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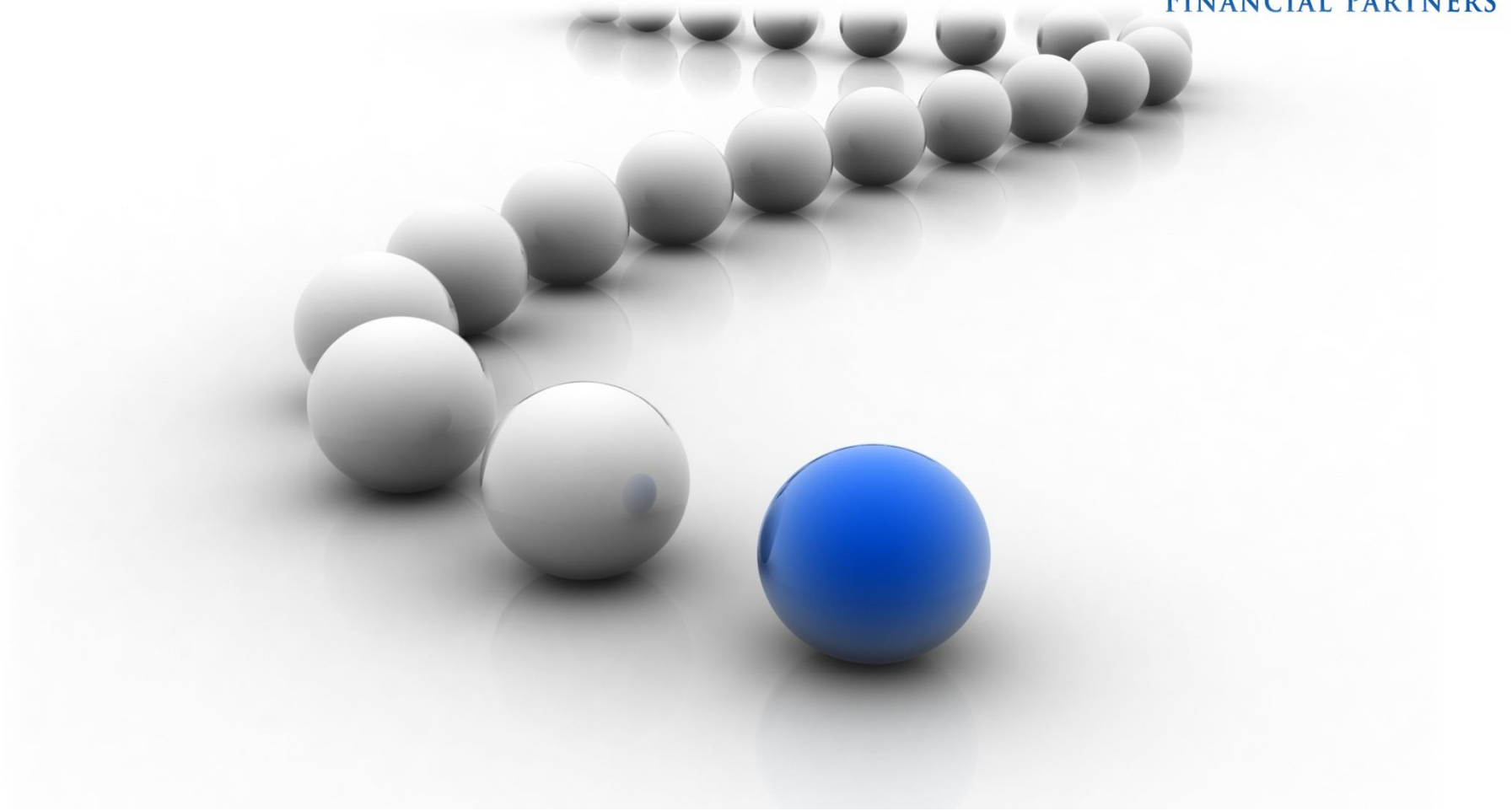

Wrong-Way Risk, Collateral and Central Clearing

Jon Gregory, Partner

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Wrong-Way Risk, Collateral and Central Clearing

i) CVA for collateralised counterparties

ii) General and specific wrong-way risk

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Calculating Exposure with Collateral

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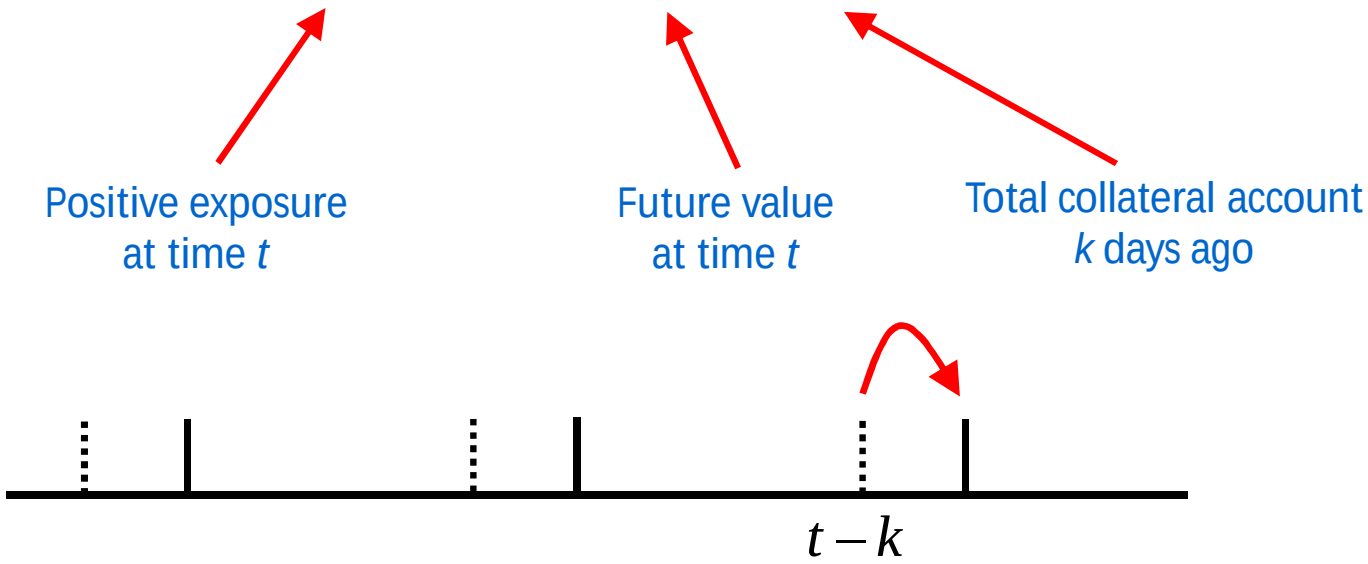
$$E_t = max(V_t - C_{t-k}, 0)$$



- **Obvious problems**
  - Imperfect collateral parameters (can't ask for enough)
  - Time to receive collateral
  - Volatility of collateral
  - Need to post collateral ourselves

Margin Period of Risk

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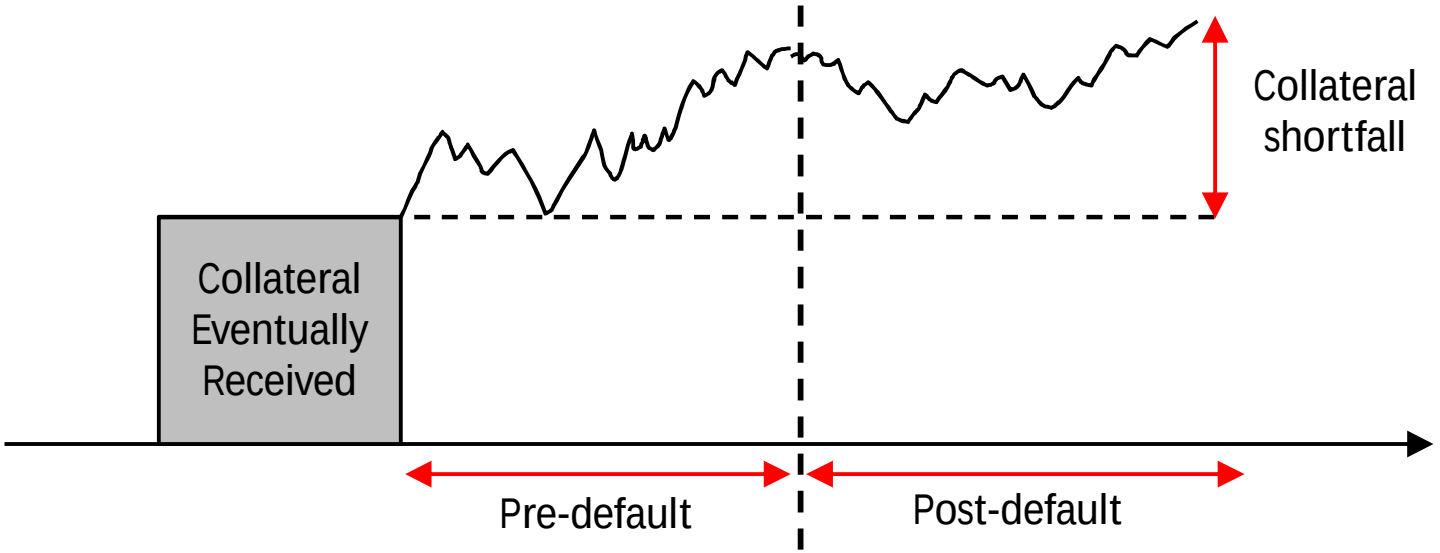
- **Margin period of risk is the actual time delay when receiving collateral**
  - Pre-default (posting frequency, operational delays, disputes, settlement, grace period)
  - Post-default (closeout, liquidation and rehedging / replacing trades)



- **Must assume that collateral will always arrive late**
  - For example, Basel II defines 10 business days for OTC derivatives

Receiving Collateral Reduces Risk

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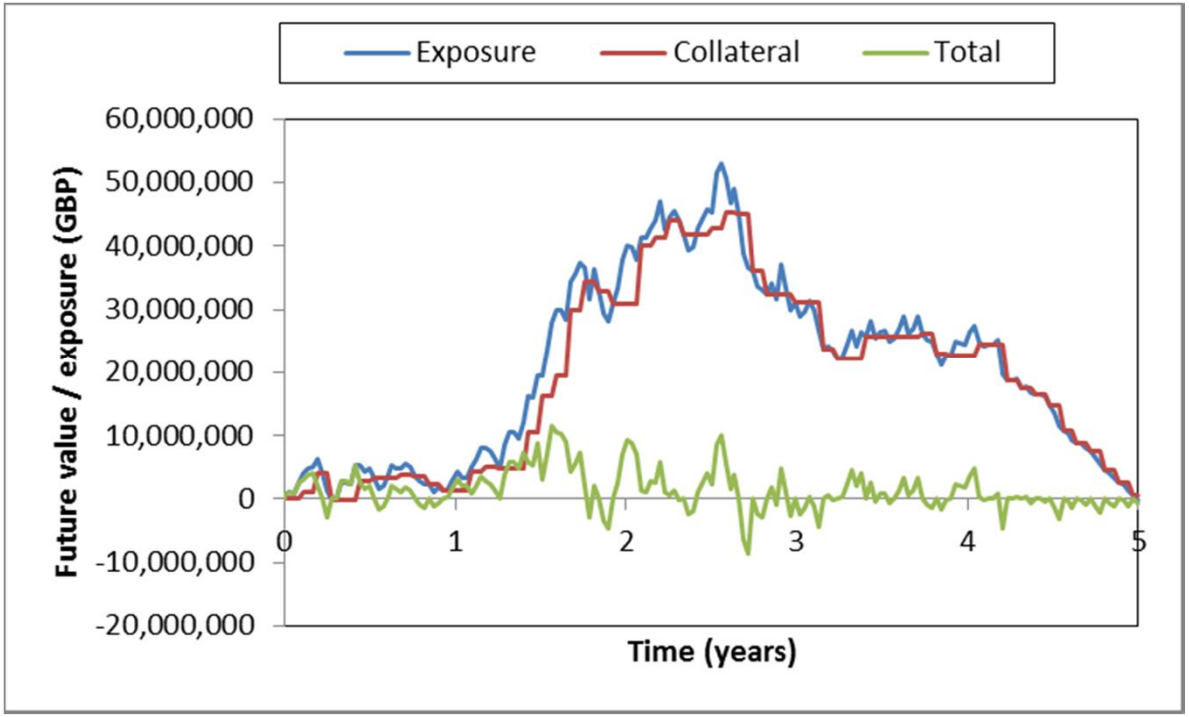
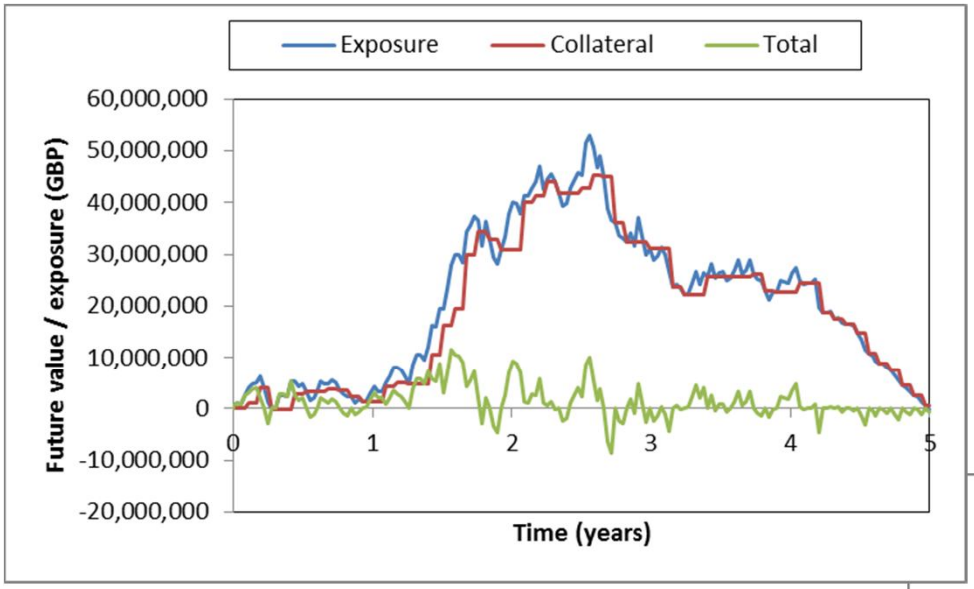
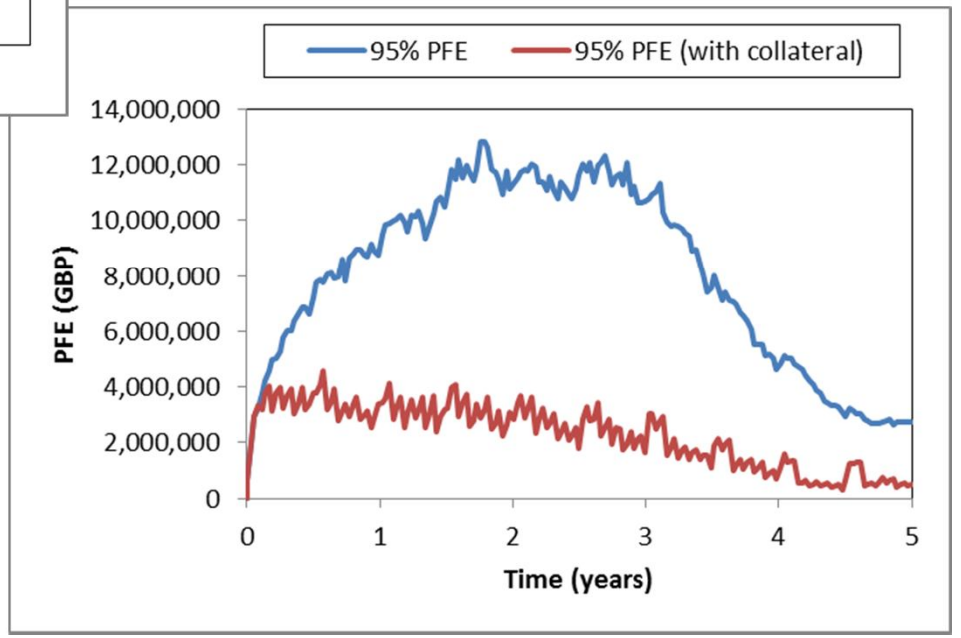
- **Residual risk is due to**
  - Margin period of risk (20-days in this example as can be required under Basel III)
  - Non-perfect collateral parameters (minimum transfer amount)
  - (In this case we assume zero threshold and cash collateral)



Example 1





Impact of Margin Period of Risk on CVA

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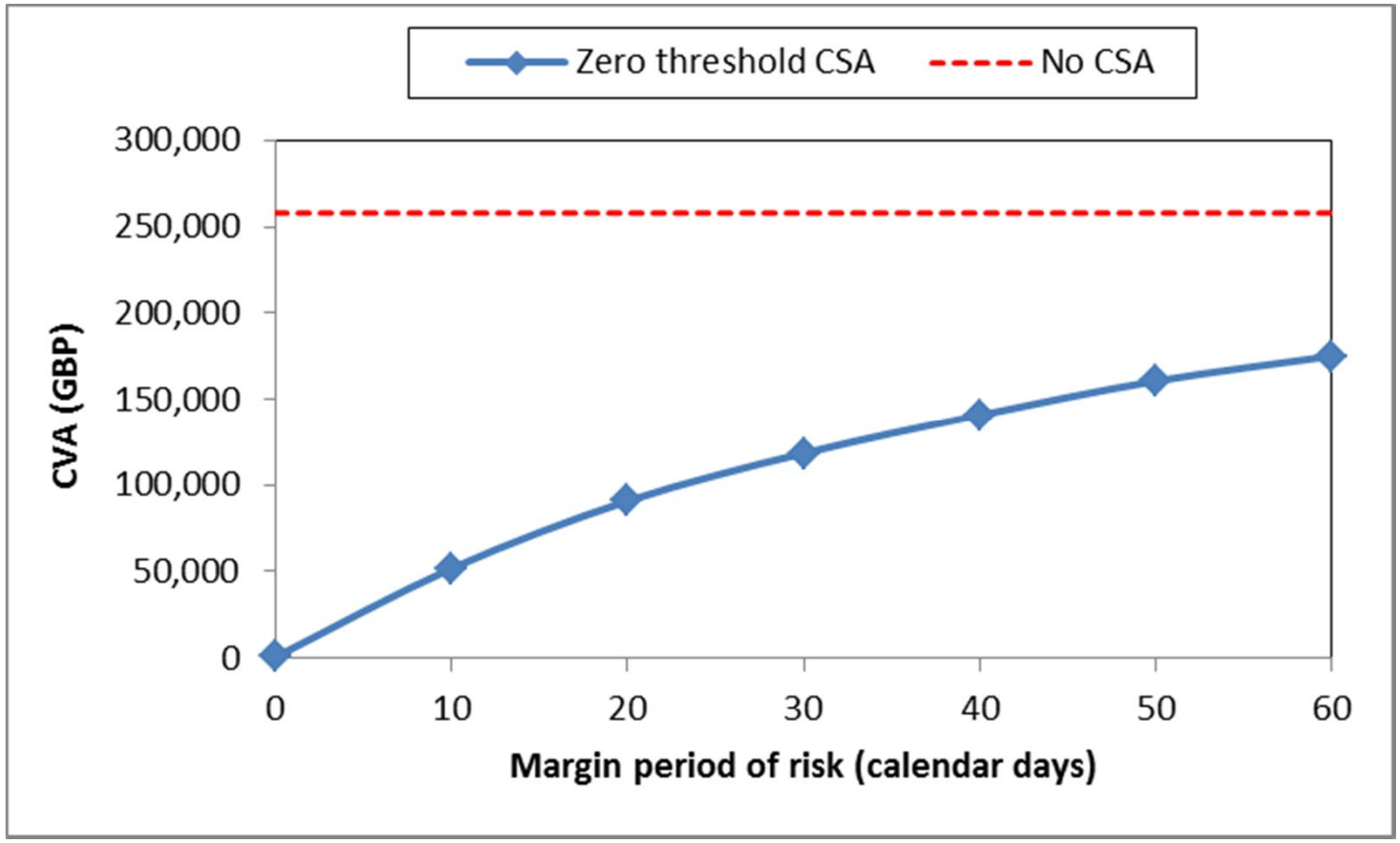
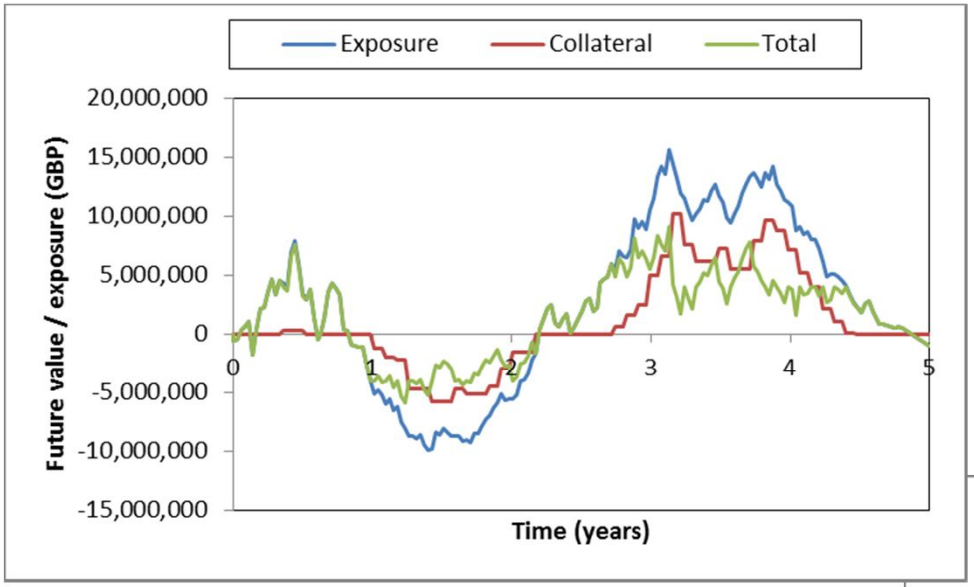
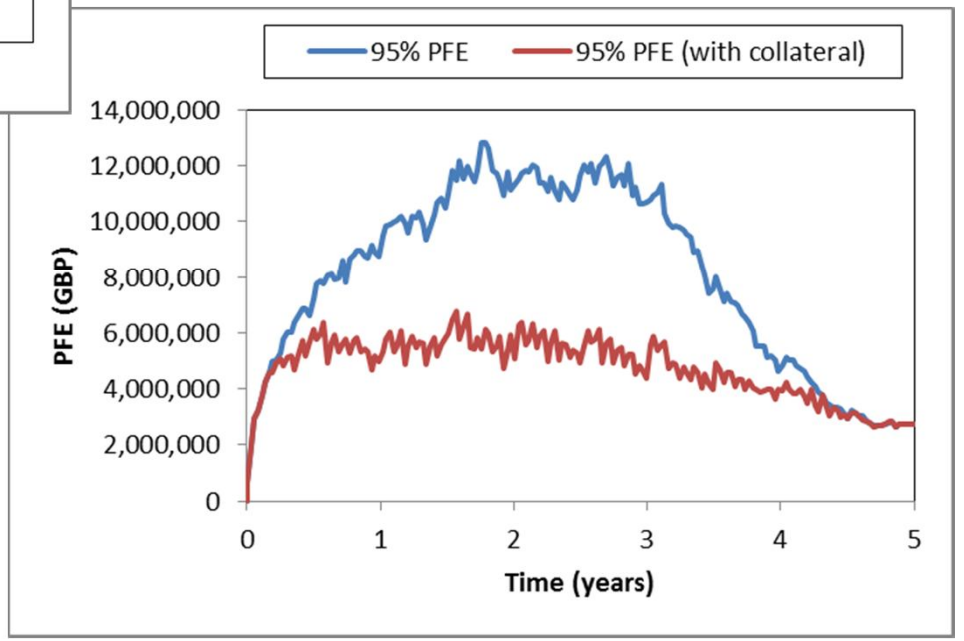
- **Base case IRS, CSA with zero threshold**

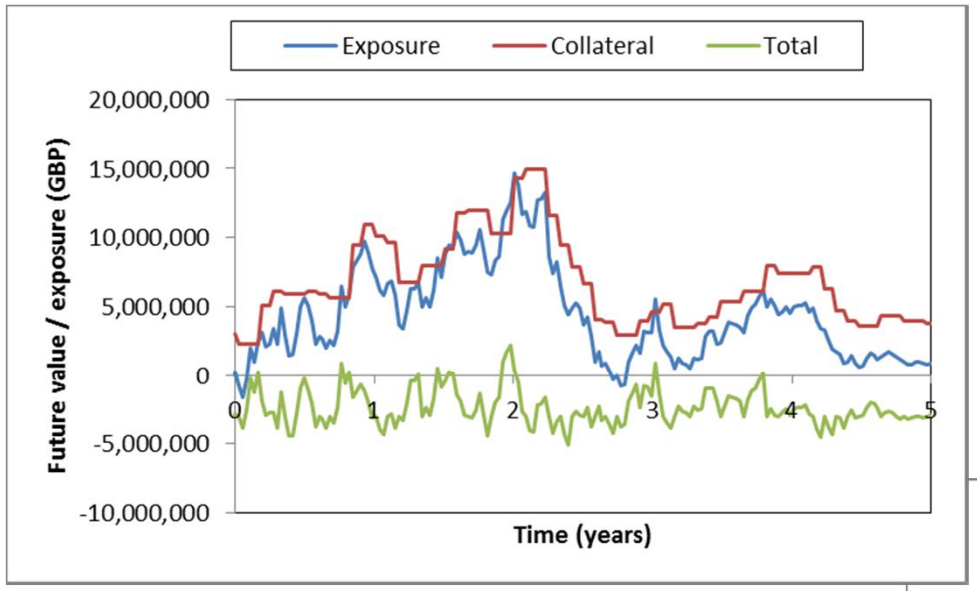


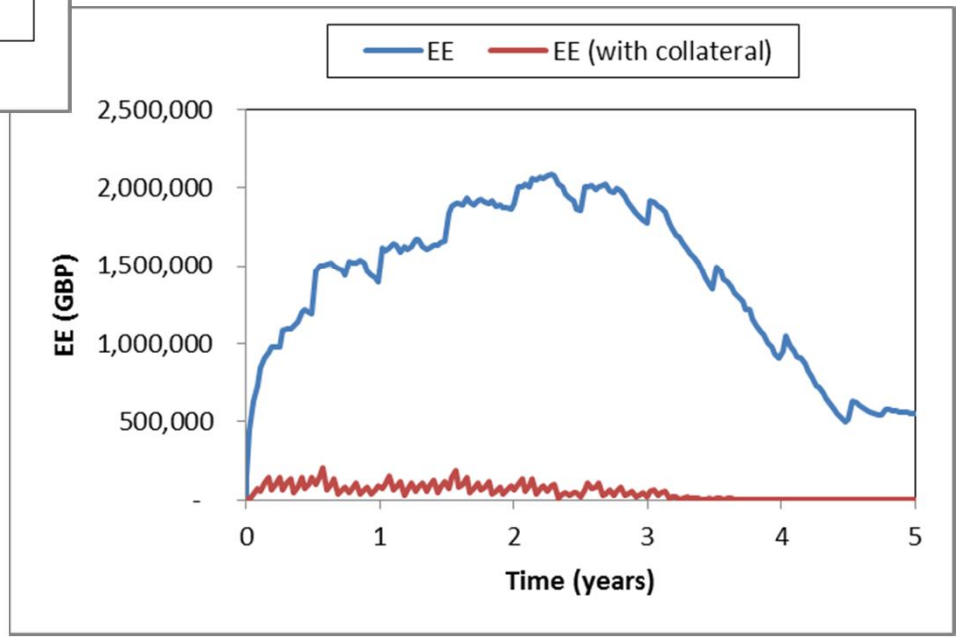
Example 2





Example 3





CVA with Independent Amount /Threshold

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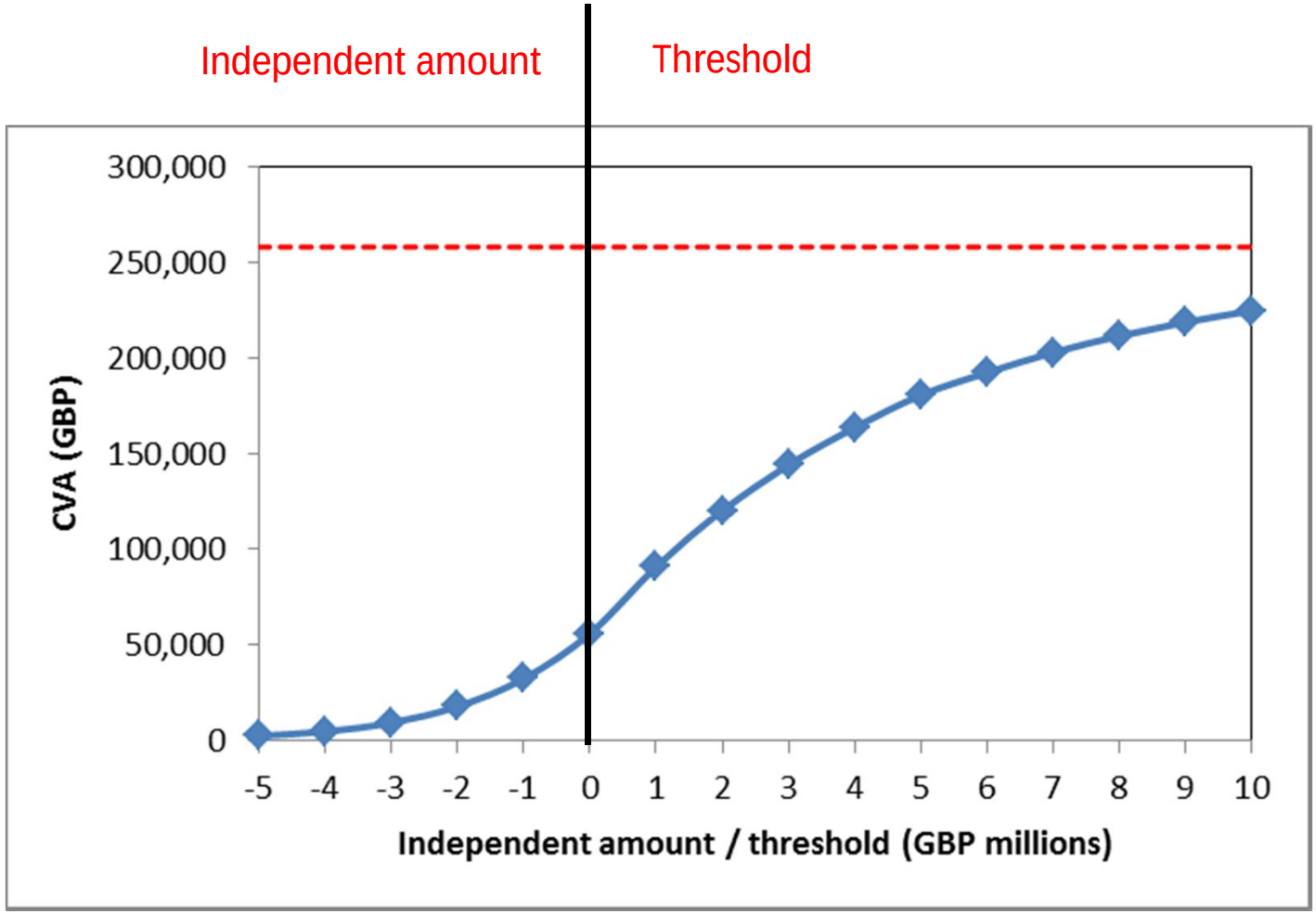

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Wrong-Way Risk, Collateral and Central Clearing

i) CVA for collateralised counterparties

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Wrong-Way Risk

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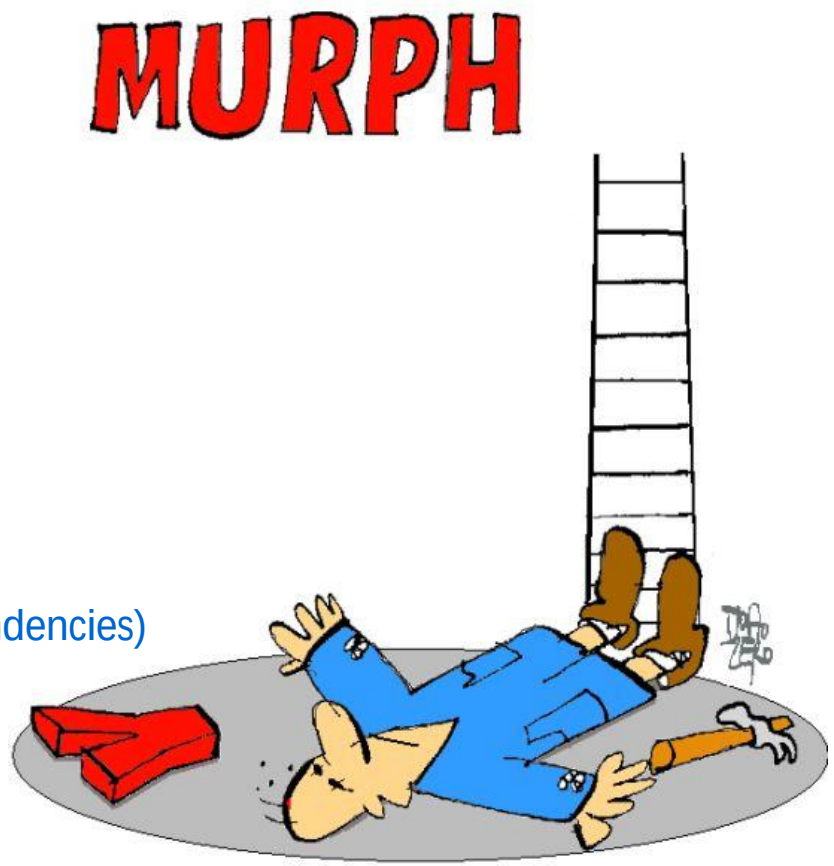
- **It is typical to assume independence between**
  - Default probability of counterparty
  - Exposure at default
- **But in reality this is often wrong**
  - Buying out of the money put options
  - Buying CDS protection
  - FX products involving local currencies
- **Types of wrong-way risk**
  - General (driven by macroeconomic co-dependencies)
  - Specific (driven structurally due to counterparty and trade type)



Empirical Evidence of Wrong-Way Risk

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- **Interest rate products**
  - Duffee [1996] shows a clustering of corporate defaults during low interest rates periods
  - But institutions may be more likely to default when interest rates increase significantly?
  - Note : correlation and dependency are not the same thing
- **Currency products**
  - Levy and Levin [1999] show a devaluation of currencies linked to sovereign default
  - The devaluation is most severe for high credit quality entities
  - Loss in Asian crisis of 1997 (e.g. Thai Baht US dollar cross currency swap with a Thai bank)
- **Credit derivatives**
  - Very clear relationship between exposure (credit spreads) and counterparty default

Rating	Devaluation
AAA	83%
AA	83%
A	78%
BBB	73%
BB	59%
B	38%
CCC	38%

Source : JP Morgan 1999

Conditional Expected Exposure

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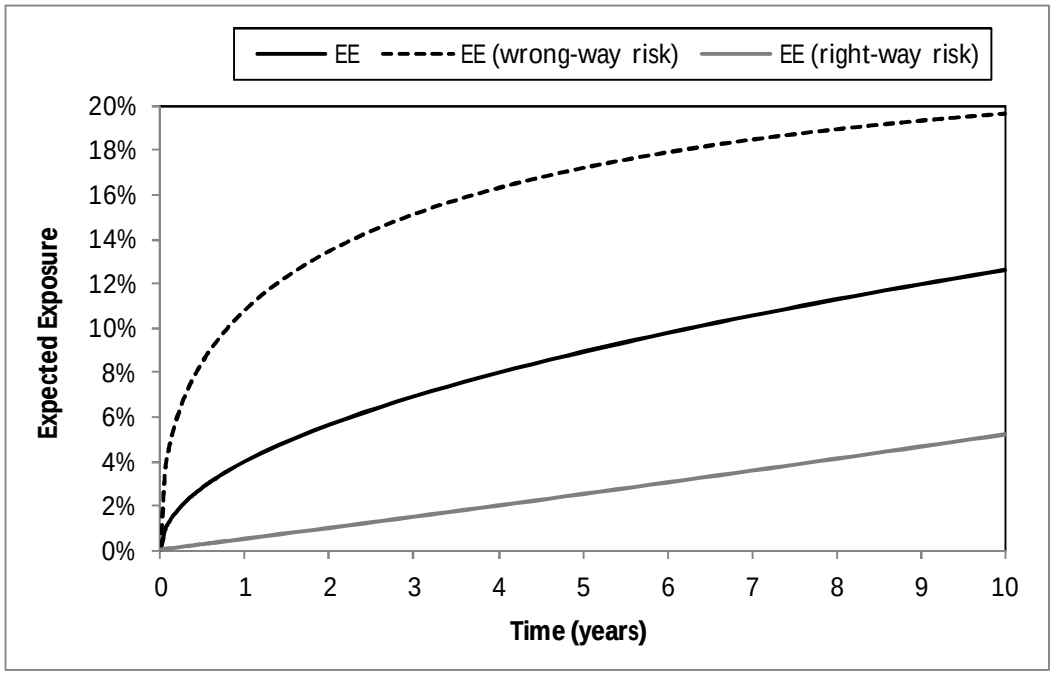
- **One way to interpret wrong way risk is to look at the unconditional default probability and the conditional exposure**

$$CVA(t) = LGD \int_t^T EE(u) dPD_C(u)$$

Exposure conditional on default



Interest Rate Swap

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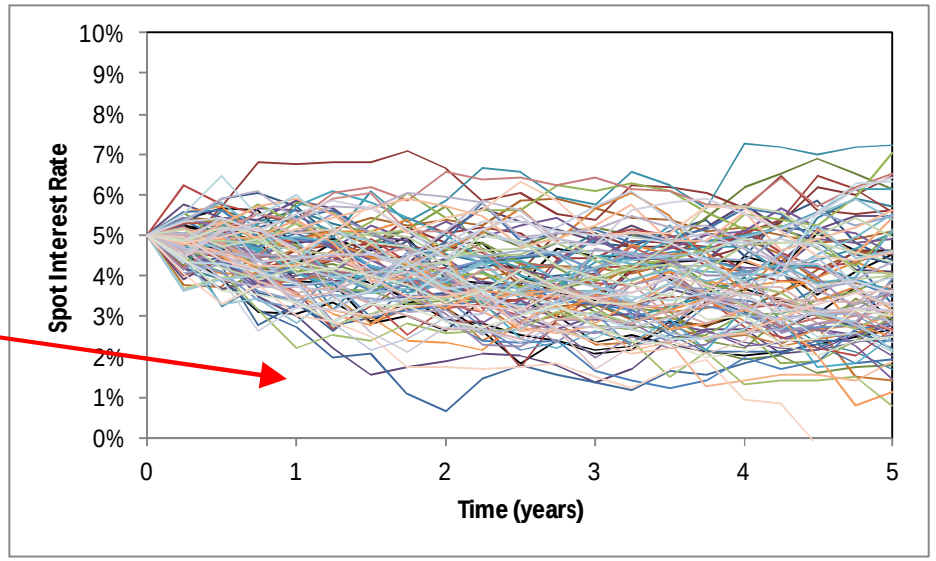
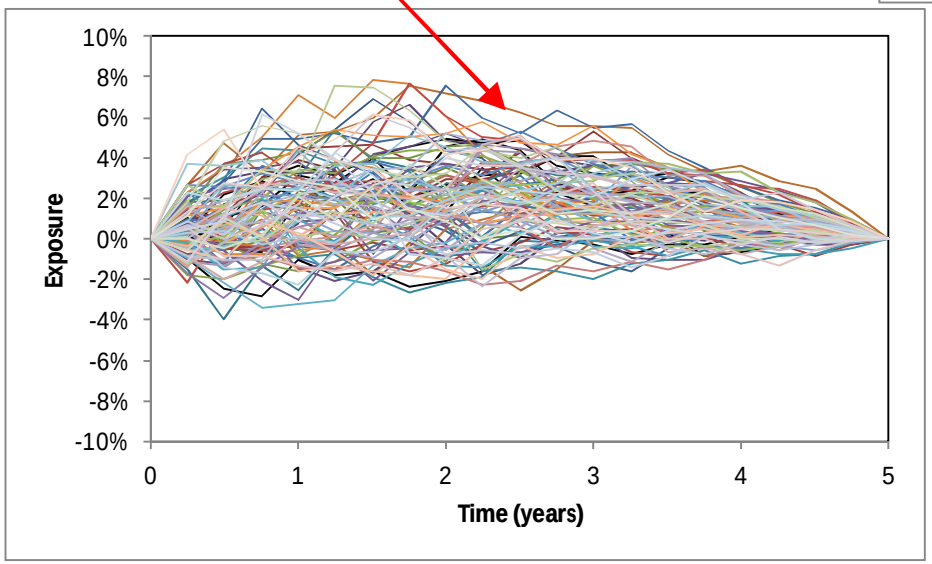
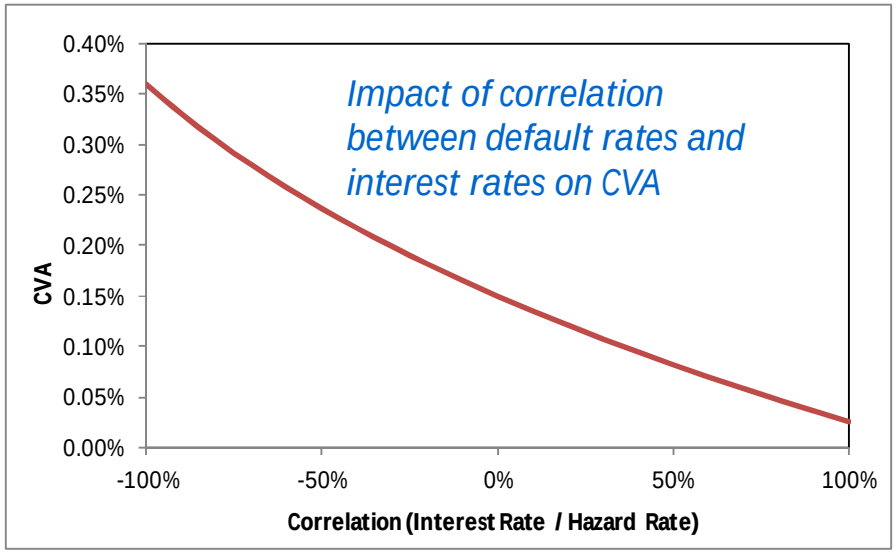
- **Negative correlation between default rate and IR**
  - Conditionally on default interest rates paths tend to decrease
  - Receiver swap exposure is higher and vice versa







FX Devaluation Approach

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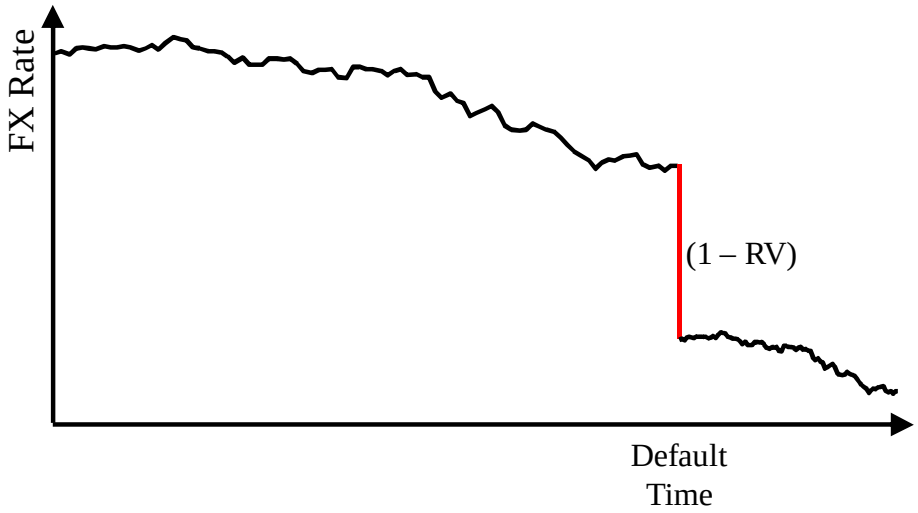
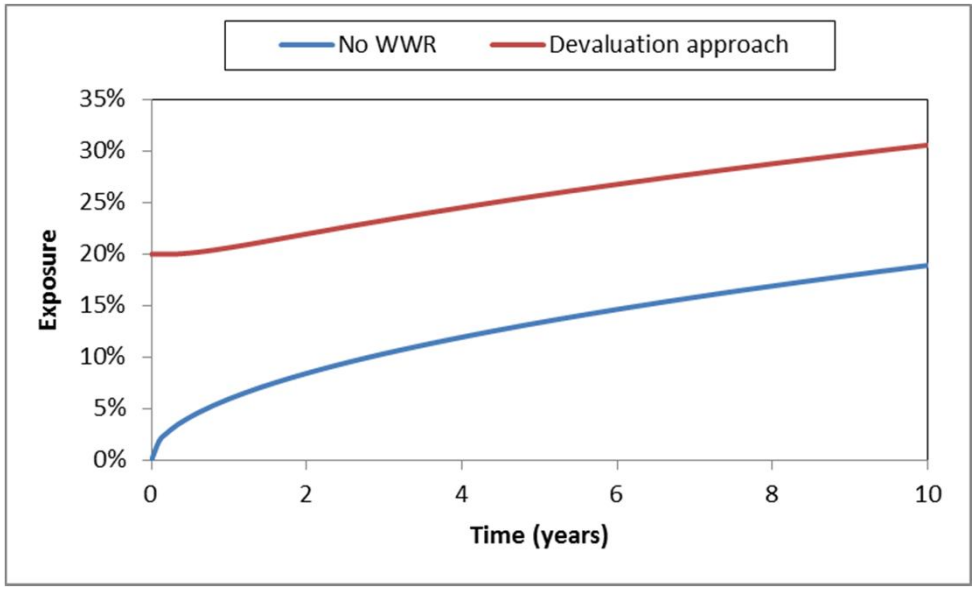
- **FX wrong way risk**
  - Devaluation of currency linked to sovereign default
  - CDS market can only be explained via a jump effect



Italy CDS Market, May 2011

Maturity	USD	EUR
1Y	50	35
2Y	73	57
3Y	96	63
4Y	118	78
5Y	131	91
7Y	137	97
10Y	146	103

Implied RVs in June 2010 : Greece (91%), Italy (83%), Spain (80%) and Germany (75%)



CDS Counterparty Risk Example

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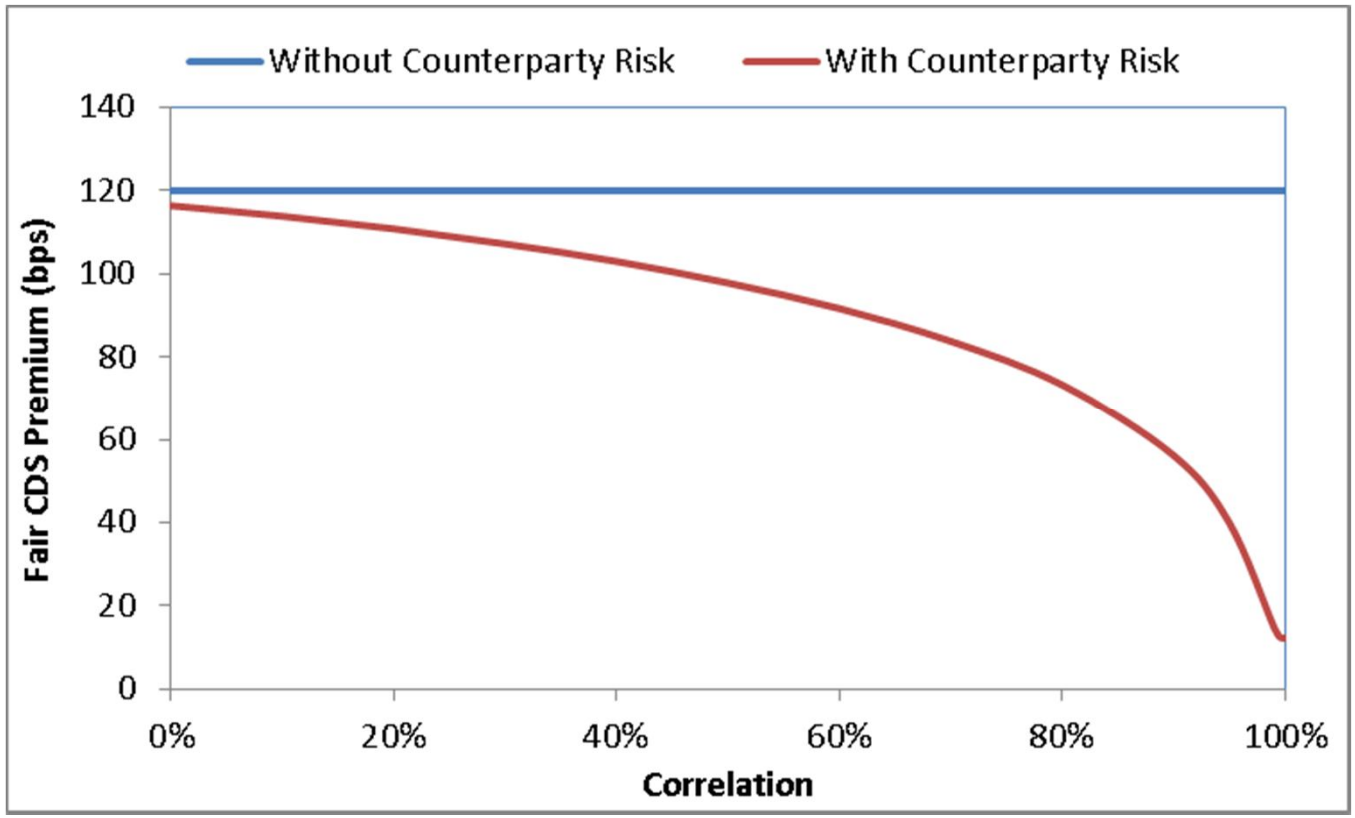
- **Bad example, counterparty at 240 bps, reference at 120 bps with recovery rate at 10% (Lehman recovery)**



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Wrong-Way Risk and Collateral

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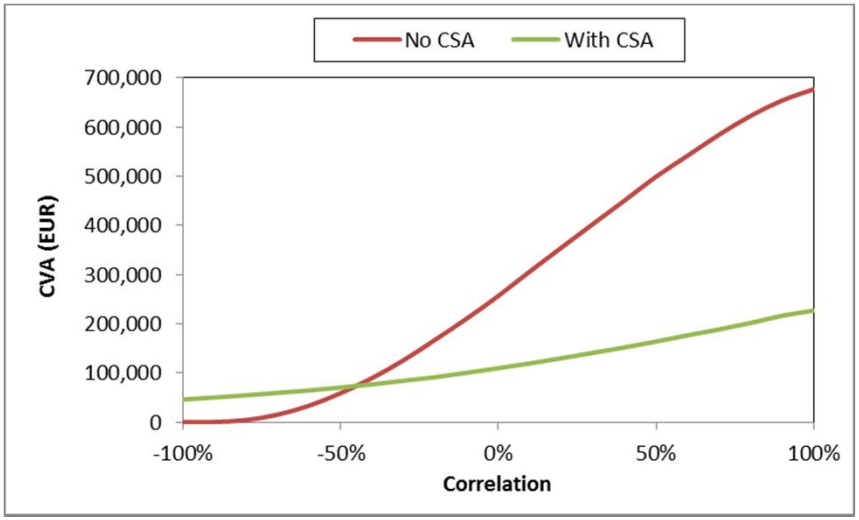
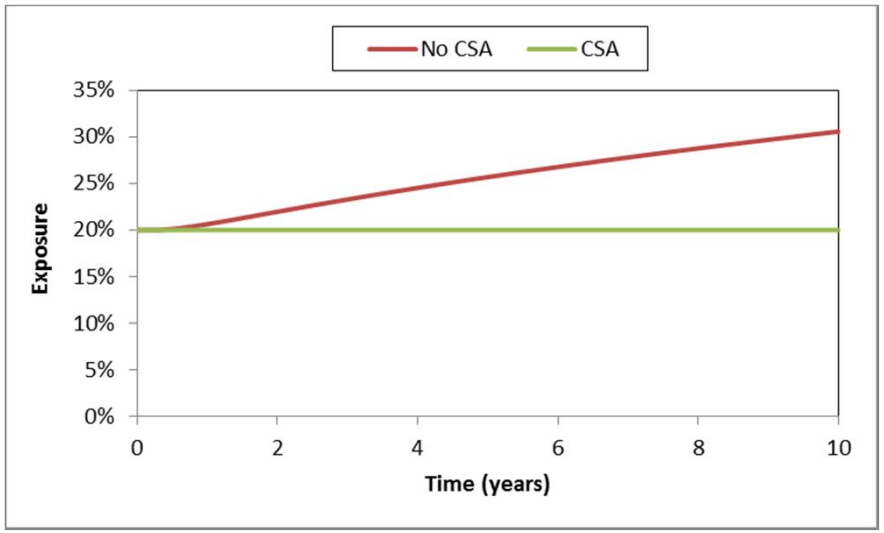
- **Correlation approach for IRS**
  - Collateral works well because it is a continuous model



- **Devaluation approach for FX**
  - Works badly as cannot take collateral against jump



So we need to know how quickly default occurs and/or exposure jumps at default

Collateral didn't help much in case of buying Lehman CDS protection

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Central Clearing Overview

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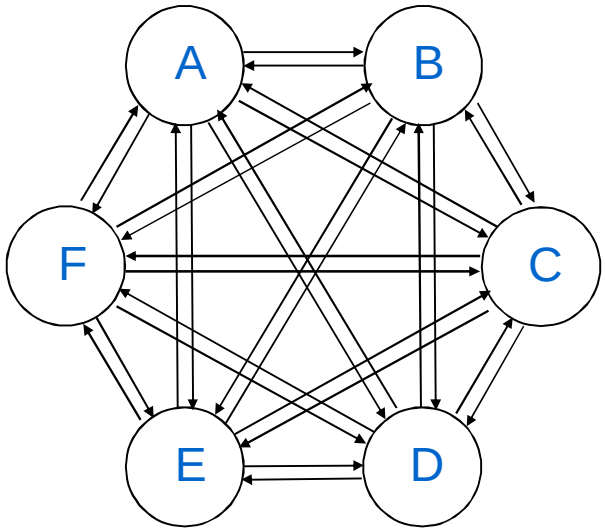
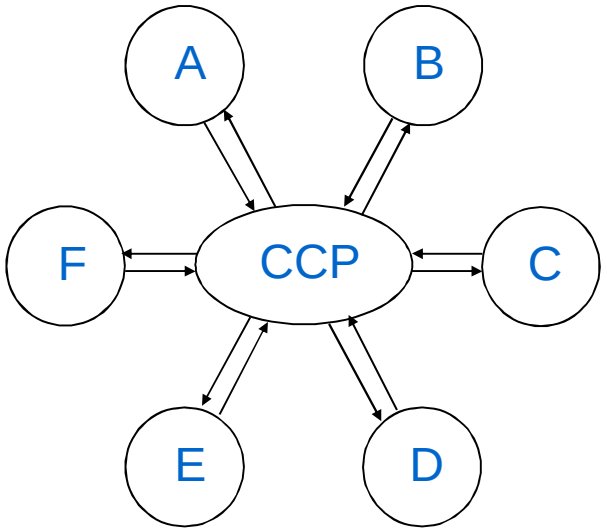
Bilateral market



CCP market



CCP Loss Waterfall

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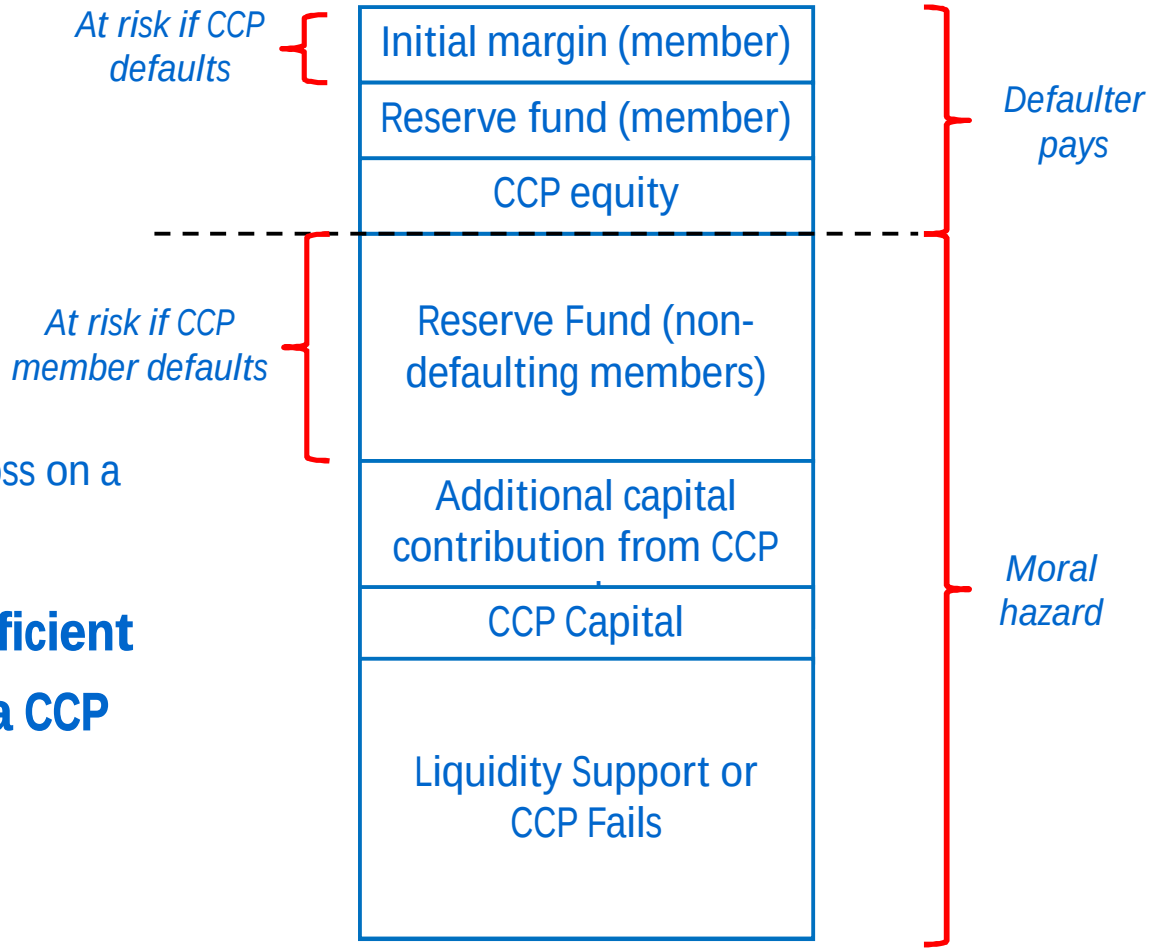
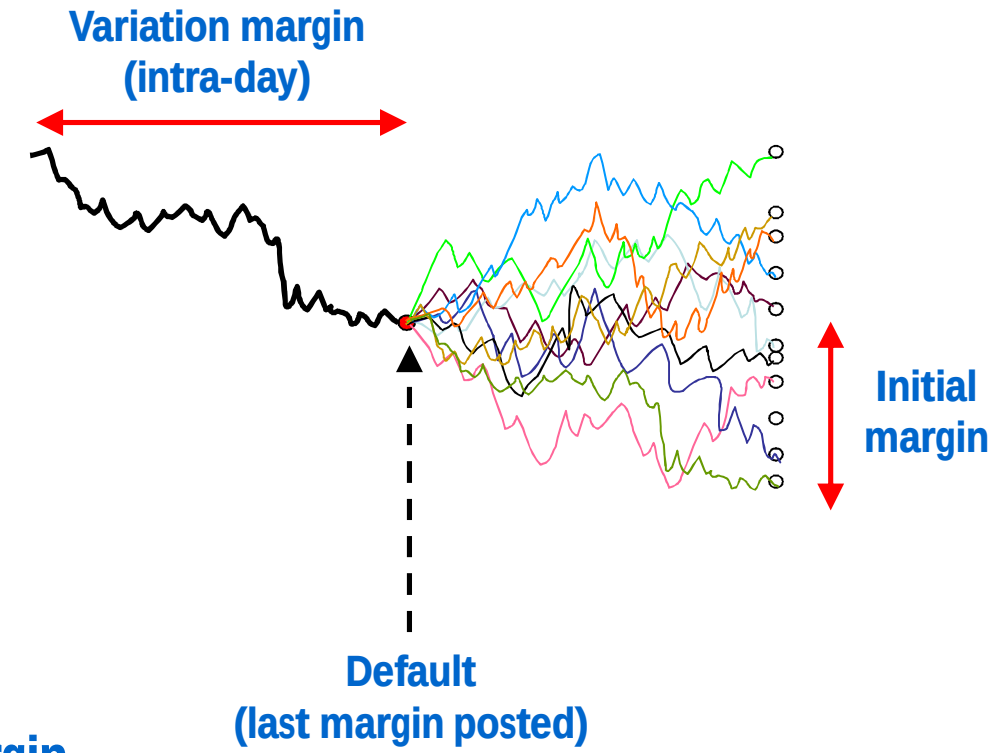
- **Allocation of losses after CCP has closed out trades and liquidated variation margin**
- **CCP capital charges**
  - Trade level (initial margin)
  - Reserve fund related
- **Exposure to a CCP**
  - Something like a second loss on a financial basket
- **If initial margin is not sufficient then there is real risk as a CCP member**



CCPs and Initial Margin



- **Initial margin**
  - Cover the cost of a member defaulting (to a confidence level over a pre-defined period)
  - Also significantly drives the cost of central clearing
  - To a large extent independent of the credit quality of the member
  - Not great in the case of wrong-way risk (likely jump in exposure when member defaults)

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The Impact of Counterparty Risk Reduction

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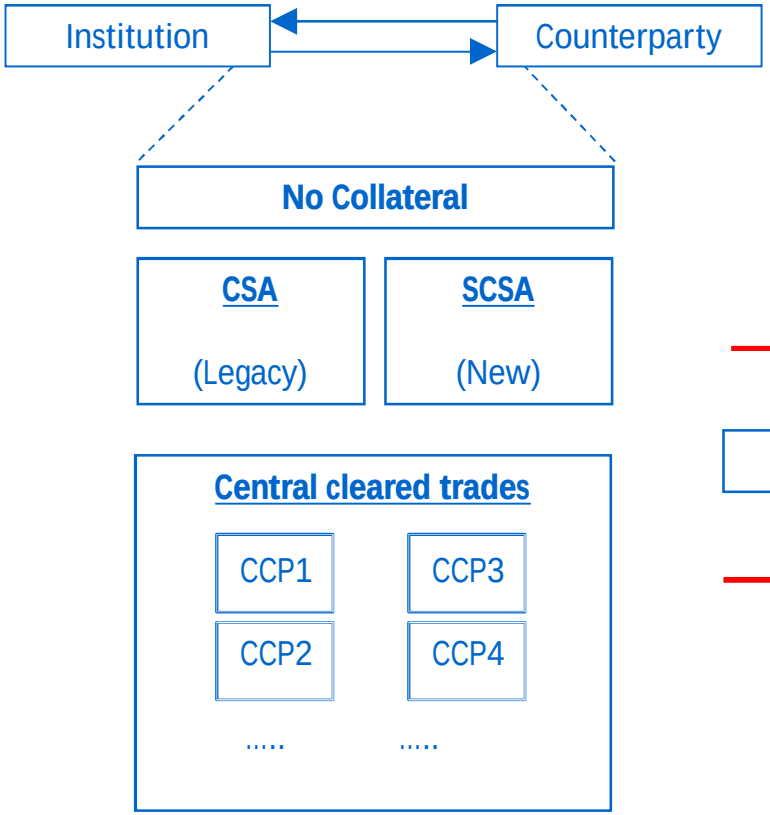
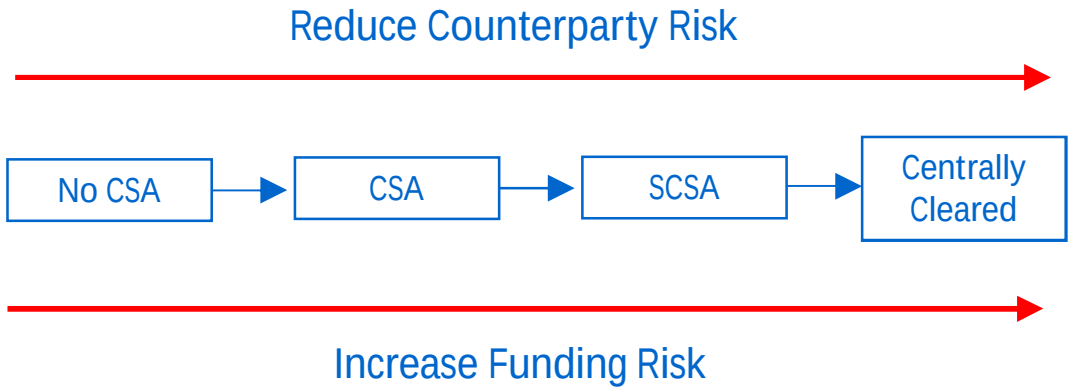
- **Collateral (or lack of it) also creates funding costs (FVA)**
- **What is the combined impact of CVA and funding costs?**





CVA, DVA and FCA

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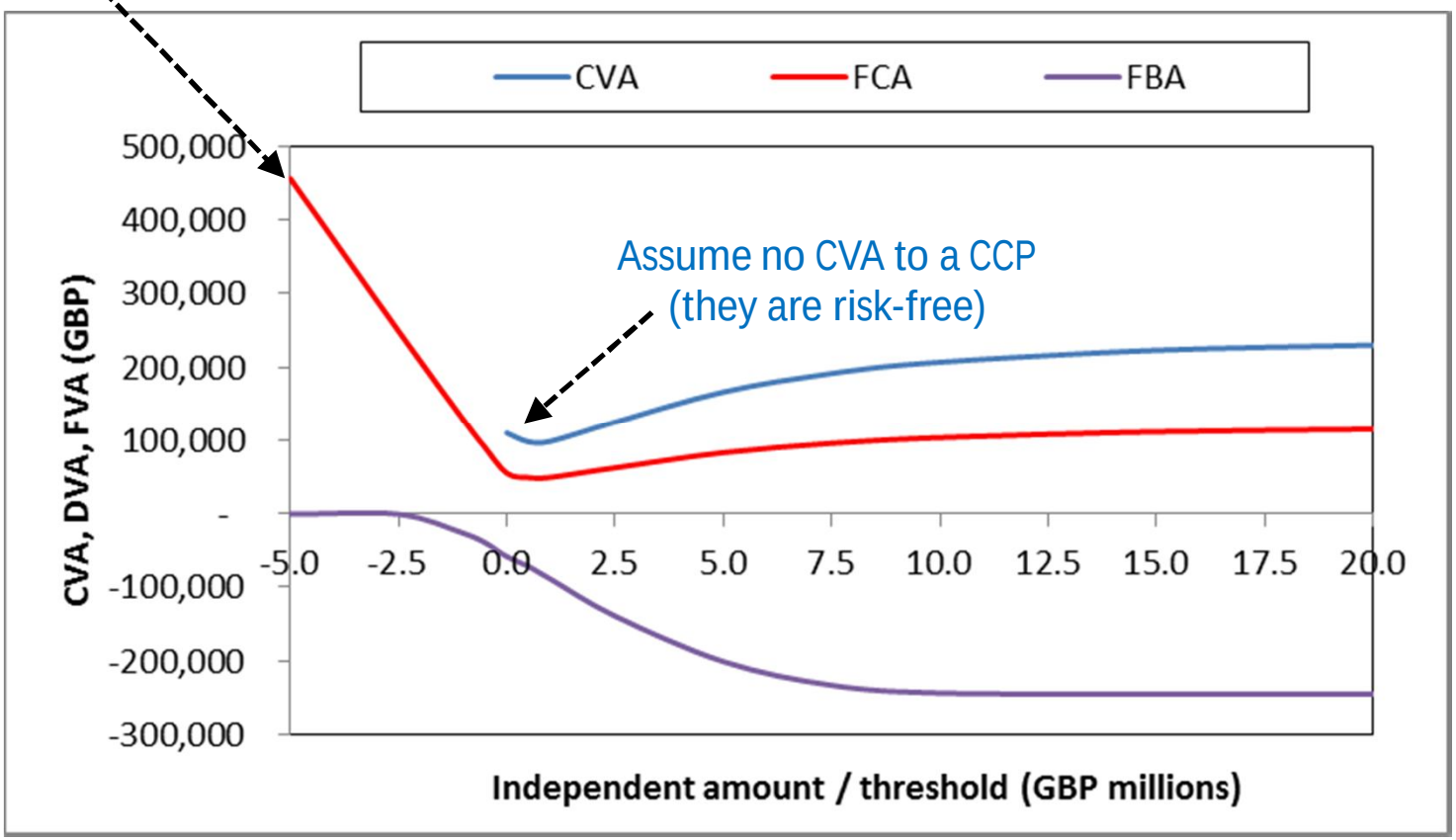
Funding cost of initial margin

$$CVA + FCA(DVA) + FBA$$



Overall Effect