Linking FRTB with CVA Capital

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 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

![Price Chart](#)
Overview of the Problem

- Suppose for a traditional market risk VAR model regulation required:

- All pricing formulas would be regulatory driven and not a bank’s own
- Pricing models would not be calibrated to current volatility surfaces
  - Historical volatility could be used instead of market implied
  - In either case, a stress period must be included
- Some risk factors would not be allowed to be simulated and/or associated
  hedges for such risk factors would not be offsetting
- This gives a rough idea of the problems banks face with the CVA capital charge
Counterparty risk capital requirements

The CVA capital charge

Exemptions and criticisms

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 always been present
  – 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>
<thead>
<tr>
<th>Banks with IMM approval and with specific risk VAR approval for bonds</th>
<th>Default Risk Capital Charge</th>
<th>CVA Risk Capital Charge</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>IMM methodology for EAD</td>
<td>Advanced method:</td>
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<tr>
<td></td>
<td></td>
<td>• uses banks VAR model for bonds to model spreads</td>
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<tr>
<td></td>
<td></td>
<td>• eligible hedges (CDS single-names and indices) can be included</td>
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<tr>
<td></td>
<td></td>
<td>• sum of normal and stressed VAR</td>
</tr>
<tr>
<td>Banks with IMM approval only</td>
<td></td>
<td>Standardised method:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Variance type formula assuming 50% correlation with global index giving split into idiosyncratic and systematic spread components</td>
</tr>
<tr>
<td>Other banks</td>
<td>Simpler (non-IMM) method</td>
<td>• Hedges included</td>
</tr>
<tr>
<td></td>
<td>Typically CEM</td>
<td></td>
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<tr>
<td></td>
<td>SA-CCR (from 2017)</td>
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</tbody>
</table>
Counterparty risk capital requirements

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• **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)

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

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

\[
CV_{\text{A}} = LGD_{\text{mkt}} \sum_{i=1}^{T} \max \left(0; \exp \left(-\frac{s_{i-i} t_{i-i}}{LGD_{\text{mkt}}}ight) - \exp \left(-\frac{s_{i} t_{i}}{LGD_{\text{mkt}}}ight)\right) \left(EE_{i-i} B_{i-i} + EE_{i} B_{i}\right)
\]

- 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

Uncollateralised 7-year swap
Triple-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
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 of this

- 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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### Impact of Credit Hedges on Capital

<table>
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<tr>
<th></th>
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<th>CVA capital</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Single-name CDS</strong></td>
<td>Substitution / Double default</td>
<td>Partial relief according to formula</td>
</tr>
<tr>
<td><strong>Index CDS</strong></td>
<td>No relief (except wrt to name in the index)</td>
<td>Partial relief according to 50% correlation</td>
</tr>
<tr>
<td><strong>Proxy single-name CDS</strong></td>
<td>No relief</td>
<td></td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td>No relief</td>
</tr>
</tbody>
</table>

![Diagram showing Delta hedge impact on capital](image)

**Delta hedge**
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

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**Hedges**
- **collateralised**

**Trader**
- **uncollateralised**

**Client**

**Market Risk Hedges**

**CVA Desk**

**Credit Risk Hedges**

**Standard VAR Calculation**

**CVA VAR Calculation**
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 aspects 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)
Summary

• Capitalising CVA risk is much more complex than traditional market risk
  – Banks may struggle to calculate the full range of CVA sensitivities
  – Hedges are more complex to treat (e.g. index CDS and proxy CDS)

• The current CVA capital rules are problematic for a number of reasons
  – CVA definition differs from accounting CVA
  – Bank’s without IMM approval suffer from simplistic treatment
  – Only credit spread risk is capitalised
  – Treatment of some hedges is inappropriate

• The new proposed rules aim to resolve the above issues and treat CVA capital within a FRTB approach
  – Likely to focus banks on calculation of CVA sensitivities and related aspects and less so on risk methodology implementation and IMM approval
  – May also lead to great procyclicality in the CVA capital charge
"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)