Counterparty Credit Risk under Basel III

Application on simple portfolios

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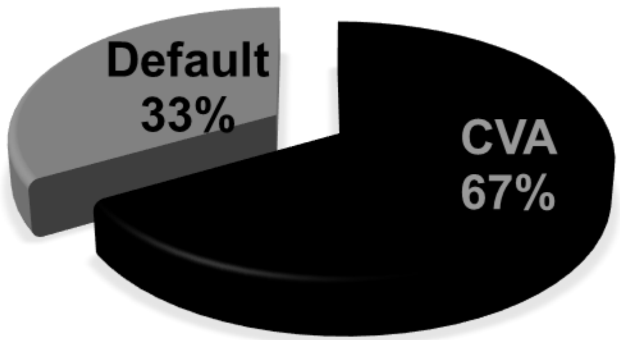
Recent crisis and Basel III

After recent crisis, and the increasing volatility on the market most players are struggling to find answers to one of their most critical risk factors : the Counterparty Credit Risk.

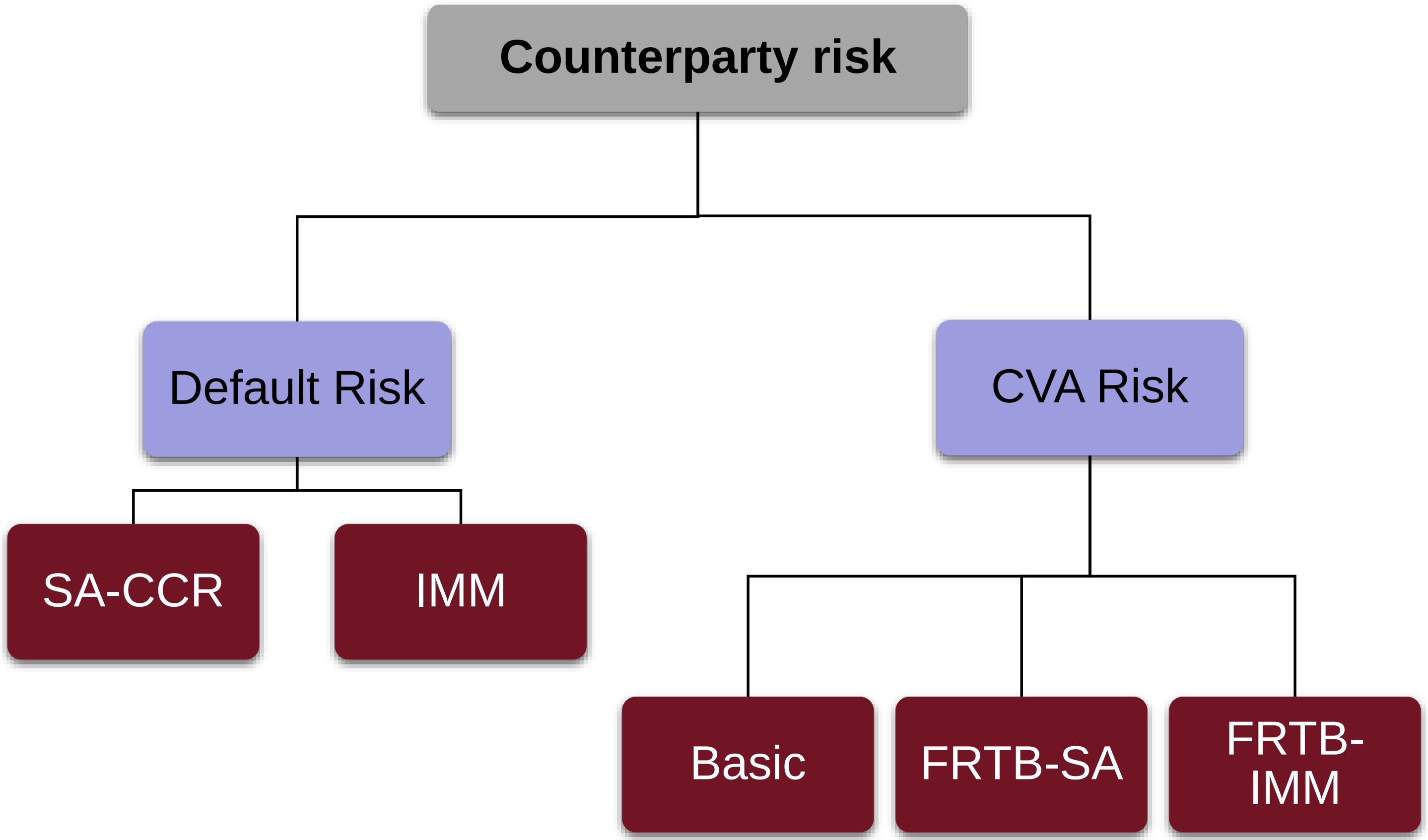
Default Counterparty Credit Risk was already accounted for but a BIS study showed that two thirds of the losses due to counterparty risk during the financial crises resulted from the CVA and not the default of the concerned counterparties.



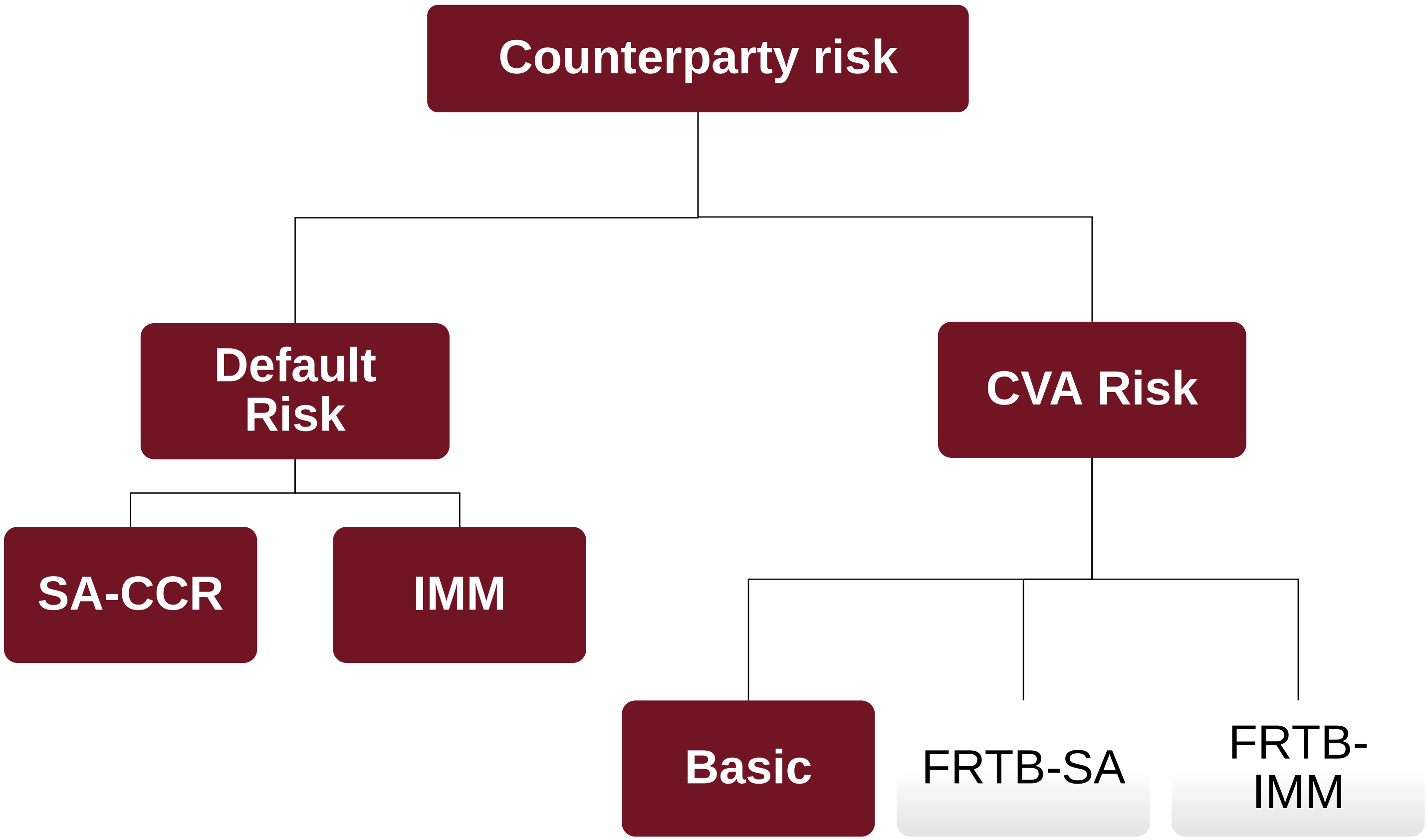
Therefore, Basel III amended the computation of an additional CVA capital charge under its pillar 1 capital adequacy computation.

Based on these facts, this presentation aims to explain the counterparty risk computation for default and CVA, under standardised or internal models.

Basel Methodologies



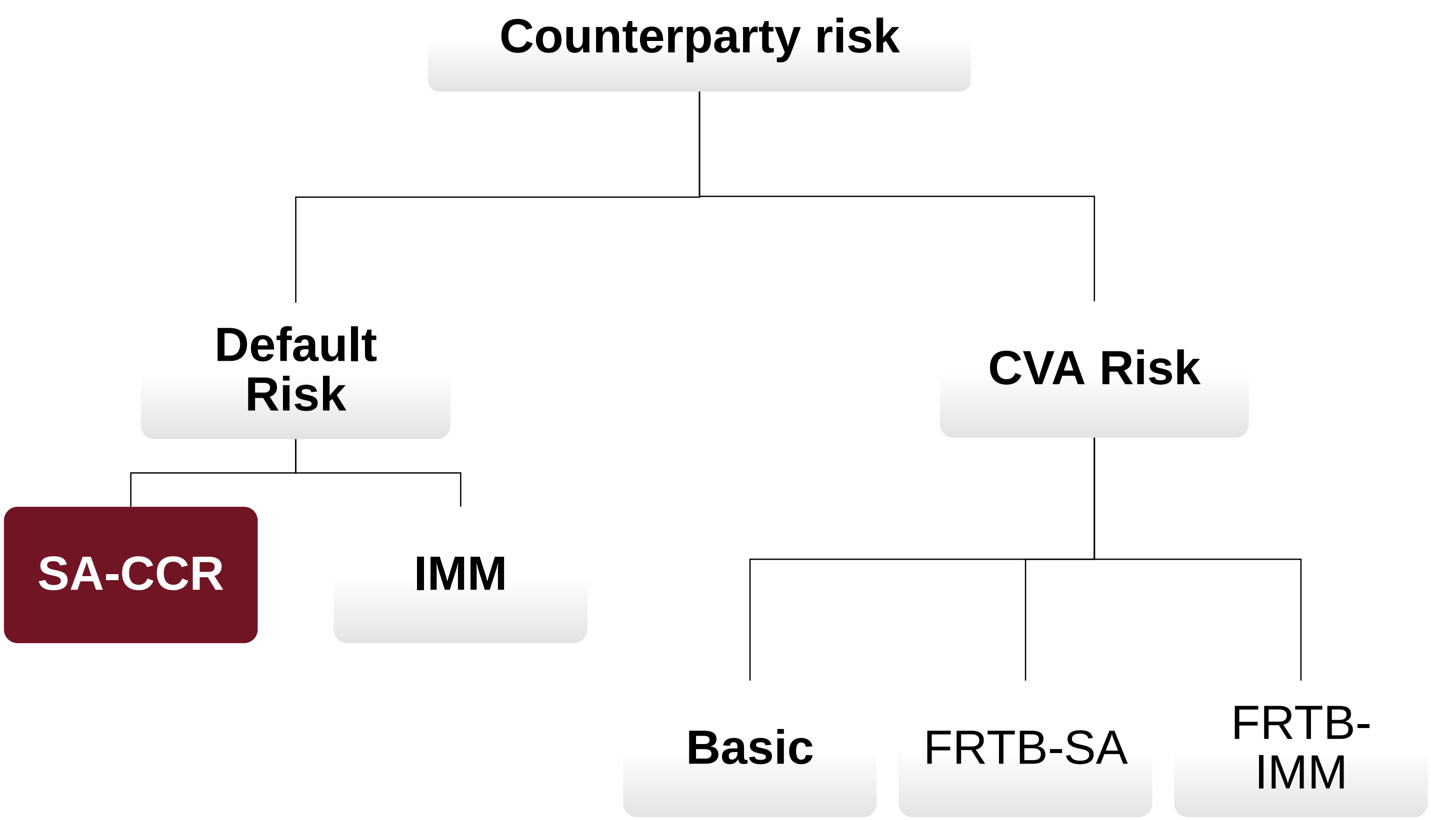
Basel Methodologies



Outline

1. Standardized Counterparty Credit Risk Approach (SA-CCR)
2. Construction of an internal model
3. CVA computation
4. Application on: Interest Rate Swaps and FX vanilla options
5. Comparison
6. Conclusive results

Basel Methodologies



SA-CCR

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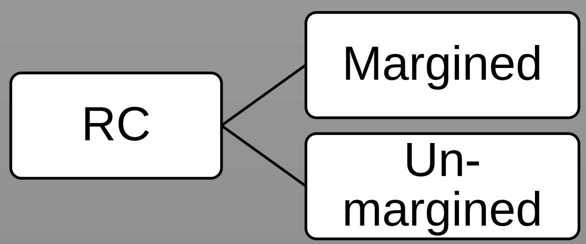

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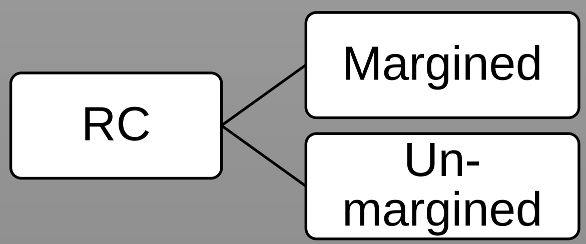

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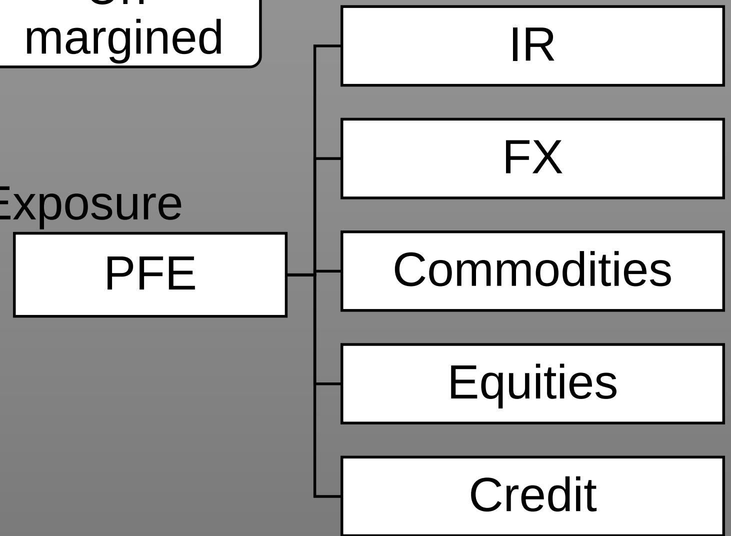
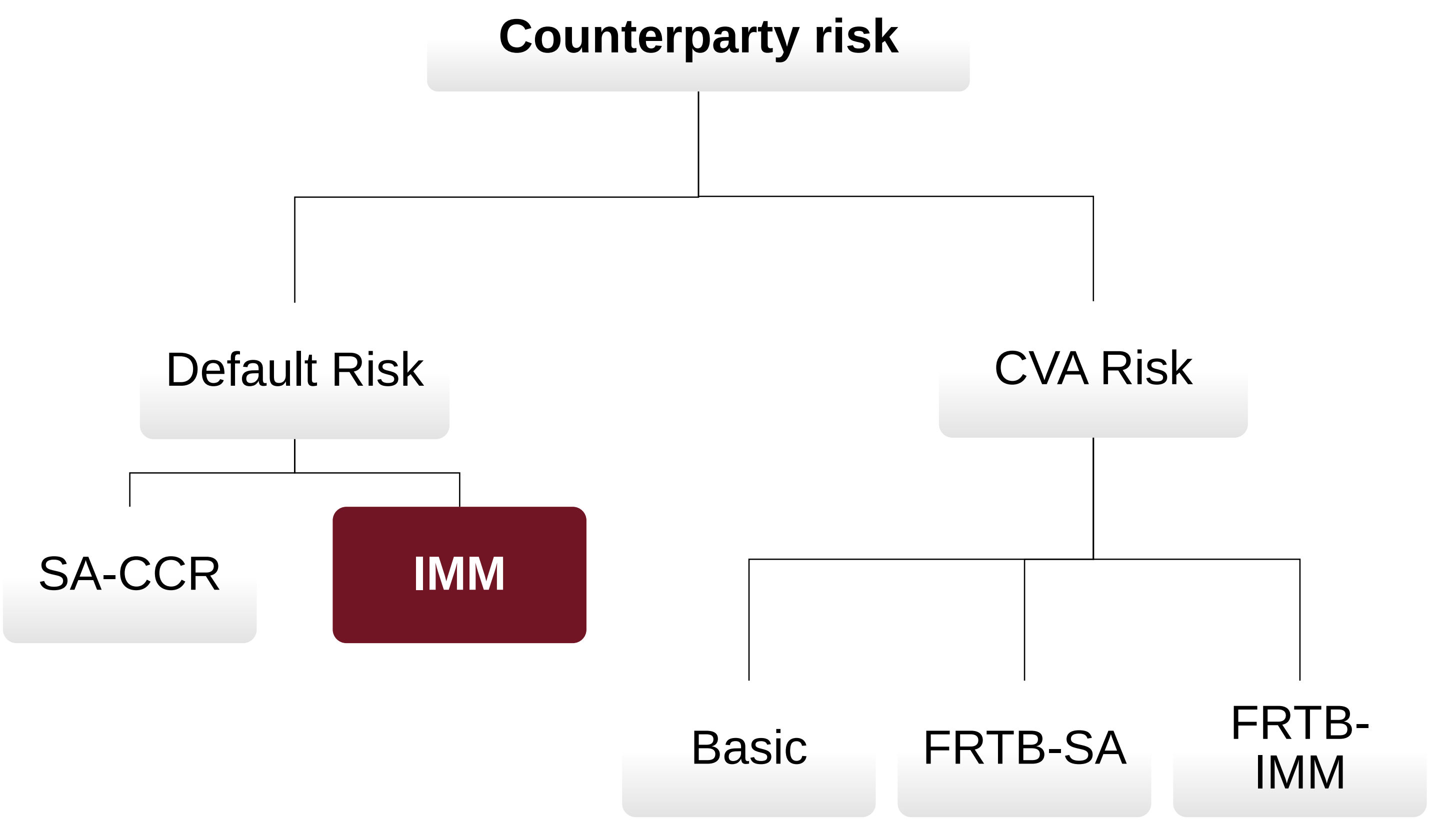


SA-CCR

$$EAD = \alpha(RC + PFE)$$

- α gives a loan equivalent, equals 1.4.
- RC is the positive MtM after the margining addition
- PFE is the product of a multiplier and an asset class based Add-on
- The multiplier is capped at 1 and floored at 5% based on the level of collaterization.
- The Add-on considers the Notional amount of the deal multiplied by a given Supervisory factor based on the average positive exposure of one given instrument (incorporating the annualized volatility).

Basel Methodologies



Internal Model Method

Basel Recommendations:

- Three years historical calibration containing a one-year stress among them.
- The model should specify a forecasting distribution for changes in market value such as interest rate or foreign exchange rate.
- For margined counterparties, the model should also capture the future behavior of the collateral in question. Note that no particular form of model is required.
- Determining the default capital charge should be based on the greater computation using: once the current market data to calibrate the projection models and once a stressed calibration. In both cases the time frame should be three years and in the stressed conditions it should cover a stressed period in between (three years containing a stress among them).

Internal Model Method

- Computation steps:

1. Exposure at Default (EAD):

$$EAD = \alpha \times EEPE$$

2. Effective Expected Positive Exposure (EEPE) relies on internal model to predict counter-party exposures typically simulating underlying market risk factors out to long horizons and revaluating counterparty exposures at future dates along the paths simulated, it is the weighted average of the Effective Expected Exposure (EEE).

$$EEPE = \sum_{k=1}^{\min(1year, maturity)} EEE \quad k \times \Delta k$$

3. The EEE is the increasing function of the Expected Exposure (EE): this amends a more restrictive approach, once an exposure is hit the method does not permit a decrease in the exposure for future dates.

$$EEE_k = \max(EEE_k - 1, EE_k)$$

EE_k being the average exposure at future date k across possible future values of relevant market risk factors.

Our Model suggestion

Using Bloomberg Data:

- USD swap curve, EUR swap curve and the FX spot rate (USD-EUR).
- For each swap curve the observed tenors are 1 month up till 50 years.
- Daily frequency, Historically observed dates: since end of April 2004 until end of April 2007.
- swap curve number of observations: 1536 per tenor (112,128 observations), FX curve: 1565 observations.

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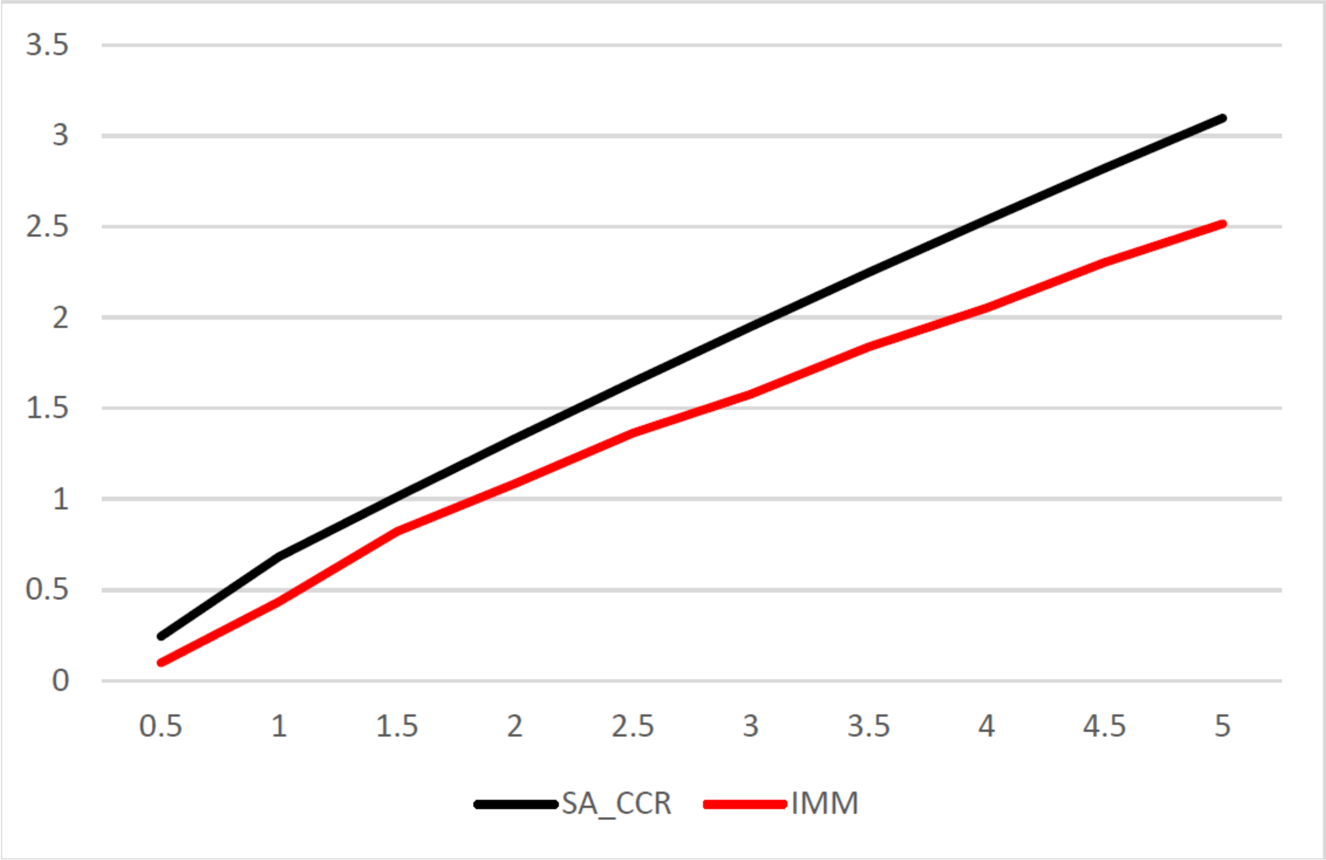
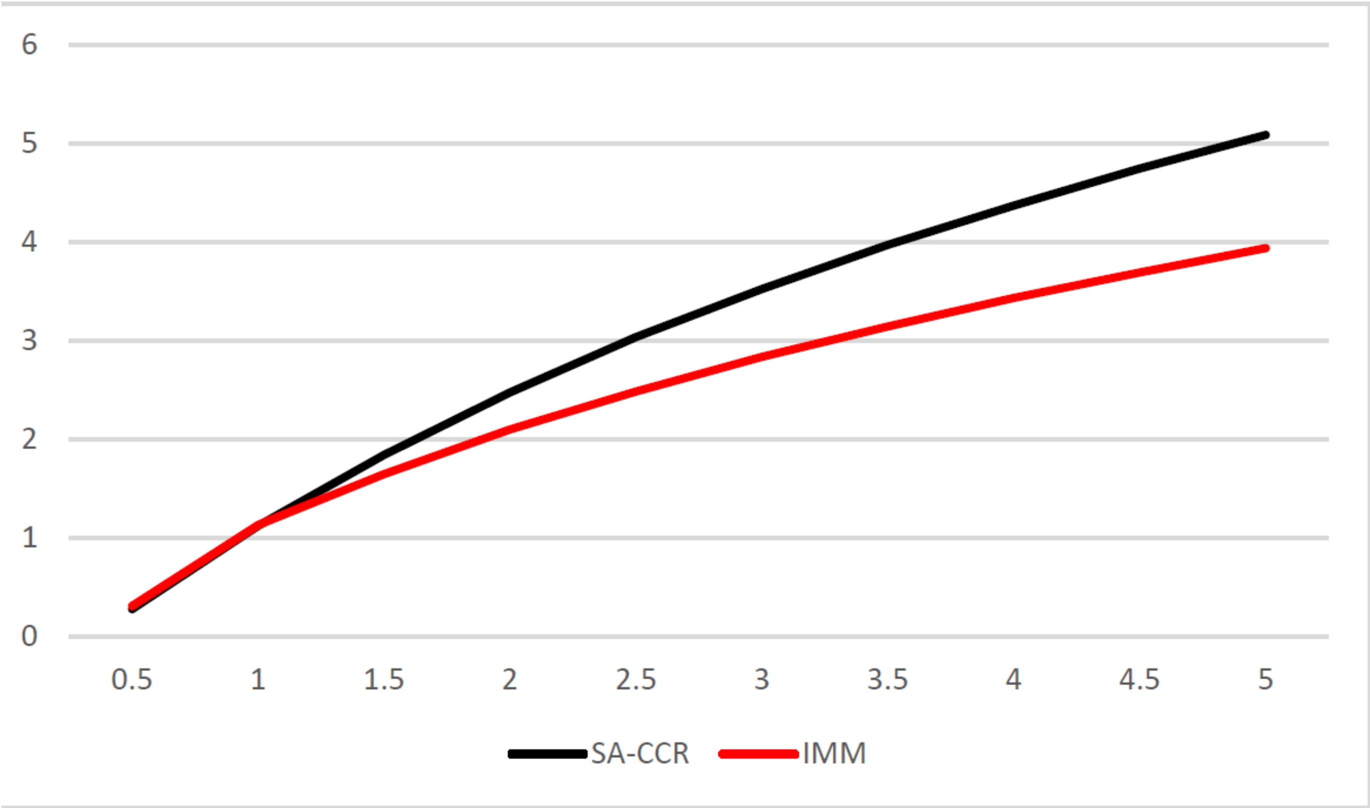
- Calibrating a Vasicek model for each swap curve based on the historical stress (upward).
- Change only the speed of adjustment in a way converging the Vasicek projection to the FOMC and experts Bloomberg estimations.
  For the FX instruments, project the FX rates based on historically calibrated GARCH(1,1) model.
- Forecast the instruments values for 100,000 simulations and get the expected exposures.

Comparing results: Interest Rate Swap



Comparing results: FX vanilla call



CVA computation

- Basel amends one formula for the CVA capital requirement (for unhedged exposures):

$$K_{Basic\_CVA} = 1.5 \times K_{spread} = 1.5 \sqrt{\left(\rho \sum_c S_c\right)^2 + (1-\rho^2) \sum_c S_c^2}$$

Where

$S_C = \frac{RW_b}{\alpha} \sum_{NS \in c} M_{NS} \, EAD_{NS}$

α=1.4

$RW = 10.2\ \%$

M the effective maturity,

$\mathrm{E}AD$ the exposure at default and

ρ is taken as the idiosyncratic correlation of counterparts.

Default vs CVA

	CVA Capital Charge	CCR Capital Charge	CVA/CCR
One IRS	35.33%	64.67%	54.64%
One FX vanilla call	35.33%	64.67%	54.64%
Portfolio 1	57.74%	42.26%	136.61%
Portfolio 2	55.87%	44.13%	126.58%

P.s: Note that the paper discussing the final version of the CVA capital charge computation is a consultative document and the weights might change based on the QIS.

Hedging

Netting

Margining

Both

Comparative results

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SA-CCR

	Portfolio 1	Portfolio 2
Nothing	100%	100%
Netting	79%	84%
Margin	23%	20%
Both	15%	14%

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IMM

	Portfolio 1	Portfolio 2
Nothing	100%	100%
Netting	93%	84%
Margin	18%	20%
Both	14%	19%

Comparative results

SA-CCR

	Portfolio 1	Portfolio 2
Nothing	100%	100%
Netting	79%	84%
Margin	23%	20%
Both	15%	14%

IMM

	Portfolio 1	Portfolio 2
Nothing	100%	100%
Netting	93%	84%
Margin	18%	20%
Both	14%	19%

IMM/SA-CCR

IMM/SA-CCR	Portfolio 1	Portfolio 2
Nothing	77%	90%
Netting	91%	90%
Margin	61%	91%
Both	68%	118%

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- However, the hedging is more recognized under Basel methodology: our work showed a tendency to encourage banks into hedging techniques especially margin agreements through reducing the capital charge amended when such practices are in place.
- CVA risk added a large weight to the capital requirement as expected, however its computation depends highly on the risk type that we are handling and the effective maturity of the portfolios.

Bibliography

- Basel Committee on Banking Supervision (BCBS), 2014a, The Standardized Approach for Measuring Counterparty Credit Risk Exposures.
- Basel Committee on Banking Supervision (BCBS), 2015a, Review of the Credit Valuation Adjustment Risk Framework, Consultative Document.
- FOMC, 2015, Federal Open Market Committee Economic projections for December 2015, www.federalreserve.gov.
- GREGORY J. , 2015, Linking FRTB with CVA capital, WBS FRTB Conference, London.
- ISDA, 2013, International Swaps and Derivatives Association, Standard Initial Margin Model for Non-Cleared Derivatives.

Thank you for your attention.