Calculating Counterparty Exposures for CVA

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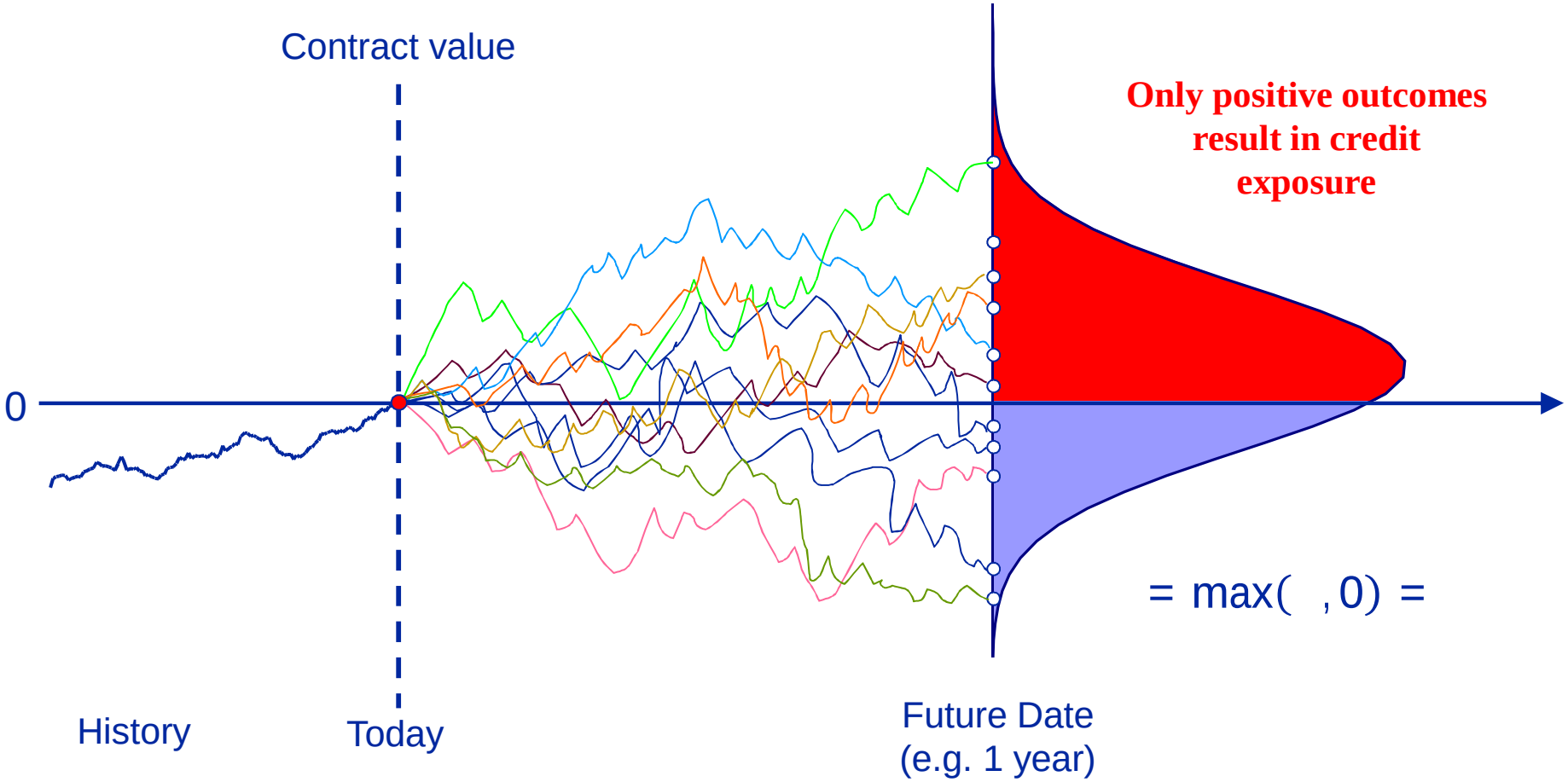
Credit Exposure and Definitions

Methodology for Quantifying Exposure

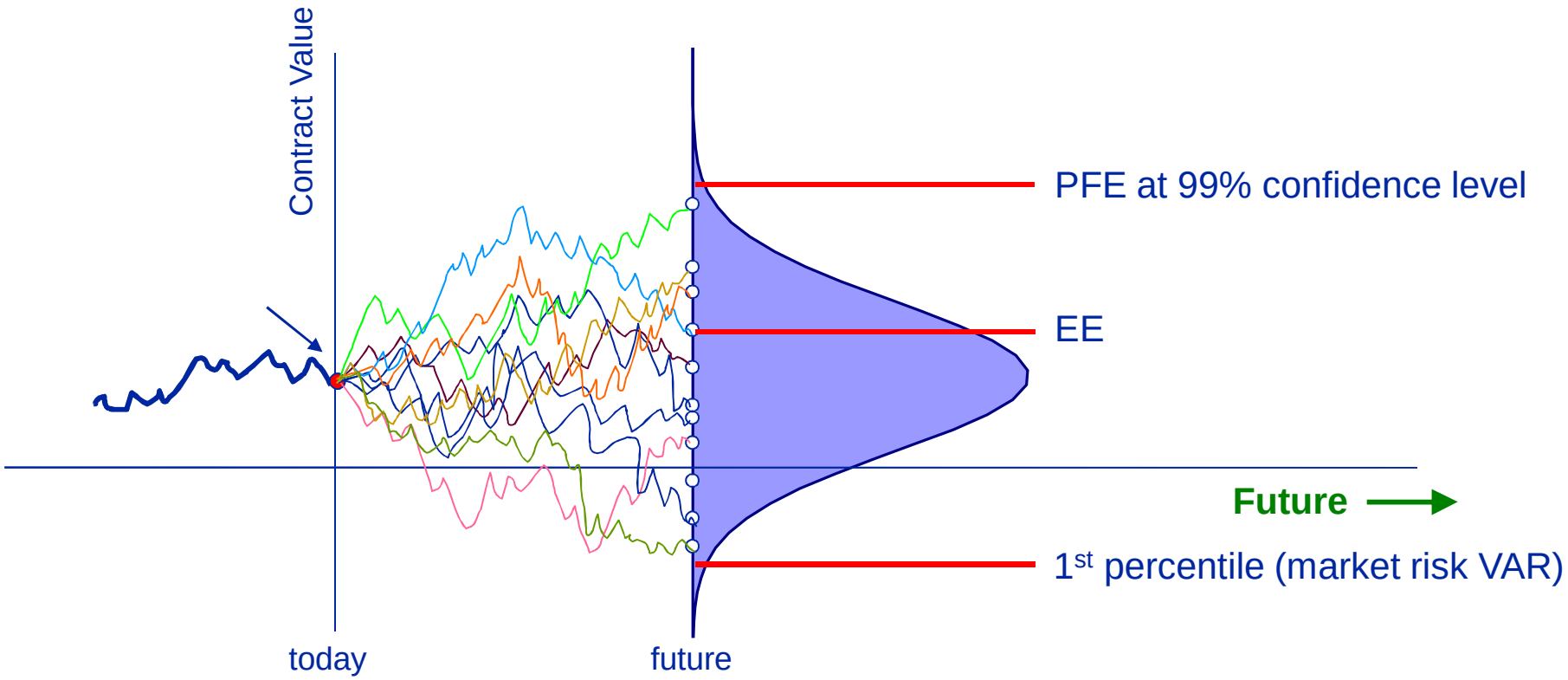
The Impact of Netting and Collateral

Example Results

Potential Future Exposure



Potential Future Exposure (PFE) and Expected Exposure (EE)



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Exposure Simulation Methodology (I)

1. Factor choice
   - Choose a model for each risk factor
   - The model must provide a reasonable distribution of the possible risks of the transactions and thus account for a large fraction of the future plausible scenarios - risk manager view – PFE mainly AND/OR
   - Model must calibrate to (match) today's market variables (for example, yield curves, FX rates, commodity prices) – trader view – CVA mainly
2. Scenario generation
   - Each scenario is a joint realisation of risk factors at various points in time
   - It must be reasonably easy to simulate risk factors within a Monte Carlo simulation
   - Risk factors need also to be correlated

Exposure Simulation Methodology (II)

3. Revaluation
   - Revalue individual positions at each point in time in the future
   - E.g. 250 counterparties, average 40 trades with each counterparty, 100 simulation steps, 10,000 scenarios - total number of instrument revaluations will be 10 billion
4. Aggregation
   - After revaluation, there will be a matrix of values with respect to scenario and time point. Now aggregate these values up to the netting set (or counterparty) level.
5. Post processing
   - Treatment of collateral (discussed later)
   - Go through exposure and account for collateral according to thresholds etc
6. Extraction
   - Extraction of statistics such as EE, EPE and PFE

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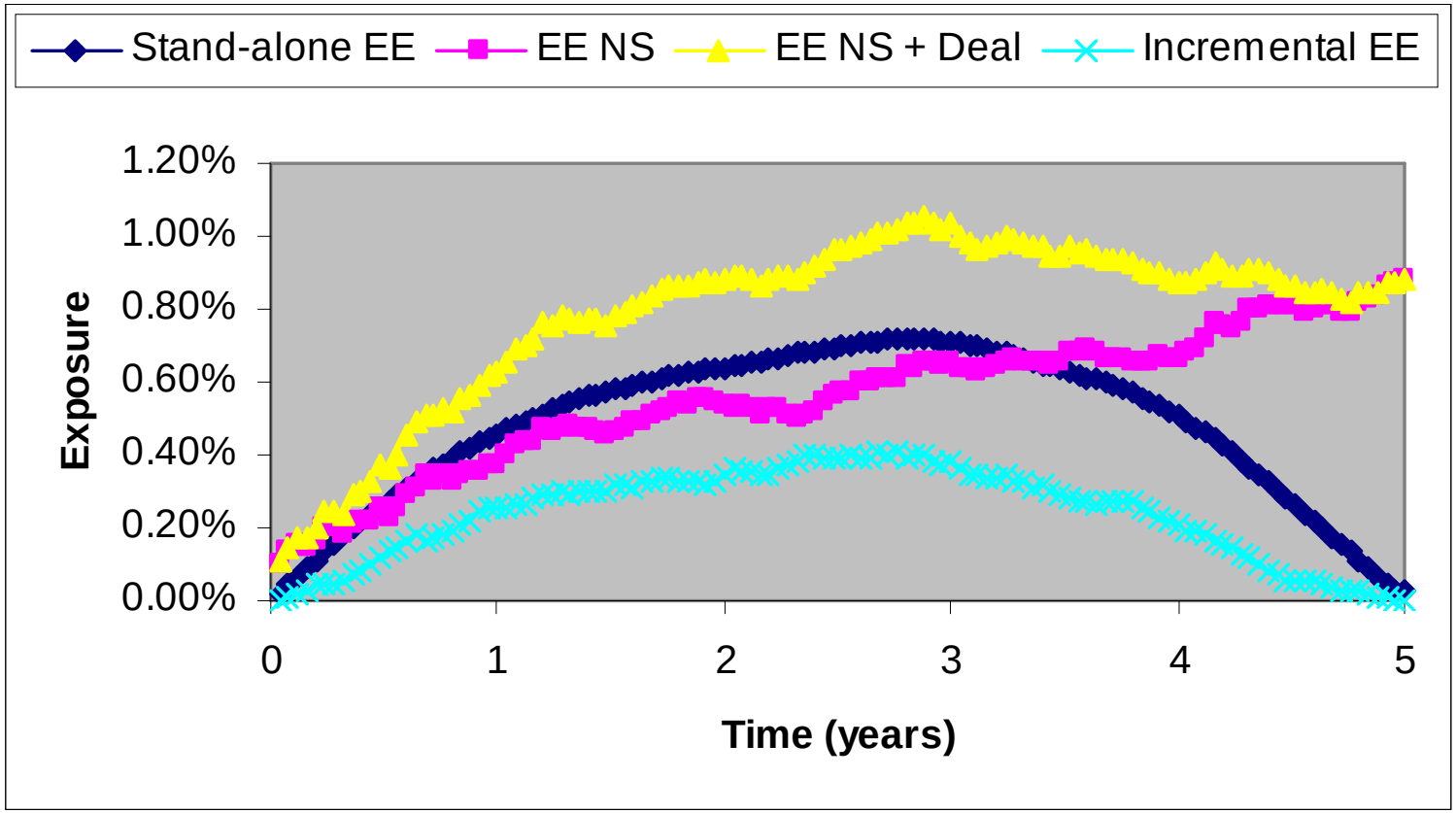
Calculating Incremental Exposure

- Simply the exposure after adding a new deal minus the exposure before adding the new deal
- Used for many years in pre-trade approvals with credit lines

$$\underbrace{EE_i'(u)}_{\text{Incremental expected exposure for trade } i} = \underbrace{EE_{NS+i}(u)}_{\text{Expected exposure of netting set with new trade } i} - \underbrace{EE_{NS}(u)}_{\text{Expected exposure of netting set before new trade}}$$

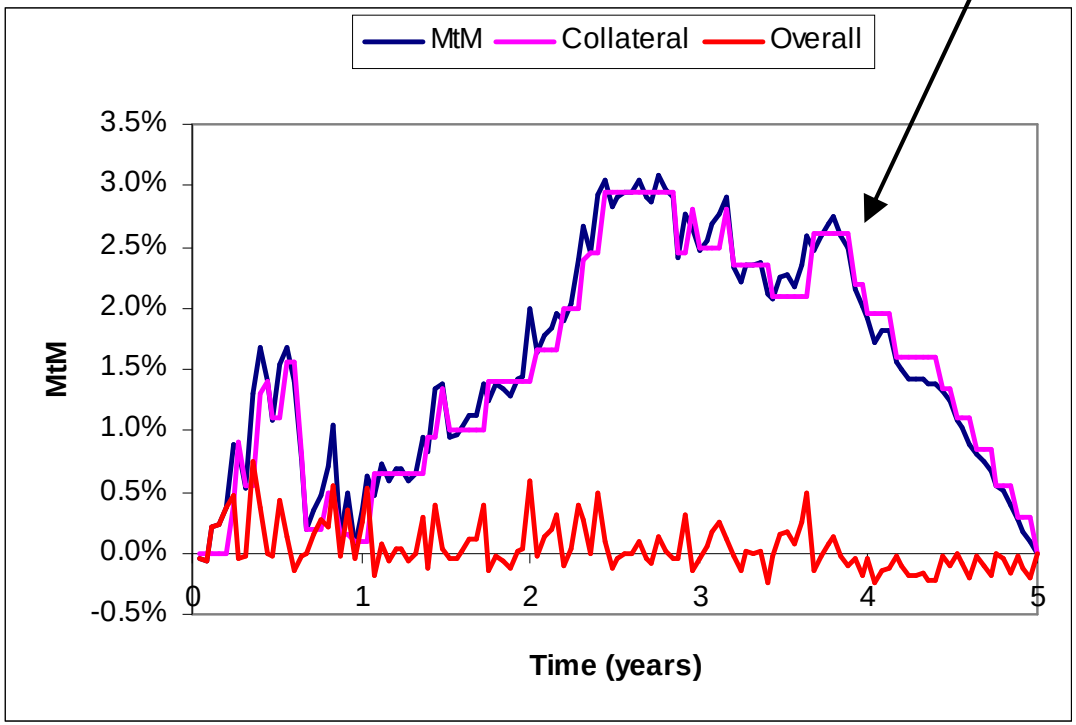
Incremental Expected Exposure



Impact of Collateral

	Party A	Party B
Independent Amount	0.00%	0.00%
Threshold	0.00%	0.00%
Minimum Transfer Amount	0.25%	0.25%
Rounding	0.05%	0.05%

10-day remargin period assumed



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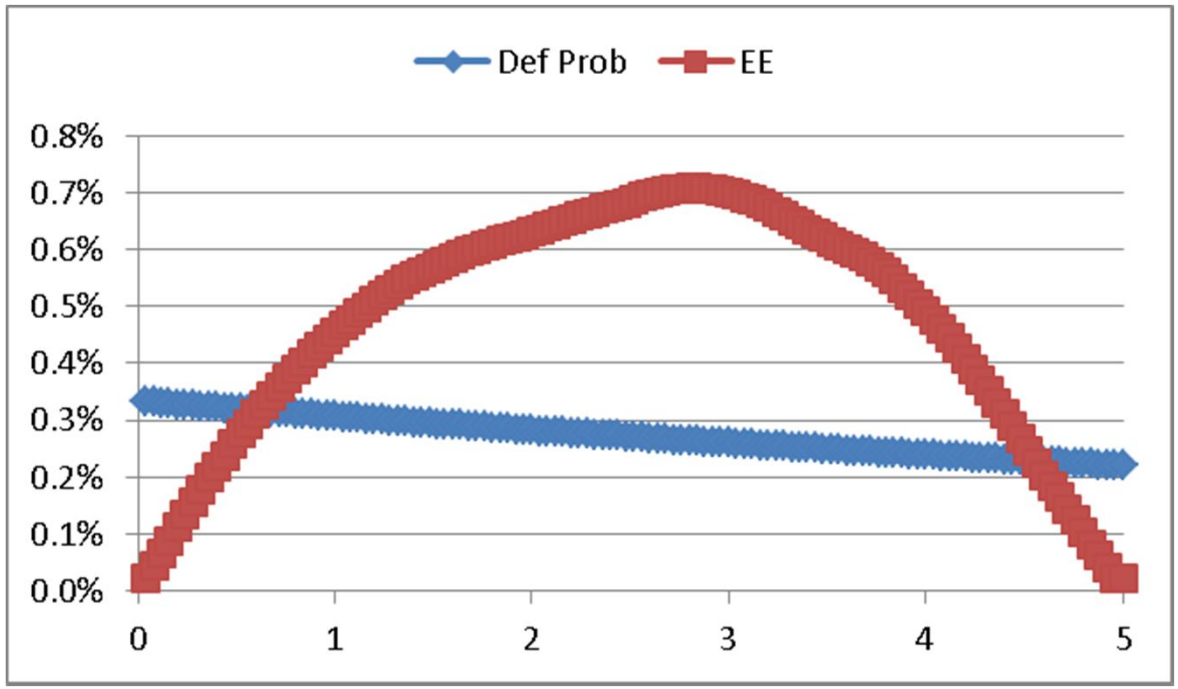
Base Case - IRS

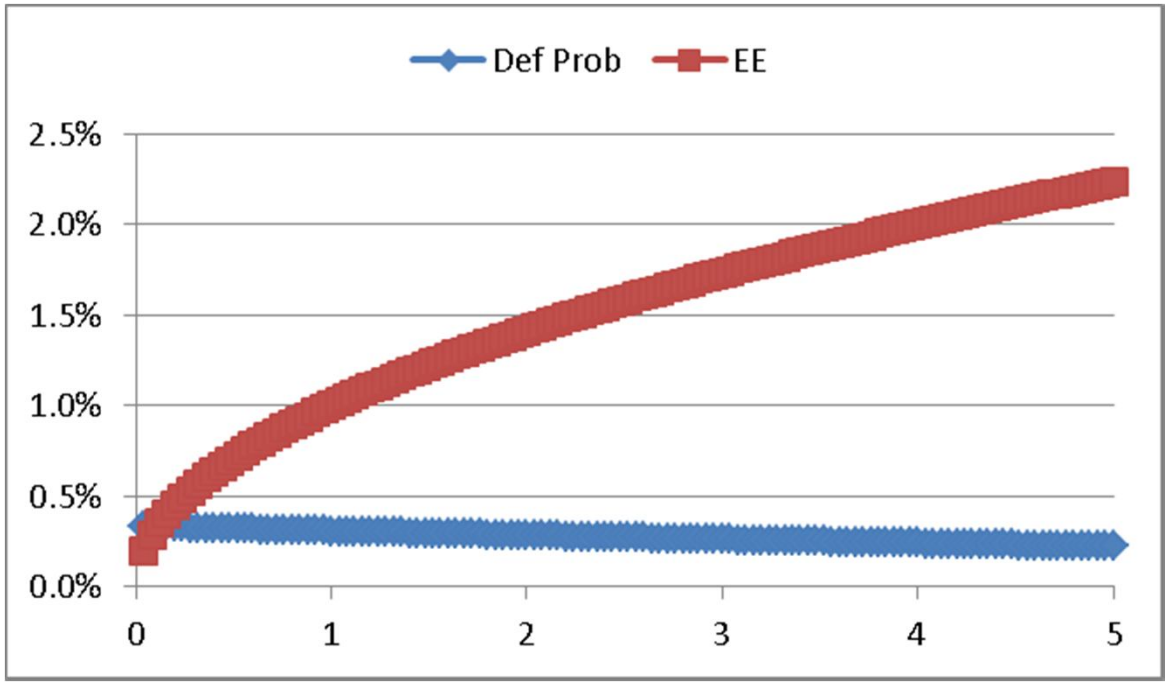
- 5-year interest rate swap, 500 bps counterparty



- Simple calculation – 0.47% $\times$ 500 = 2.36 bps
- Accurate calculation – 2.34 bps or 0.085% of notional up-front

Base Case - CCY

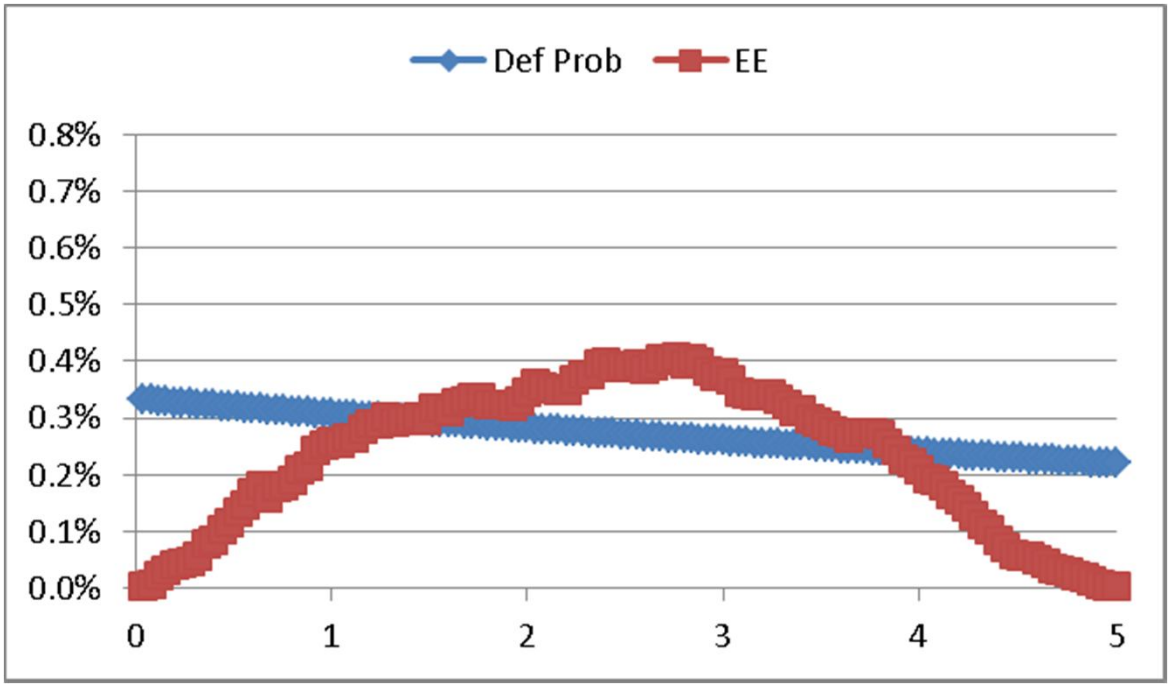
- 5-year cross-currency swap, 500 bps counterparty



- Simple calculation – 1.50% $\times$ 500 = 7.50 bps
- Accurate calculation – 6.99 bps or 0.255% of notional up-front

Incremental CVA

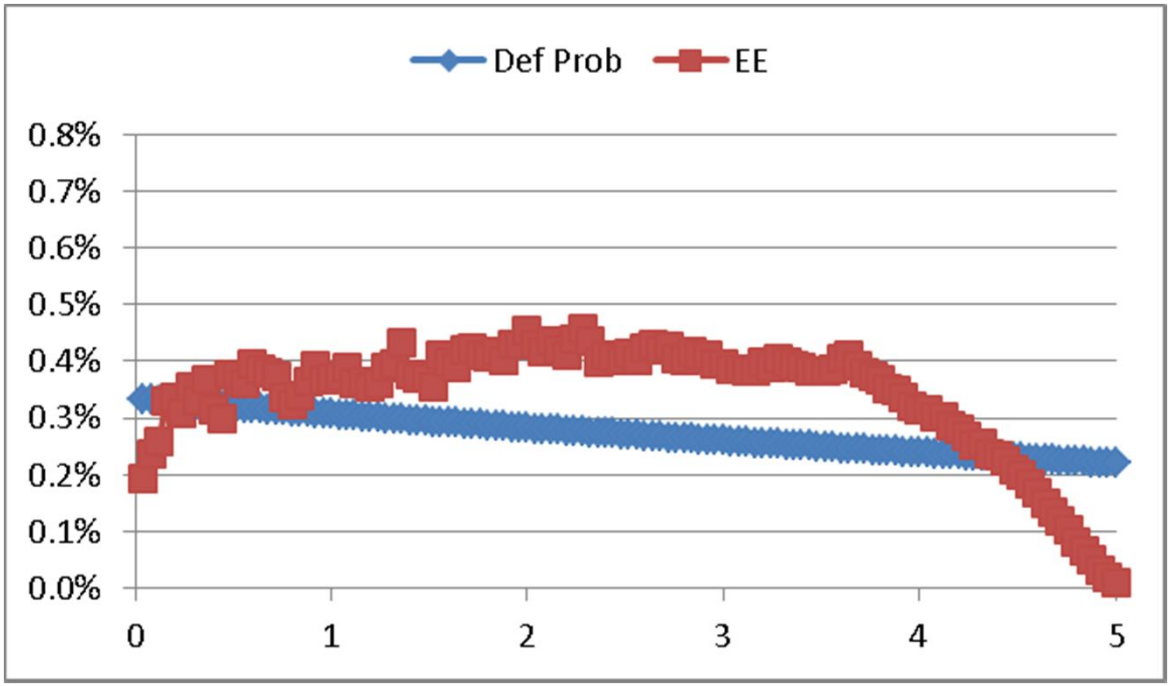
- Base case IRS, existing trade is a CCY swap



- Simple calculation – 0.24% $\times$ 500 = 1.19 bps
- Accurate calculation – 1.19 bps or 0.043% of notional up-front

CSA Counterparty

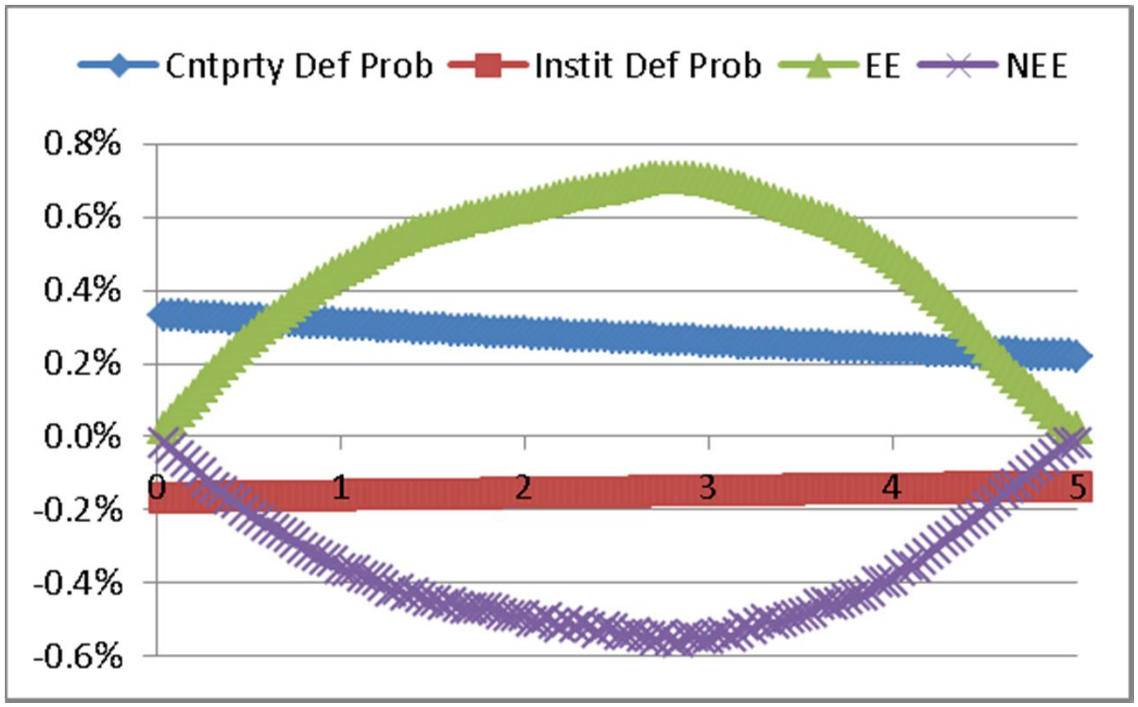
- Base case IRS, CSA with threshold



- Simple calculation – 0.34% $\times$ 500 = 1.71 bps
- Accurate calculation – 1.75 bps or 0.064% of notional up-front

DVA

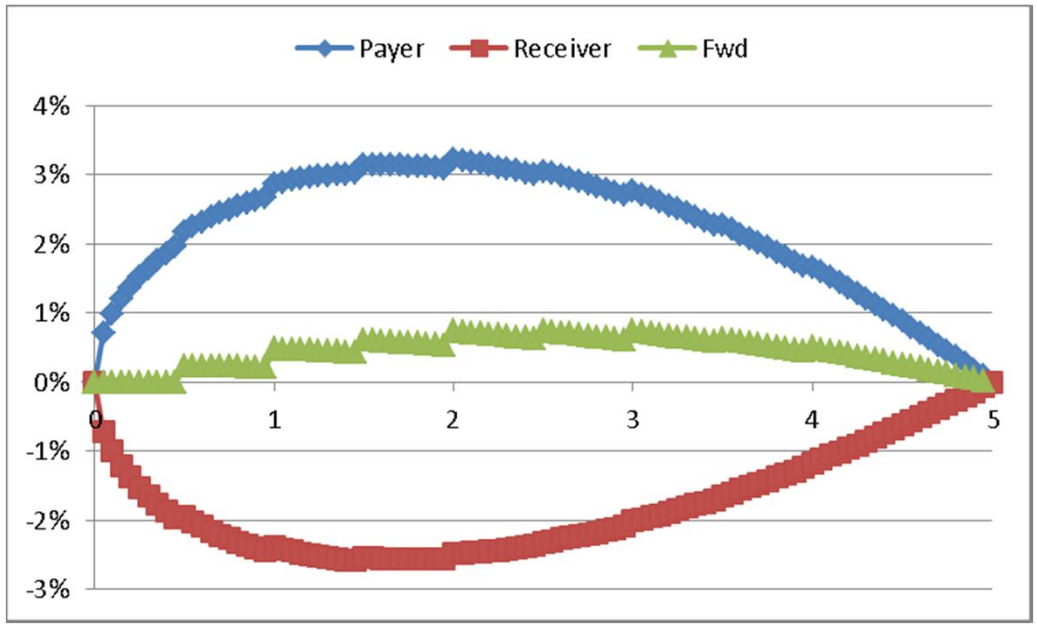
- Base case IRS with DVA (own credit at 250 bps)



- Simple calculation – 0.47% $\times$ 500 – 0.37% $\times$ 250 = 1.44 bps
- Accurate calculation – 1.37 bps or 0.047% of notional up-front

Funding Costs – no CSA

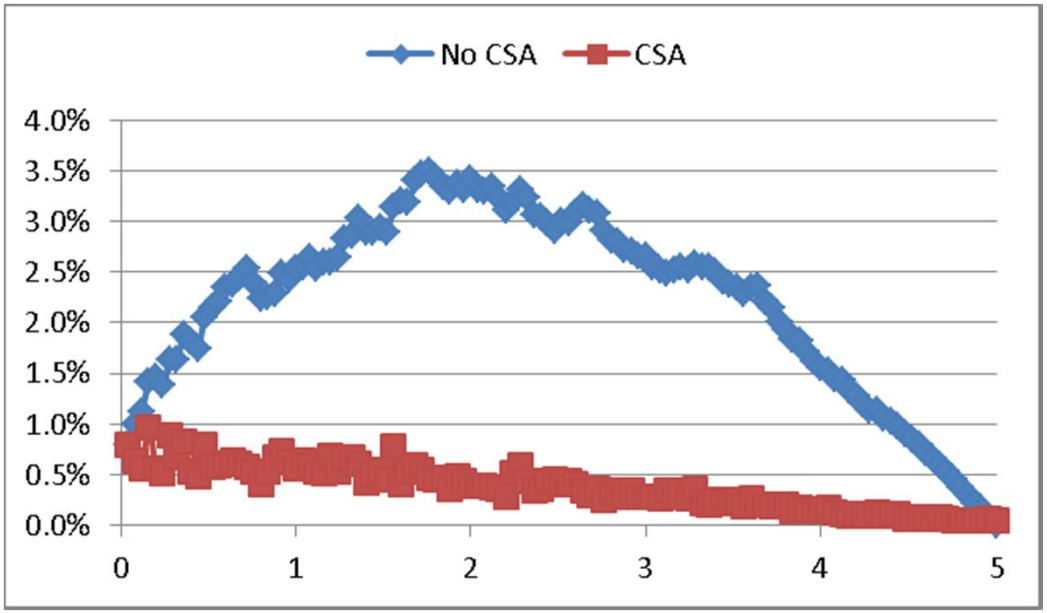
- Different IRS, assume risk-free cashflows priced on OIS curve
- Assume our funding spread is 250 bps (symmetric)



- Calculation – 2.22% × 250 – 1.78% × 250 = 1.09 bps = 0.44% × 250
- CVA with a 500 bps counterparty (less DVA) = 6.63 bps

Funding Costs – CSA no Threshold

- Assume risk-free cashflows priced on OIS curve, cash collateral
- 10-day remargin period (10-days to receive, post collateral immediately)



- Calculation – 0.37% $\times$ 250 = 0.93 bps
- CVA with a 500 bps counterparty = 1.85 bps (11.1 bps without CSA)