Agenda

- CVA and the trading desk
- Hedging of CVA risk
- Best practices in CVA solutions
CVA Impact on the Trading Desk
Definitions

● Potential Future Exposure (PFE)
  • PFE(T) is maximum loss due to counterparty default at time T with a given confidence level
  • Confidence level based (like VaR)
  • Does not affect your PnL

● Credit Value Adjustment (CVA)
  • Change in portfolio value due to the possibility of counterparty default (unilateral or bilateral)
  • Affects your P&L (whether or not your firm includes it in financial reporting)
CVA is not really about the counterparty default
– rather, it is about the sensitivity to credit spread of counterparties and your firm

• In practice, dealer default happens very rarely

• Buy-side counterparty defaults happen once in a while

• Credit spreads go up and down every day, increasing your P&L volatility and adding noise to the true performance of your OTC trading business
CVA is not like issuer risk

Issuer risk:

- Can be dealt with at the level of individual bond position
- Quantifying this risk uses simpler valuation, hedging, and stress testing methodologies
CVA is not like issuer risk

CVA:

- Depends on the **entire portfolio** of trades between you and the counterparty
- Depends on the nature of collateral posted to or received by the counterparty
- Requires knowledge of Credit Support Annex (CSA) details
- Is not easily valued or hedged
Imagine you are running a flow desk

- You are currently fully hedged to your market risk…

- The next day you have negative P&L of $50m…

- …because your counterparty reported weak numbers and its credit spread widened (but why is this your problem?)

- OR because your firm reported strong numbers and its credit spread have narrowed, reducing your firm’s DVA (i.e., reducing liabilities)
Imagine you are running a derivatives desk

- If you were not trading credit before, now you are - and you do not have credit traders

- Credit exposure cannot be hedged for the majority of counterparties (no CDS or too costly) – increasing the volatility of your P&L

- Your counterparties want to charge you for CVA, but no vice versa– and arguing about the adjustment requires a full tally of mutual OTC positions across all desks in both firms
CVA Reporting

Reporting CVA in your P&L

- You have credit spread sensitivity even if you do not trade credit
- This sensitivity is not hedgeable for the majority of counterparties

Not reporting CVA in your P&L

- You cannot trade or closeout at the price close to your internal model - potentially large charges both ways vis a vis your counterparty
Hedging CVA
Who is best equipped to manage CVA for the firm?

In the order of increased capability:

- Non-credit flow trading desk
- Credit flow trading desk
- Non-credit derivatives desk
- Credit derivatives desk
- Centralized CVA desk – best equipped to consolidate and centrally manage firm-wide CVA
Objectives of Hedging CVA

- Reducing the sensitivity
  - Avoiding CVA-driven P&L when the credit spread of the counterparty or your firm changes
  - Protecting your CVA position for the duration of your trades with the counterparty

- Reducing the exposure
  - Reducing your Maximum PFE at given confidence level (e.g. 99%)
Current exposure does not take into account changes in the exposure profile over time.
Vanilla swap value over time

Exposure profile of OTC derivatives fluctuates over different time horizons.
XCcy swap value over time
Exposure early in deal lifetime

Instruments early in its life can have exposure profiles significantly different than when it is near maturity
Exposure late in deal lifetime
Problems with static CDS hedging

Static hedging issues

• CDS will pay out the same amount if counterparty defaults, independently of the amount of your exposure
• CDS will pay out every time while you will have positive exposure only some of the time

These problems can be solved by dynamic hedging

• adjusting CVA position over time and depending on the amount of exposure you have today
Problems with any CDS hedging

Problems with CDS hedging which cannot be solved by dynamic hedging

- By making hedging overall sensitivity your objective, you have committed to a specific hedge position.

- This position is related to your CVA (expected exposure) and will only partially hedge your exposure at a given confidence level (PFE), e.g. 95%.
Single name vs. macro hedging

**Single name hedging**
- More precise in case of bad news affecting a single firm rather than broad market moves
- Not available for most counterparties
- Does not easily balance sensitivity and exposure hedging
- Expensive

**Macro hedging**
- The only option against counterparties
- Not a hedge against bad news affecting a single firm
Contingent CDS

The issue with vanilla CDS hedging drives innovation in credit products such as contingent CDS

- A combination of vanilla CDS, foreign-denominated CDS, and contingent CDS is on theoretical grounds a better way to hedge your exposure profile

- In practice, high cost of transacting in anything other than vanilla CDS offset some of the advantages in using these products
Best Practices
Best Practices for a CVA solution

- Product coverage
- Big data solution
- Time to market
Product coverage

- Does the solution cover all your asset classes?
- Does it cover vanillas to exotics?
- How long will it take to add new product types for PFE/CVA calculations?
## Big Data problems

<table>
<thead>
<tr>
<th></th>
<th>Trades</th>
<th>Simulation paths</th>
<th>Time Steps</th>
<th>Total # of Obs</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVaR 99%</td>
<td>10,000</td>
<td>250</td>
<td>1</td>
<td>2,500,000</td>
</tr>
<tr>
<td>MCVaR 99%</td>
<td>10,000</td>
<td>1000</td>
<td>1</td>
<td>10,000,000</td>
</tr>
<tr>
<td>PFE 99%</td>
<td>10,000</td>
<td>1000</td>
<td>20</td>
<td>200,000,000</td>
</tr>
</tbody>
</table>
Big Data solutions

- Distributed processing (grid, cloud computing) for real-time pricing
- In-memory caching for real-time data retrieval
- Closed-form vs Monte Carlo simulation
Big Data Visualization

Many tools available for visualizing big data

Need compute grid and data caching to access results in real-time
Time to market

• Solution deployable on trading desk and centralized CVA desk?

• Resolve data from siloed databases and different pricing models

• Transparent methodologies for risk mgmt, regulators, and auditors
Summary

• CVA forces us to quantify joint market and credit risks

• CVA significantly increases computational need for pricing and data interpretation

• Hedging is challenging and requires careful consideration of costs and liquidity

• Solutions should keep in mind (product coverage, speed of processing, time to market)
Thank you

www.numerix.com