure Gross JTD then both can be added into a Net JTD. This will effectively be netting because by design Gross JTD for short exposures would come out negative because of -ve Notional and Market value. And Gross JTD of Long exposures is +ve by design i.e. +ve MV and notional. For example we can add Gross JTD for long bond with Seniority = Covered and Short bond or equity with seniority = "Senior" or "Non Senior". But if seniority is flipped; addition i.e. netting is not allowed and these 2 Gross JTD will be just known as 2 Net JTDs. This will happen when long exposure is Bond or Equity with Seniority = "Senior" or "Non Senior" and Short exposure being "Covered".

- b) Issuer with single exposure i.e. Gross JTD. This gets assigned to Net JTD. No netting, aggregation possible.
4. Distribute all Net JTDs in 3 buckets. Each exposure is assigned to a bucket.
5. Calculation of HBR in a bucket i.e. Hedge benefit ratio. Basically it measures effectiveness of hedging or netting. If there is hedging via short exposures then HBR would be less than 100%.

0 means 100% hedging.

100% means 0% hedging

$$HBR = \frac{\sum net JTD_{long}}{(\sum net JTD_{long} + \sum |net JTD_{short}|)}$$

We will calculate HBR for each bucket, so we will get 3 HBRs

6. Bucket DRC =  $\max[(\sum_{i \in Long} RW_i \cdot net JTD_i) - HBR \cdot (\sum_{i \in Short} RW_i \cdot |net JTD_i|); 0]$   
 DRC has to be calculated for each bucket, so we will calculate 3 Default Risk charges.
7. Sum all 3 bucket DRCs to give DRC non securitization capital charge.