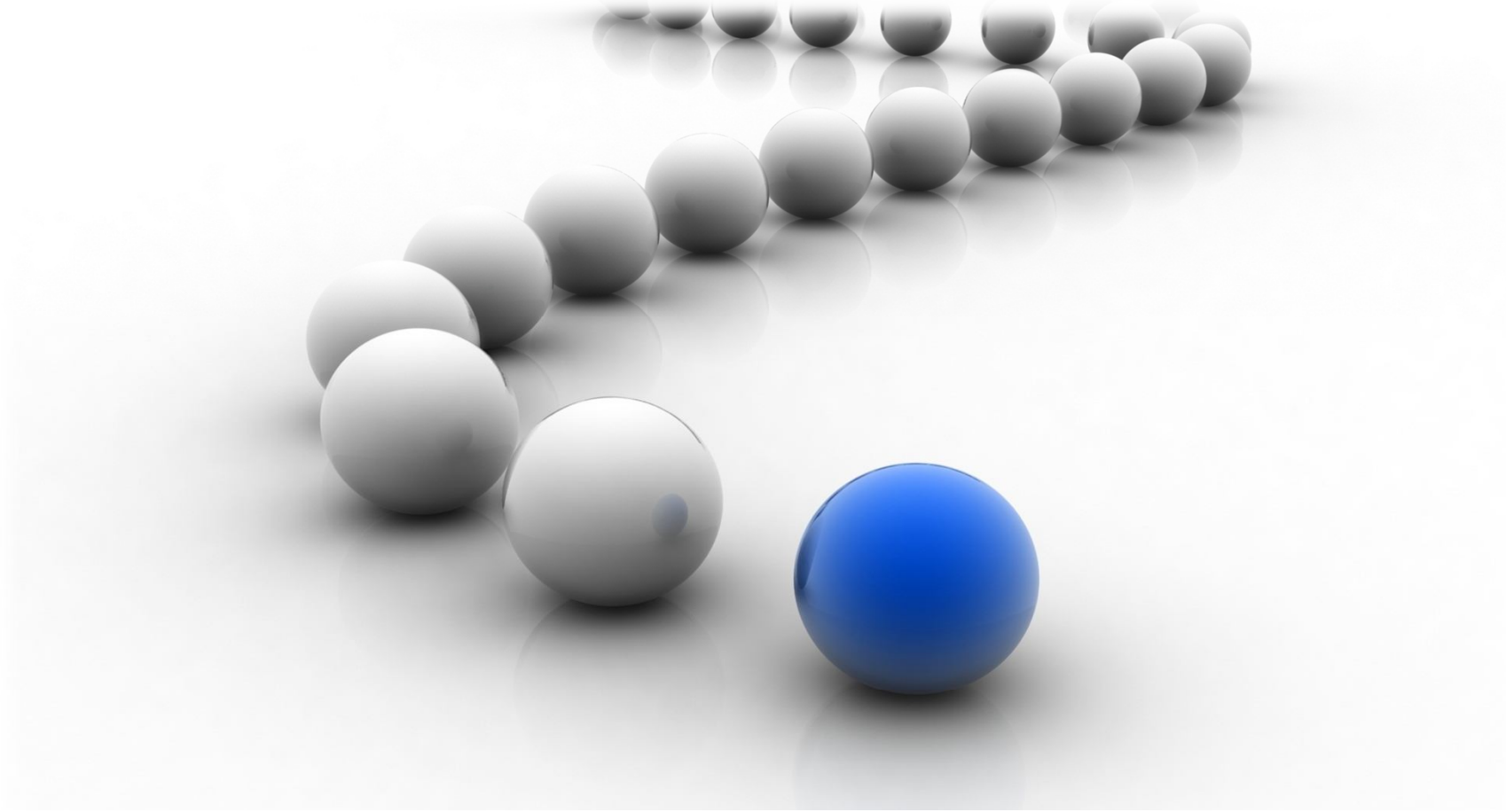
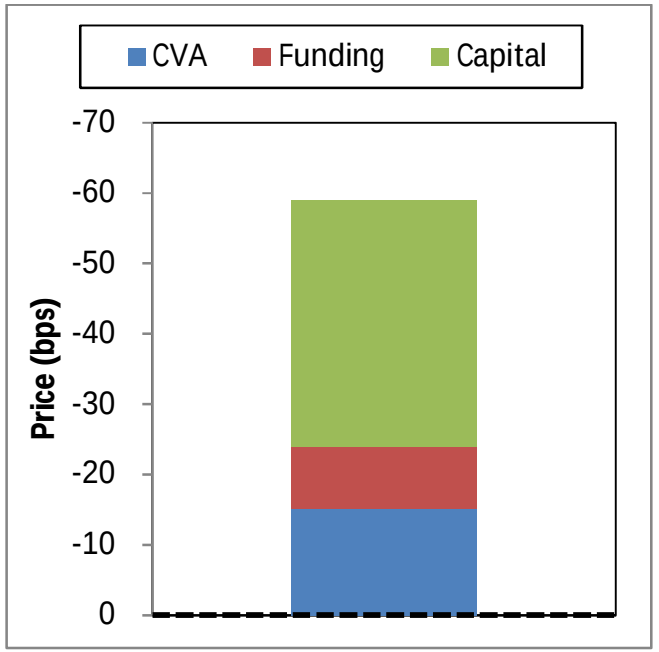


Regulatory Developments in Counterparty Credit Risk Management

Jon Gregory

Counterparty Risk and Capital

- **Counterparty risk was seen as a major contributor to the crisis from 2007**
- **Not surprisingly, increased capital requirements were introduced via Basel 3**
  - This involved changes to existing methodologies (e.g. stressed data, margin period of risk)
  - And a completely new CVA related capital charge
- **Counterparty risk capital is a very significant driver in OTC businesses**
- **Banks traditionally warehoused much of their CVA but this has changed with most banks having active CVA desks**
  - A key question is therefore whether capital charges react appropriately to the active management of CVA



Uncollateralised
20-year IRS
double-A counterparty

Counterparty risk capital requirements

The CVA capital charge

Exemptions and criticisms

KVA and the impact of CVA hedging

New CVA risk framework proposed by the BCBS

Counterparty Risk Capital

- **There are two main capital charges that relate directly to counterparty risk**
- **Default risk capital charge (sometimes called the CCR capital charge)**
  - This has existed since before the crisis
  - It accounts for default risk and some credit migration risk
- **CVA capital charge**
  - This was introduced in Basel 3
  - It accounts for CVA volatility risk (credit spread volatility)
- **Difference methodologies exist for the computation of these capital requirements**
  - CEM, SA-CCR and IMM (general definition of exposure that is used for both capital charges)
  - Advanced and standardised approaches (CVA capital charge)

Overview of Counterparty Risk Capital Charges

<table>
<tr><th></th><th>Default Risk Capital Charge</th><th>CVA Risk Capital Charge</th></tr>
<tr><td>Banks with IMM approval and with specific risk VAR approval for bonds</td><td rowspan="2">IMM methodology for EAD</td><td><u>Advanced method:</u>

• uses banks VAR model for bonds to model spreads
• eligible hedges (CDS single-names and indices) can be included
• sum of normal and stressed VAR</td></tr>
<tr><td>Banks with IMM approval only</td><td rowspan="2"><u>Standardised method:</u>

• Variance type formula assuming 50% correlation with global index giving split into idiosyncratic and systematic spread components
• Hedges included</td></tr>
<tr><td>Other banks</td><td>Simpler (non-IMM) method
Typically CEM
SA-CCR (from 2017)</td></tr>
</table>

Exposure at Default (EAD)

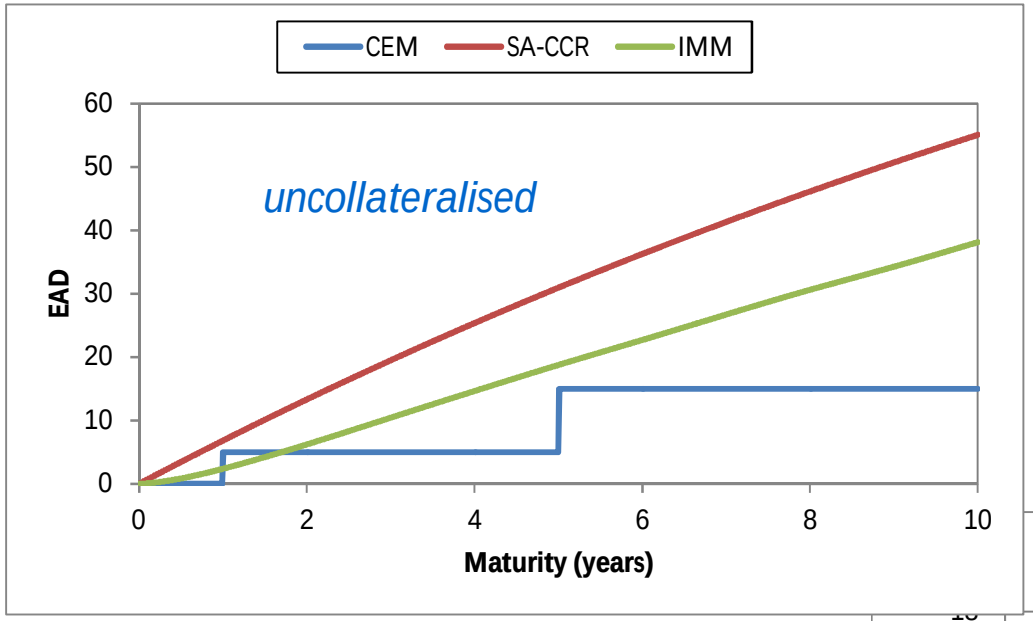
- **The main metric driving CCR capital is EAD which represents the regulatory exposure to a given counterparty**
  - EAD is difficult to define for OTC derivatives compared to standard debt instruments
  - Aspects such as collateral make EAD definition even more problematic
- **Three main methods exist for EAD definition**
  - Current exposure method (CEM) – very simple but not risk sensitive
  - Internal model method (IMM) – complex risk sensitive modelling framework but expensive to implement
  - Standardised approach for counterparty credit risk (SA-CCR) – scheduled from 2017 attempts to be risk sensitive without requiring significant implementation effort

Regulatory Approaches for Exposure at Default (EAD)

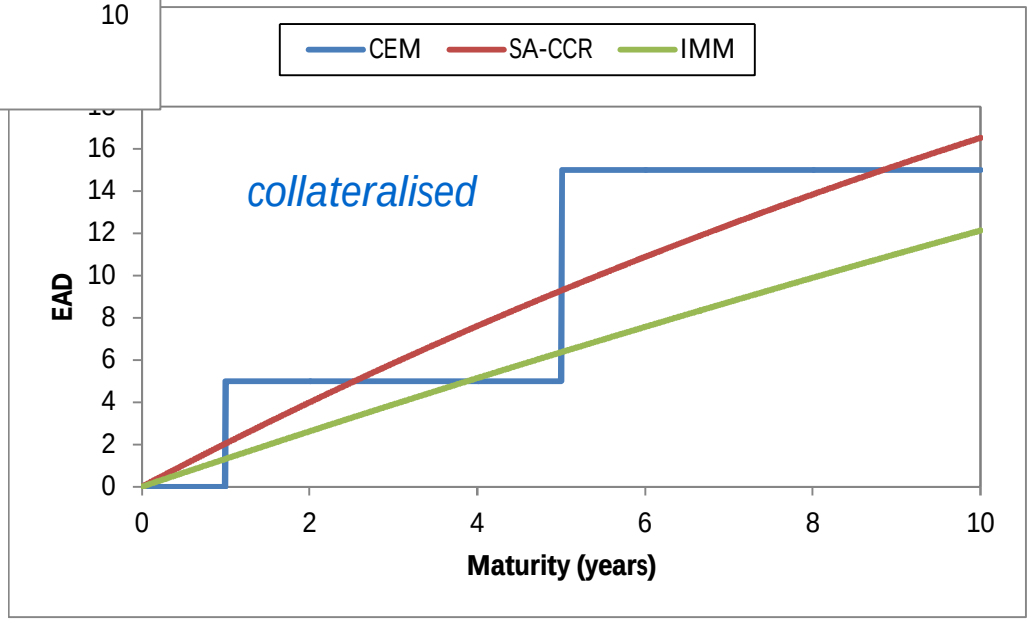
Method	Basic approach	Netting	Collateral
Current exposure method (CEM)	Simple add-ons (calibrated pre-crisis!)	60% of current netting benefit applied	Only current collateral held is included (not future collateral)
SA-CCR (from 2017)	Simple add-ons (calibrated post-crisis!)	Tenor and basis netting but no netting across currencies and asset classes	Both variation and initial margin are incorporated into parametric formulas
Internal model method (IMM)	Full modelling of individual risk factors	Full netting where legally enforceable	Modelling of both current and future collateral

- **Other methods (increasingly uncommon)**
  - Standardised method
  - Shortcut method (collateralised exposures)

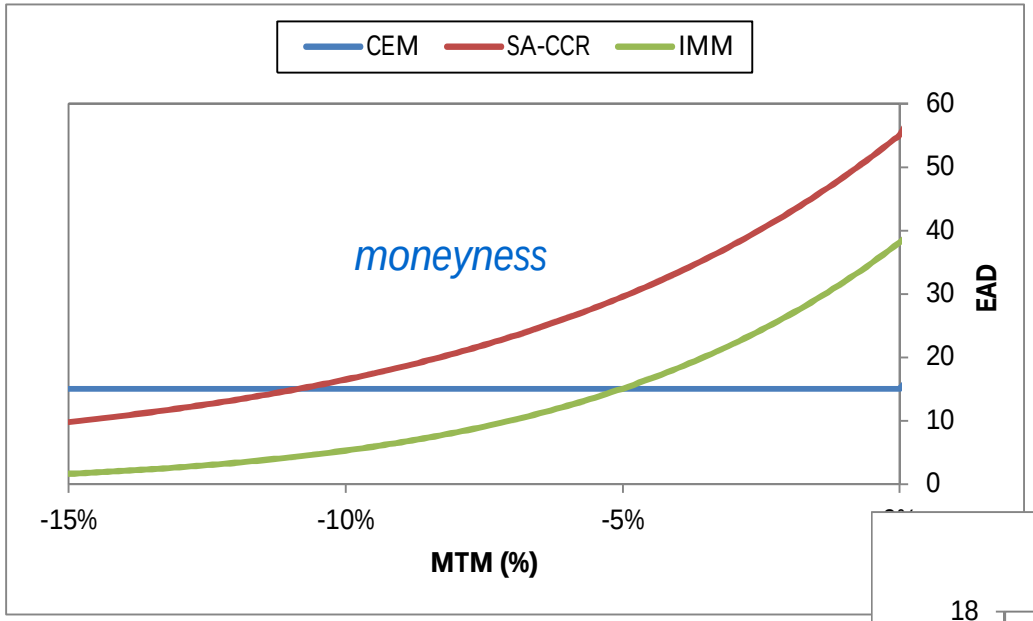
Comparison Between CEM, SA-CCR and IMM (1)

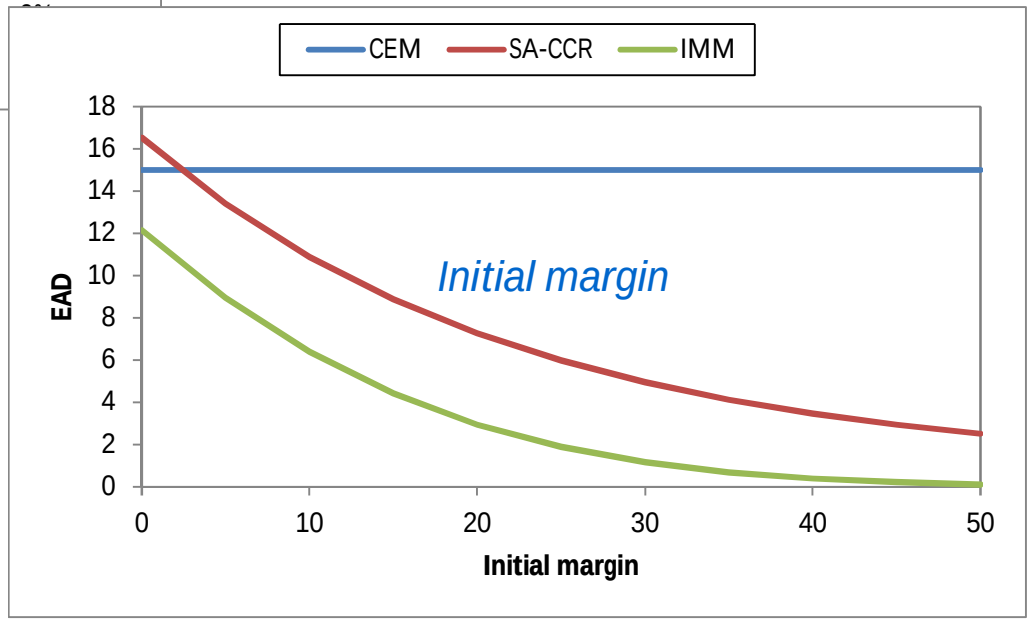


Interest rate swaps (by maturity)

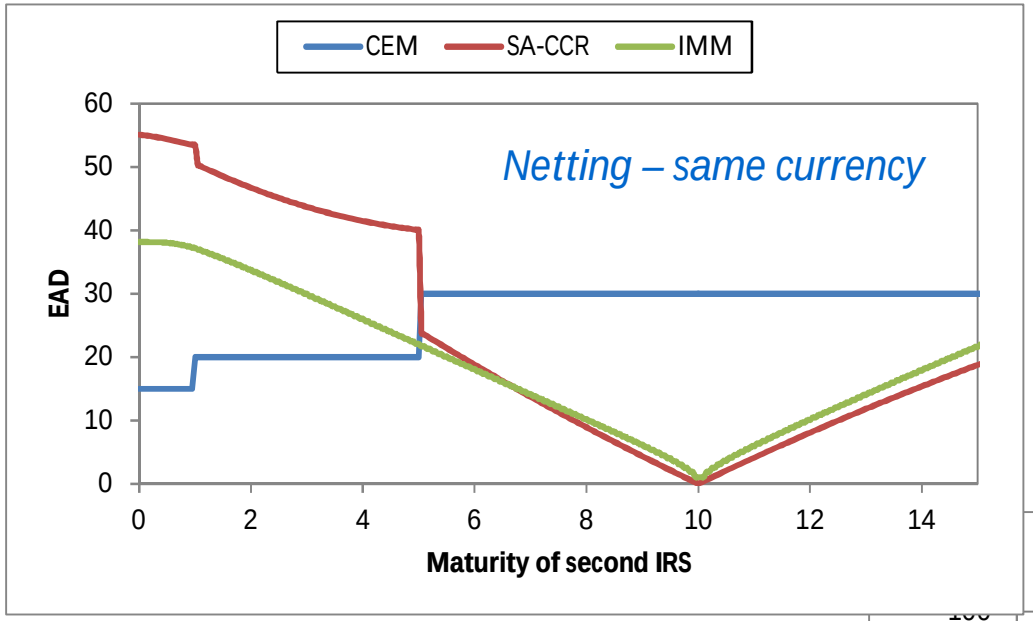


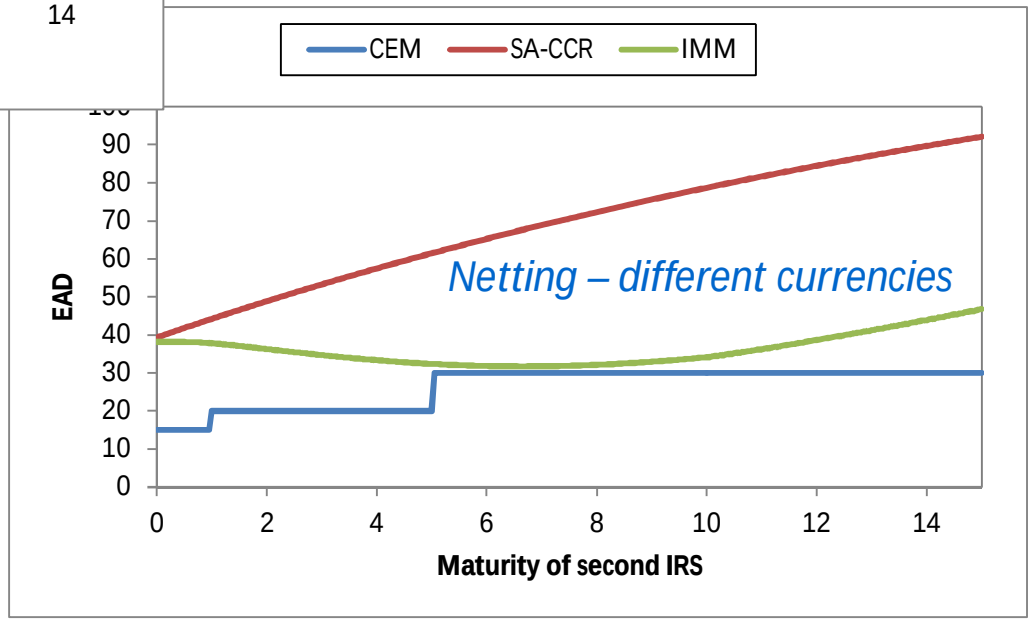
Comparison Between CEM, SA-CCR and IMM (2)





Comparison Between CEM, SA-CCR and IMM (3)





Counterparty risk capital requirements

The CVA capital charge

Exemptions and criticisms

KVA and the impact of CVA hedging

New CVA risk framework proposed by the BCBS

Basel III and CVA capital

- **BCBS Consultative document (December 2009)**
  - "Roughly ***two-thirds of CCR losses were due to CVA losses*** and only about one-third were due to actual defaults. The current framework addresses CCR as a default and credit migration risk, but does not fully account for market value losses short of default."
- **This seems to identify the need for a new capital charge**
  - "Banks will be subject to a ***capital charge for potential mark-to-market losses (CVA***) associated with a deterioration in the credit worthiness of a counterparty."
  - The capital can be reduced by hedging with credit default swaps
- **Two options**
  - Standardised approach (simple formula)
  - Advanced approach (VAR type calculation)

Standardised Approach

- **Normal distribution VAR approach based on the standard deviation of CVA**
  - 99% confidence level, 1-year time horizon
  - Included single-name and index CDS hedges (see later)

Systematic term

Idiosyncratic term

$$Capital = 2.33\sqrt{h}\sqrt{\left(\rho\sum_i w_i N_i - \sum_{ind} w_{ind} M_{ind} B_{ind}\right)^2 + (1-\rho^2)\sum_i w_i^2 N_i^2}$$

Correlation parameter (50%)

Counterparty weight by rating

Index hedges

Single name hedged notional

$$N_i = M_i EAD_i^{total} - M_i^{hedge} B_i$$

Effective maturities

Notional of single-name hedge

Advanced Approach

- **Bank can model the VAR with their own models with CVA defined by:**

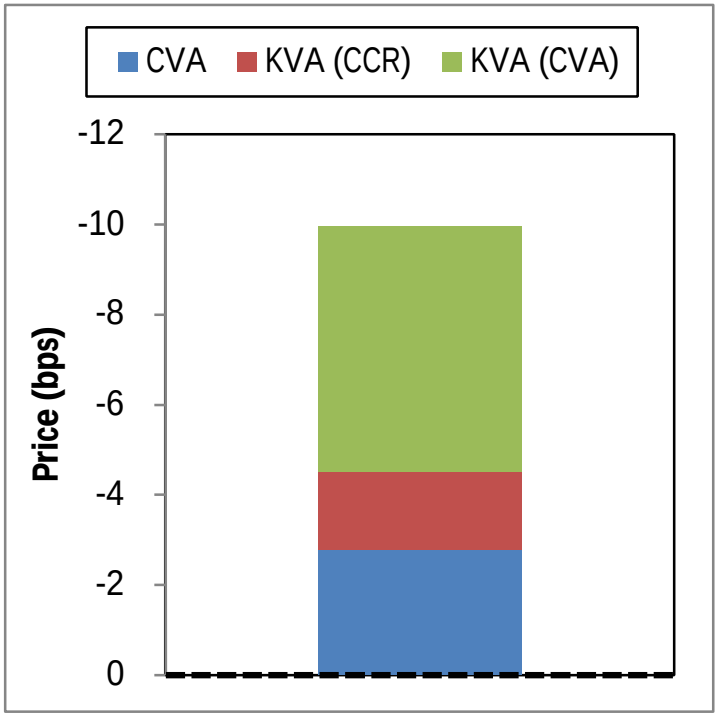
$$CVA = LGD_{mkt} \sum_{i=1}^{T} max\left(0; exp\left(-\frac{s_{i-1}t_{i-1}}{LGD_{mkt}}\right) - exp\left(-\frac{s_i t_i}{LGD_{mkt}}\right)\right)\left(\frac{EE_{i-1}B_{i-1} + EE_i B_i}{2}\right)$$

Fixed

Loss given default — Spread for time point — EE (from IMM model) — Discount factor

- **This can be seen as an application of traditional VAR to CVA**
  - 10-day period, 99% confidence level, usual VAR multiplier of 3
  - Capital defined as **sum** of normal and stressed (wrt credit spreads) calculations
- **But traditional VAR is changing under FRTB?**

The Impact of CVA Capital on Pricing



Uncollateralised
7-year swap
Single-A counterparty

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CVA and Accounting Rules

- **The CVA capital charge is not fully consistent with accounting requirements (e.g. IFRS 13)**
- **CVA calculation**
  - Accounting CVA will be driven by the internal model of a bank
  - Many banks do not have IMM approval and must use a more prescriptive method for capital calculations
  - Even IMM banks face differences between their CVA valuation methodology and their IMM approved approach (e.g. historical calibrations, requirement to use stressed data)
- **DVA**
  - Required under IFRS 13
  - Must be fully deducted under Basel III
- **FVA**
  - The Basel committee have an FVA project …..

How Effective is CDS Hedging?

- **Bank of England Q2 2010**
  - *"… given the relative illiquidity of sovereign CDS markets a sharp increase in demand from active investors can bid up the cost of sovereign CDS protection.* ***CVA desks have come to account for a large proportion of trading in the sovereign CDS market*** *and their hedging activity has reportedly been a factor pushing prices away from levels solely reflecting the underlying probability of sovereign default*."
  - This leads to the "doom loop" although this is not supported by the IMF study (April 2013)
  - Has led to the CVA capital exemptions granted in Europe for Sovereigns and non-financials
- **Kenyon and Green (2013)**
  - Capital relief could easily account for 50% of CDS spread
  - This in turn would increase CVA capital!

The EU Exemptions

- **Factors such as the doom loop led to EU exemptions for CVA capital charge under CRD IV**
  - Corporates, sovereigns
  - Pension funds (temporary)
- **These exemptions were significant**
  - For example, HSBC reported a drop in RWAs of $22 billion as a result
- **It seems likely that these exemptions will be reversed at some point**
  - For example "Overall, the EBA is of the opinion that EU exemptions on the application of CVA charges should be reconsidered or removed, since they leave potential risks uncaptured"

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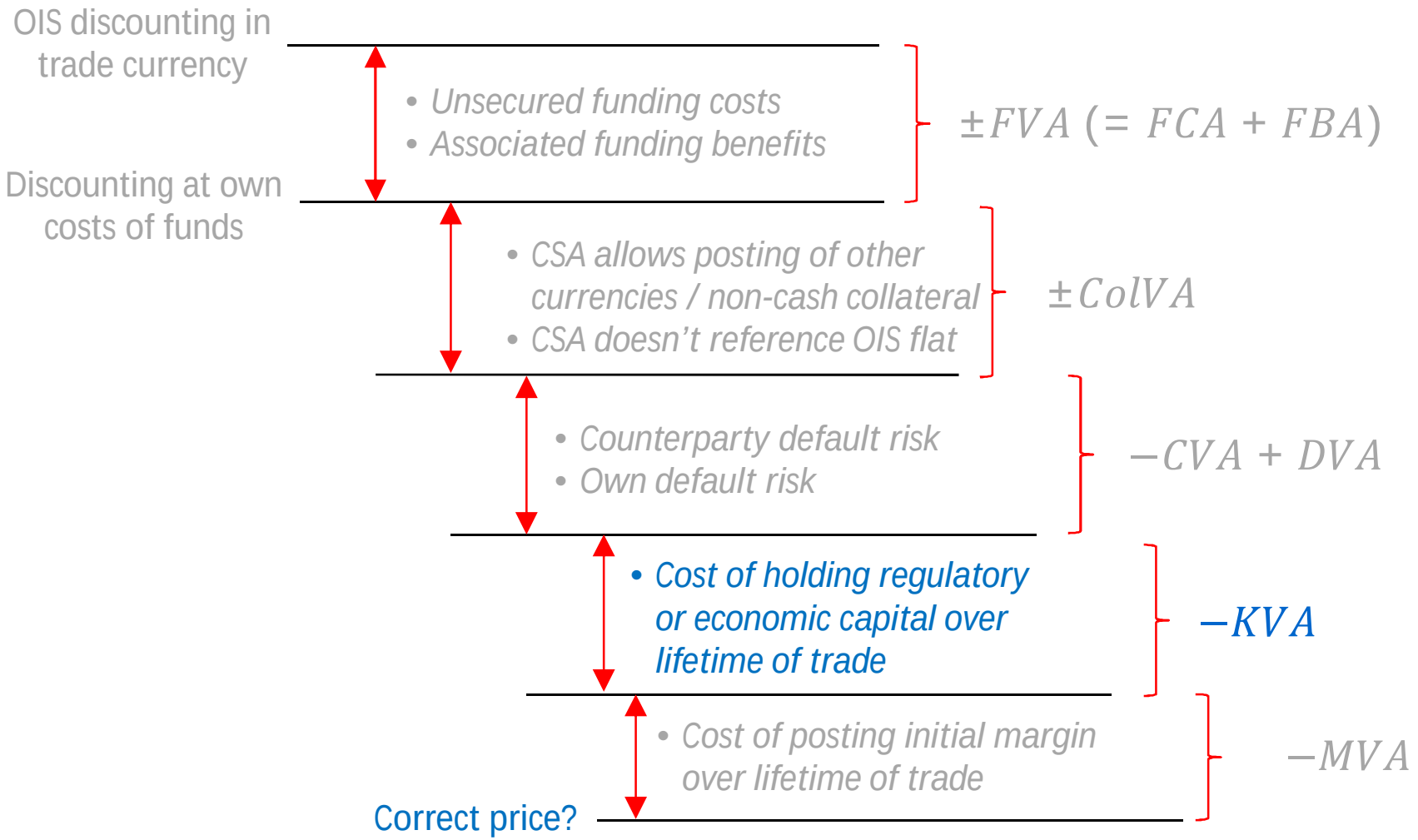
Valuation Components



KVA (Capital Value Adjustment) Formula

$$KVA = -\sum_{i=1}^{m} ECP(t_i) \times CC(t_i) \times (t_i - t_{i-1}) \times S(0, t_i)$$

Expected capital profile

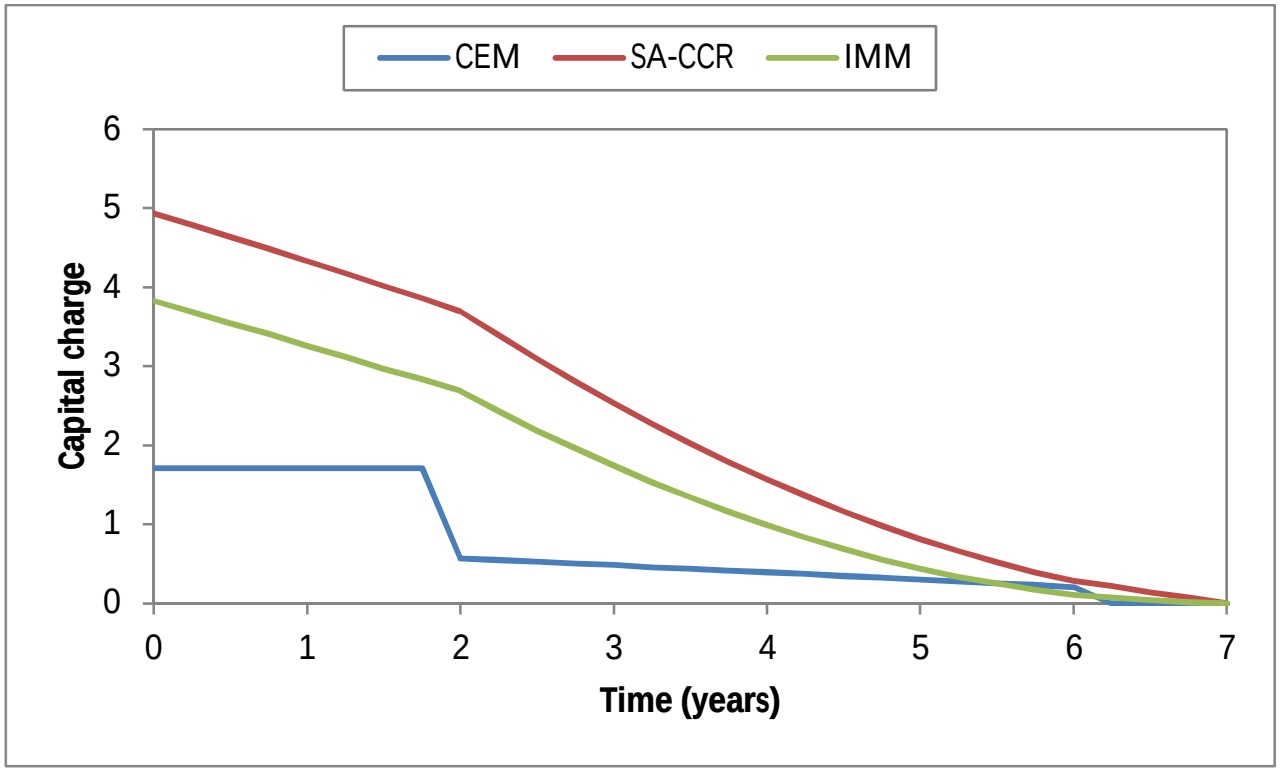
Cost of capital

Probability of no defaults

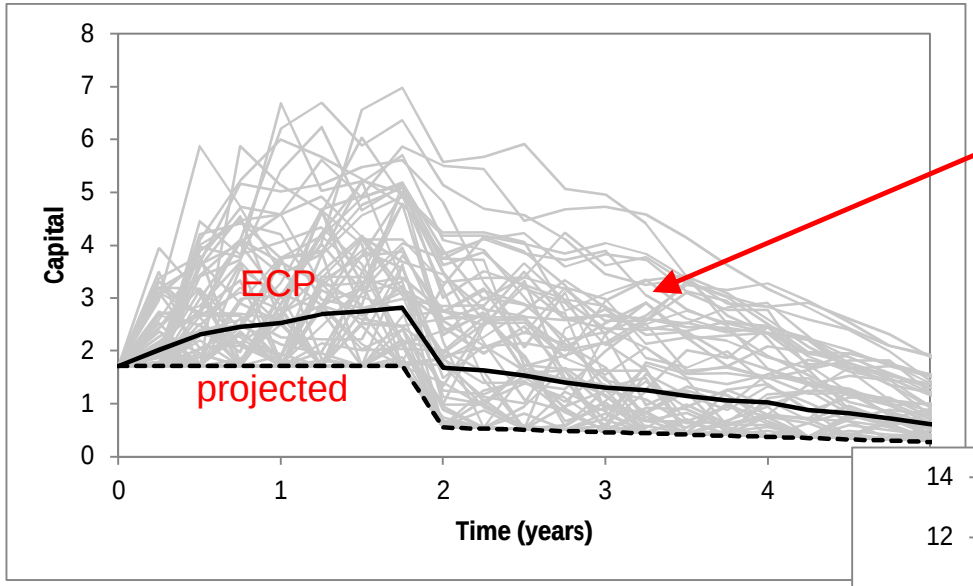
- **Aim of KVA**
  - To provide a profit that can be released over time and matches the cost of regulatory capital requirements
  - NOTE: most banks still see KVA as a hurdle and do not charge it explicitly

Projected Capital Profile

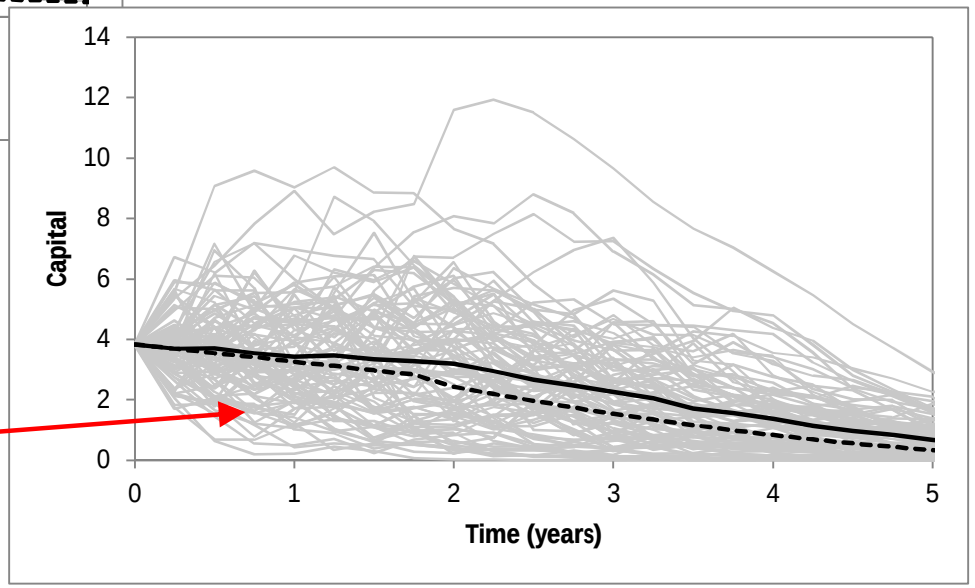
- **For a 7-year interest rate swap**
  - We just project the calculation forward at a number of points in the future
  - But what about the uncertainty of future capital?



Expected Capital Profile



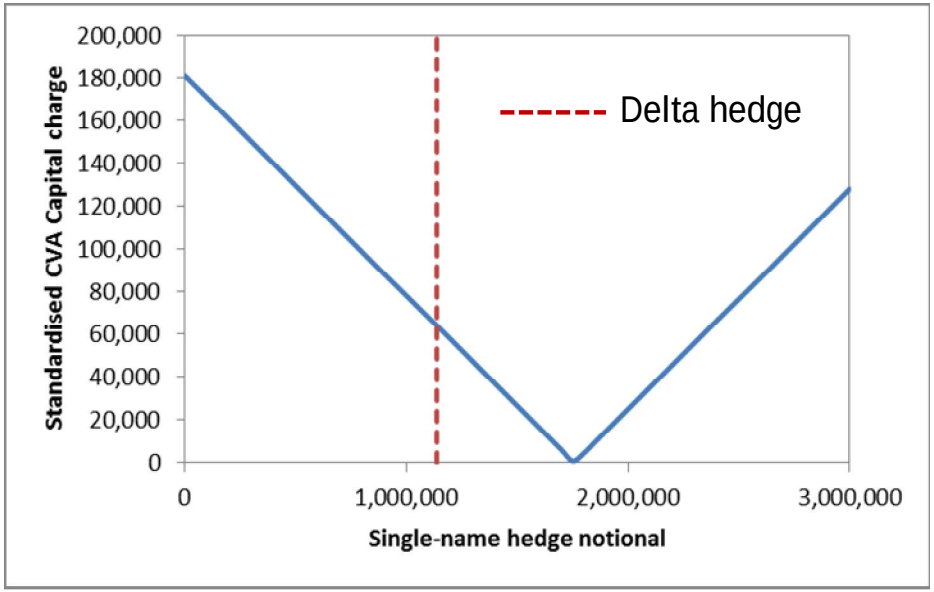
Standardised CVA
+ current exposure method



Advanced CVA + IMM

Impact of Credit Hedges on Capital

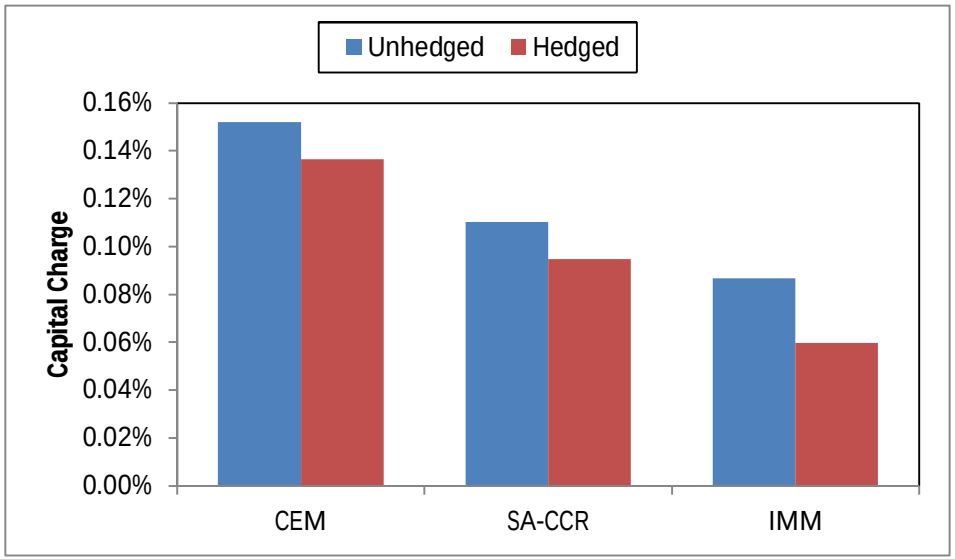
	CCR capital	CVA capital
Single-name CDS	Substitution / Double default	Partial relief according to formula
Index CDS	No relief (except wrt to name in the index)	Partial relief according to 50% correlation
Proxy single-name CDS	No relief	
Other		



KVA and Credit Hedging

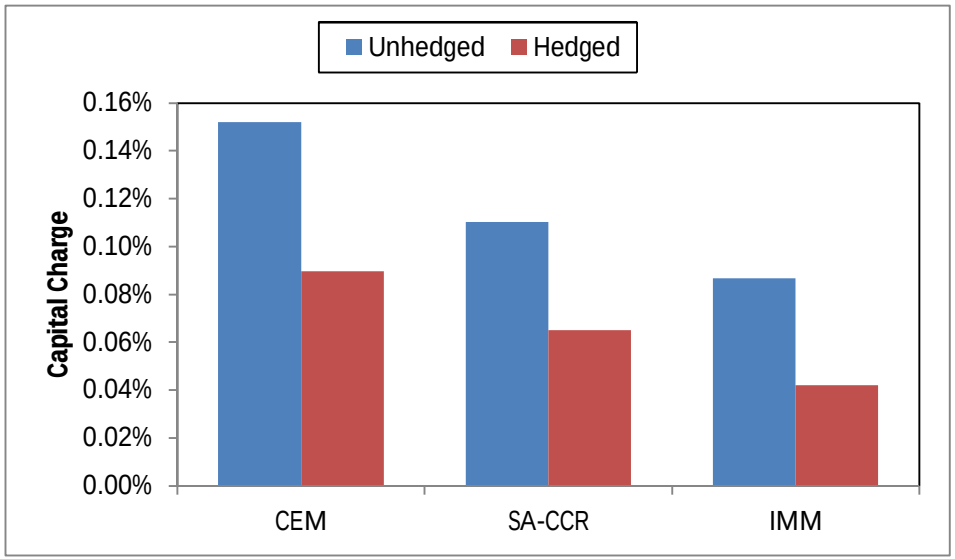
Index delta hedge

Some capital relief but not optimal as shown on previous slide

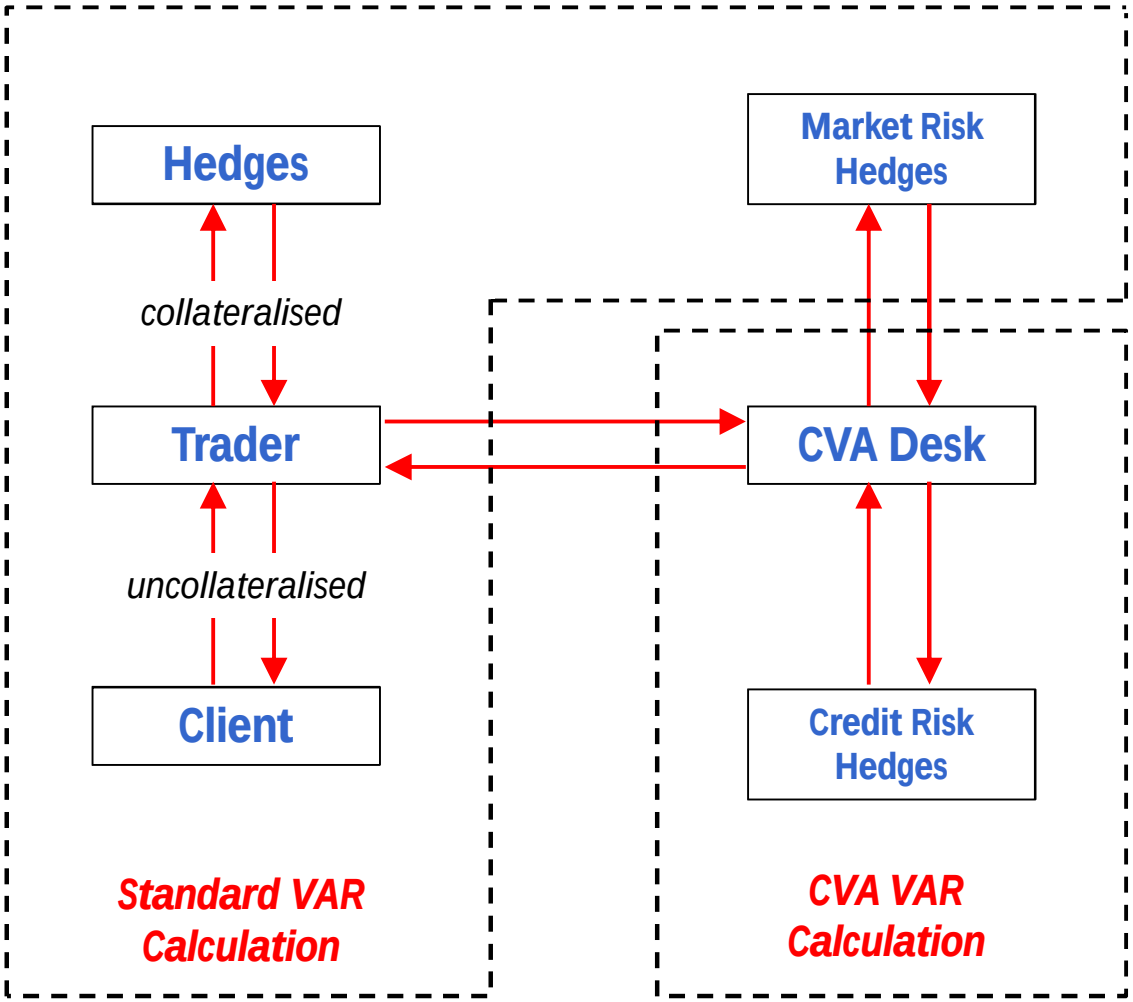


Capital index hedge

Maximum capital relief achievable (depends on correlation and portfolio effect)



Impact of Hedging on CVA Capital



- **US and Canada**
  - Market risk CVA hedges not included in the market risk capital rules
  - No split hedge issue

Mis-Alignment of CVA - Example

The second quarter 2013 net revenues were €3.7 billion, versus €3.4 billion in the second quarter 2012, and included a loss of €58 million related to the impact of a Debt Valuation Adjustment (DVA) on certain derivative liabilities, ***and a loss of € 69 million related to the mitigation of pro forma CRR/CRD 4 RWA on Credit Valuation Adjustment (CVA)***

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Problems with the CVA Capital Charge

1. Definition of CVA is not consistent with the accounting definition of CVA

- This is less problematic for IMM banks but even then aspects such as stressed data and risk-neutral calibrations can be problematic

2. Only credit spread volatility is considered

3. CVA capital must be computed separately from traditional market risk capital

4. The treatment of hedges is imperfect

- Market risk hedges actually increase capital (due to points 2 and 3 above)
- Single-name proxy hedges are not allowed and will also increase capital
- Credit risk hedges may be "misaligned" (due to point 1 above)
- This could be made worse with the introduction of the SA-CCR in 2017

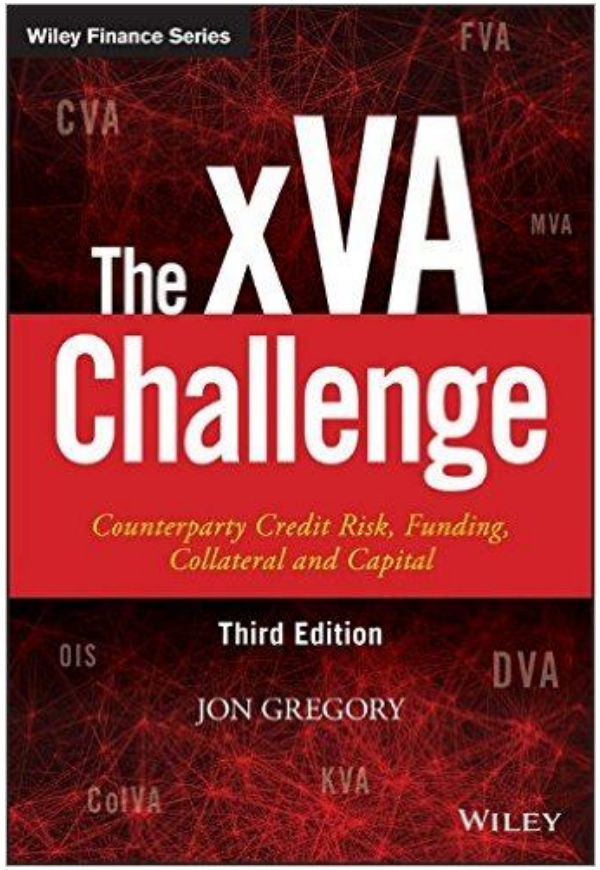
5. Due to FRTB, the CVA capital methodologies would be even less aligned to those for traditional market risk

Rationale for the New Proposals

- **BCBS "Review of the Credit Valuation Adjustment Risk Framework", July 2015**
- **Capturing all CVA risks and better recognition of CVA hedges**
  - In particular, including the exposure component of CVA (e.g. interest rate, FX risk)
- **Alignment with industry practices for accounting purposes (but not DVA)**
  - Accounting approaches for CVA have become broadly aligned with respect to aspect such as the use of risk-neutral default probabilities
- **Alignment with proposed revisions to the market risk framework**
  - Adapt FRTB for market risk in the trading book to cover CVA and related hedges
- **However .....**
  - CVA risk is by nature more complex in nature than market risk on the trading book leading to different frameworks and choices about precise implementation
  - The FRTB-CVA calculation will still be on a stand-alone basis and non-eligible CVA hedges will remain in the trading book

BCBS Proposals – FRTB-CVA Framework

- **Requirements:**
  - Bank can compute CVA sensitivities to a sufficiently large range of risk factors
  - Bank has a methodology for generating credit spreads for illiquid counterparties
  - Bank has a dedicated CVA risk management desk (CVA desk)
  - Otherwise a simpler "Basic CVA framework" must be used
- **Further split into IMA-CVA and SA-CVA depending on bank's ability to perform P&L attribution and backtesting**
  - Question of whether the accounting CVA or IMM CVA (for banks with approval) is used
- **Treatment of hedges**
  - Single-name and index CDS (as in current rules)
  - Proxy single-name CDS (basis risk must be captured)
  - Market risk hedges (where the purpose of the transaction is to hedge market risk and is booked by the CVA desk)
  - Some hedges are still not allowed (e.g. tranched or basket CDS)



"The issue of counterparty risk has undergone rapid change since the credit crisis. All end–users of OTC derivatives are affected by these changes. The new title 'xVA' of the third edition reflects the increased complexity generated by these changes. Jon Gregory provides the reader with a comprehensive, yet readable, discourse on the different facets of counterparty risk. This book is essential reading for regulators and OTC derivatives users."

Stuart M. Turnbull, Bauer Chaired Professor of Finance, Bauer College of Business, University of Houston

"Jon Gregory is one of the godfathers of the VA story. He is amongst the few who can demystify the puzzle and this book is a key tool for bringing light into these dark matters."

Wim Schoutens, independent consultant and professor in financial engineering at the University of Leuven, Belgium

"This is by far the clearest and most comprehensive reference work on counterparty credit risk and related value adjustments. With this new edition, Jon Gregory explains the latest changes in market practice, along with critical expert commentary."

Darrell Duffie, Dean Witter Distinguished Professor of Finance at Stanford Graduate School of Business

"The first and second editions of Jon Gregory's book on the post–crisis OTC derivatives markets were classics, packed with a wealth of information. This third edition greatly extends the coverage of the first two editions. Like them, it is a must–buy for anyone involved with derivatives markets. Congratulations Jon on another excellent book."

John Hull, Maple Financial Chair in Derivatives and Risk Management Joseph L. Rotman School of Management, University of Toronto

"Jon Gregory manages again to grab the XVA animal in its relentless flight and restrain it long enough to take a picture of its present state. The picture is, as usual, neat and clear, with full awareness of the continuous commitment of the market to optimise this aspect of pricing that has become a crucial factor for a bank's competitiveness.

Massimo Morini, Head of Interest Rate and Credit Models at Banca IMI and Professor of Fixed Income at Bocconi University

"Jon Gregory has written a fantastic book on counterparty risk, funding, collateral management and capital. It is remarkably clear and accessible, especially considering how technical and sophisticated these topics are. The book is an indispensable guide to the challenges of understanding and computing XVA measures and definitely one to read!"

Giovanni Cesari, Author of *Modelling, Pricing, and Hedging Counterparty Credit Exposure* (Springer)