Definition and calculation of KVA

Use of KVA in pricing with other xVA components

Impact of initial margin on KVA

Impact of hedges on KVA
Regulatory Capital for Counterparty Risk

Capital (RWAs)
- KVA
- FVA
- CVA

Funding

Credit

Prudent Valuation (AVA)
- Leverage Ratio
- CVA Capital Charge
- CCR Capital Charge
- Market Risk
Overview of Capital Components

- **Market risk**
  - Basel 2.5 currently (to be replaced by FRTB)
  - Should be a small component since most risks should be hedged

- **Counterparty risk**
  - Basel 2 CCR capital (default risk)
  - Basel 3 CVA capital

- **Leverage ratio**
  - Minimum ratio of capital to exposure

- **Prudent valuation**
  - CVA uncertainty
  - Funding costs

“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”

\[
leverage = \frac{\text{capital}}{\text{exposure}} \geq 3\%
\]
Example

- Cross-currency swap with double-B corporate (uncollateralised, no refix)

![Graph showing CVA, FVA, KVA (CCR), and KVA (CVA) with price in bps ranging from -60 to 0.]

- Bank’s price (see later discussion)
- Clearing price
Cost of capital

Probability of no defaults

Expected future capital (discounted)

Cost of capital

Probability of no defaults

Aim of KVA

To provide a profit that can be released over time and matches (in expectation) the cost of regulatory capital requirements
Expected Capital Profile

Standardised CVA + current exposure method

ECP

projected

Advanced CVA + IMM
KVA and the Leverage Ratio

- **Leverage ratio formula**

  \[
  \text{leverage} = \frac{\text{capital}}{\text{exposure}} \geq 3\%
  \]

- We therefore want the ECP to be greater than 3% of the exposure

- We might represent the expected capital profile to be:

  \[
  \text{Capital}_T(t) = \max \left[ \text{Capital}_{CCR}(t) + \text{Capital}_{CVA}(t), \text{Exposure}_{LR}(t) \times 3\% \right]
  \]

- Or define leverage ratio capital as:

  \[
  \text{Capital}_{LR}(t) = \left[ \text{Exposure}_{LR}(t) \times 3\% - \text{Capital}_{CCR}(t) - \text{Capital}_{CVA}(t) \right]_+
  \]
Expected Capital Profile (ECP)

- Spot Capital
- CVA Capital
- CCR Capital

Time

Leverage ratio implied capital

ECP

CVA capital charge exemption lifted? (European Banks)
SA-CCR
Leverage ratio
FRTB
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Can we use regulatory capital for funding?

Arguably some overlap which may lead to no FCA (Hull-White) or using a lower cost of funding (funding liquidity risk premium?)

Double counting of DVA and FBA what curve should we use (own CDS, own cost of funding)?

CVA is the (theoretical) cost of hedging counterparty risk
KVA is the cost of holding regulatory capital against unhedged CVA
How much capital relief?
CVA and KVA

- CVA is the theoretical cost of hedging counterparty risk
- KVA is the capital charge since we cannot (perfectly) hedge
- Banks have sometimes charged as follows:

\[
\max(EL + KVA, CVA)
\]

- However, a CVA desk with a limits framework will likely move towards the risk-neutral cost and therefore produce zero return on capital
- A better approach is

\[
CVA + \alpha KVA
\]
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Initial Margin Exchange

• Incoming rules for non-centrally cleared derivatives:

  • Variation margin
    – Bilateral full margin (zero threshold)
    – Minimum transfer amount no more than €500,000
    – On a regular basis (e.g. daily)
    – Cash is strongly incentivised

  • Initial margin
    – Based on an extreme but plausible move based on a 99% confidence level
    – 10-day time horizon (assuming variation margin is exchanged daily)
    – Using quantitative (approved) model or a standardised margin schedule (no “cherry picking”)
    – Margin models must be additive across asset classes (currency/rates, credit, commodities)

• Rigorous and robust dispute resolution procedures should be in place
Simple Example

- Surely if we take a IM against the entire portfolio to a high confidence level then the residual exposure should be small?
  - Under normal distribution assumptions, it should be reduced by a factor given by:

\[
R_\alpha = \left[ \varphi(\sqrt{\lambda}K) - \sqrt{\lambda}K \Phi(-\sqrt{\lambda}K) \right]^{-1} (2\pi)^{-0.5}
\]

\[
\lambda = \tau_{IM}/\tau_{MPR}
\]

\[
K = \Phi^{-1}(\alpha)
\]

<table>
<thead>
<tr>
<th></th>
<th>( \lambda = 1 )</th>
<th>( \lambda = 0.5 )</th>
<th>( \lambda = 0.25 )</th>
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<tbody>
<tr>
<td>90%</td>
<td>8.4</td>
<td>4.0</td>
<td>2.5</td>
</tr>
<tr>
<td>95%</td>
<td>19.1</td>
<td>6.6</td>
<td>3.5</td>
</tr>
<tr>
<td>99%</td>
<td>117.7</td>
<td>19.1</td>
<td>6.6</td>
</tr>
<tr>
<td>99.5%</td>
<td>252.4</td>
<td>29.5</td>
<td>8.5</td>
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</table>

Bilateral result with 10-day time horizon for IM and 99% confidence level and 20-day MPR.
## Overview of Counterparty Risk Capital Charges

<table>
<thead>
<tr>
<th></th>
<th>Current</th>
<th>2017</th>
<th>Later</th>
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</thead>
<tbody>
<tr>
<td>CCR Capital Charge</td>
<td>CEM or IMM</td>
<td>SA-CCR or IMM</td>
<td>SA-CCR or IMM</td>
</tr>
<tr>
<td>CVA Capital Charge</td>
<td>CEM / standardised or IMM / advanced</td>
<td>SA-CCR / standardised or IMM / advanced</td>
<td>BA-CVA or FRTB-CVA</td>
</tr>
</tbody>
</table>
KVA With Initial Margin

- **Initial margin** *should* reduce KVA
- **However, this depends on the methodology for regulatory capital**
  - Current exposure methodology (CEM): initial margin not captured
  - Internal model methodology (IMM): initial margin modelled – but how to model a risk sensitive initial margin amount?
  - SA-CCR (2017) – initial margin (fixed only) parametrised within formula and floor of 5%
KVA with Initial Margin / Threshold

Zero threshold, 10-day margin period of risk

Initial Margin | Threshold

KVA

Initial margin (Threshold)

CEM | SA-CCR | IMM
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Capital and P&L Volatility

• The CVA capital charge allows some potential for credit hedges
  – Hence, hedging can partly reduce capital requirements
  – But hedging can also reduce CVA P&L volatility
  – Not surprisingly, these don’t always go hand in hand
  – Will improve under BCBS 325

Accounting CVA P&L Volatility
(IFRS 13)

CCR / CVA Capital Leverage Ratio
(Basel 3 / BCBS 325)

You look at it from a regulatory point of view, not an accounting point of view. This time, our efforts to reduce risk-weighted assets have resulted in a loss. Deutsche Bank Comment, Risk Sept 2013
Impact of Non-Eligible Hedges on CVA Capital

- **US and Canada**
  - Exemption for market risk hedges executed to reduce CVA volatility
  - For some banks RWA for CVA hedges is greater than the rest of the trading book
Standardised CVA Capital Charge With CDS Hedges

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

- Systematic term
- Idiosyncratic term
- Index hedges
- Single name hedged notional

\[ N_i = M_i EAD_{total} - M_i^{hedge} B_i \]

- Effective maturities
- Notional of single-name hedge

**In advanced approach CDS hedges can be modelled directly**
## Impact of Hedges on Counterparty Risk Capital

<table>
<thead>
<tr>
<th></th>
<th>CCR capital</th>
<th>CVA capital (current)</th>
<th>CVA capital (future)</th>
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<tbody>
<tr>
<td>Market risk hedges</td>
<td>n/a</td>
<td>No relief</td>
<td></td>
</tr>
<tr>
<td>Credit risk hedges</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single-name CDS</td>
<td>Substitution / Double default</td>
<td>Good relief depending on approach</td>
<td></td>
</tr>
<tr>
<td>Single-name proxy CDS</td>
<td></td>
<td>No relief</td>
<td></td>
</tr>
<tr>
<td>Index CDS</td>
<td>No relief</td>
<td>Partial relief according to correlation</td>
<td></td>
</tr>
</tbody>
</table>

Capital relief should be good in both SA-CVA and IMA-CVA approaches since it they are sensitivity based.
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)
Summary

• **Current KVA suffers from a number of problems**
  – Regulatory definition of CVA
  – Limited benefit of CVA hedges
  – European exemptions
  – Risk-neutral / real world problem

• **The FRTB-CVA approach (BCBS 325) may remedy much of this**
  – BA-CVA approach will only suit very basic banks
  – SA-CVA or IMA-CVA will likely bring better alignment and need for active management

• **Many problems still exist though**
  – Uncertain regulatory change
  – Initial margin
  – Computational challenges
  – KVA and accounting
  – .....