Pricing Counterparty Risk in Today’s Market: Current Practices

Introduction to the Panel Discussion

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Counterparty Risk is Changing (I)

- Before the credit crisis
- Most counterparty risk situations were very one way
  - The “too big too fail” concept obscured counterparty risk
  - Many institutions see their counterparty as being risk-free (at least from their point of view)
  - Credit spreads of banks just a few bps
  - Collateral agreements often one-sided or heavily skewed (independent amounts etc)
- Counterparty risk was the focus of mainly large global banks (1st tier)
- Wrong-way risk was a concept rather than a reality
- No-one had ever heard of DVA

Counterparty Risk is Changing (II)

- After the credit crisis
- "Too big to fail" illusion is shattered
  - Lehman
  - Pseudo-bankruptcies (saved only by last-ditch rescues) during the credit crisis (Bear Stearns, AIG, Fannie Mae, Freddie Mac, Merrill Lynch, Royal Bank of Scotland)
- Every counterparty risk situation is two-way
  - CVA and DVA
  - Collateral
  - Central counterparties
- Wrong-way risk is suddenly everywhere
  - Massive problems arising from credit derivatives products

CVA (Credit Value Adjustment)

- CVA is the price of counterparty risk (expected loss due to counterparty default in the future)

$$\text{Risky Derivative} = \text{Derivative} - \text{CVA}$$

- Crucial to be able to separate valuation of derivatives and their CVA

$$\text{CVA} \approx \text{PD} \times \text{EPE} \times \text{LGD} \approx \text{Spread} \times \text{EPE}$$

Default probability (how likely is counterparty to default)

Expected positive exposure (how much we expect to lose)

Loss given default (how much we expect to lose after recovery)

Why is CVA So Complex?

- Calculating the CVA of a derivative is always more complex than pricing the derivative itself
  - E.g. CVA of a swap involves volatility but pricing the swap itself doesn't
- Must account for
  - Complexities of the trade (cashflows, exercises, resets, …..) and market variables
  - Correlations between market variables
  - Default probability and recovery value (often more art than science)
  - Netting (causes exposure to be reduced)
  - Collateral agreements (as above)
  - Wrong-way risk (credit derivatives in particular)

CVA History

- 1999/2000 period
  - Banks first start using CVA to assess the cost of counterparty risk
  - Treated in an insurance style approach (**passively managed**)
  - A few first tier banks actively used CVA
- 2005 onwards
  - Accountancy regulations (FAS 157, IAS 39) mean that the value of derivatives positions must be corrected for counterparty risk
  - All banks should think about computing CVA monthly or quarterly at least
- 2007 onwards
  - Lots more attention on counterparty risk
  - Many more “CVA desks” (**actively managed**)
  - Banks are more interested in a daily or even intra-daily CVA
  - Other large users of OTC derivatives also interested in CVA

Why a CVA Desk?

- Requirements to mark-to-market CVA in all derivatives positions
  - CVA is not additive across positions (diversification effect due to netting)
- This creates two obvious key problems
  - How to allocate and charge the CVA across businesses / trading desks
  - How to avoid the volatility of all the CVA due to market movements (specifically credit spreads and volatility)
- Creates the need for an institution to have a specialised group to tackle this across all businesses
  - Cross asset focus (centralised approach)
  - Trading desk
  - Every derivative constitutes some sort of complex loan transaction

Key CVA Issues

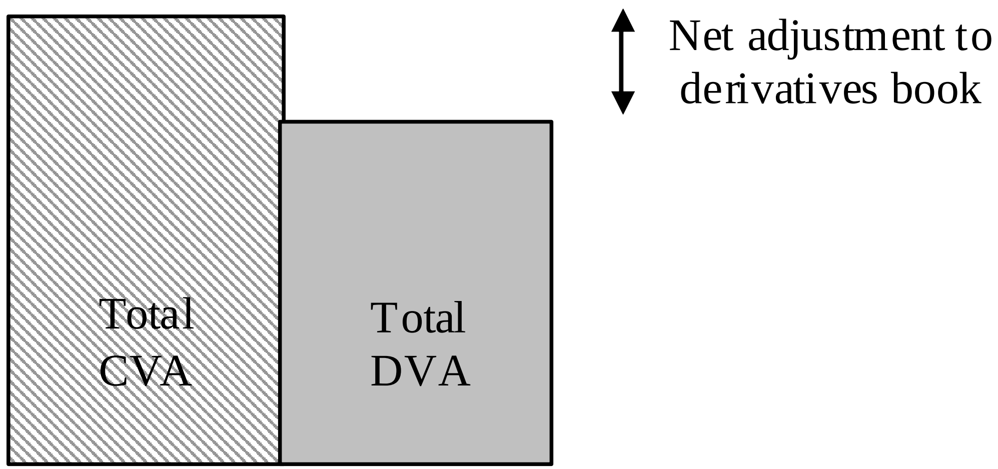
- Positioning of CVA desk
  - Centralised or decentralised
  - Profit centre or utility?
  - Liquid vs illiquid counterparties
- DVA (Debt Value Adjustment)
  - Should you monetise your own default?
  - Link to funding
- Wrong way risk
  - Monolines provided an example of where is can go dramtically wrong
  - How to avoid such trades in future?
- Regulation
  - Basel 3 proposals for “CVA VAR” charges
- Central counterparties
  - A solution or another “too big to fail” entity?

Discussion

DVA (Debt Value Adjustment)

- CVA
  - Expected positive exposure (EPE)
  - Counterparty default probability
  - Counterparty recovery rate
  - Represents a cost
- DVA
  - Expected negative exposure
  - Own default probability
  - Own recovery rate
  - Represents a gain

$$\text{Counterparty Spread} \times \text{EPE}$$
$$- \text{Own Spread} \times \text{ENE}$$



Does DVA Make Sense?

- Bilateral CVA (DVA) seems to have been widely adopted
  - Accountancy rules (FAS 157, IAS39)
- Advantages
  - CVA and associated charges reduced
  - Hedging is easier (cheaper)
  - No CVA induced gridlock of OTC markets
- Potentially unpleasant features of DVA
  - Total CVA+DVA in the market sums to zero
  - Risky value of derivative may exceed risk-free value
  - Netting and collateral may increase CVA
  - Hedging this component is problematic (moral hazard linked to own default)

CUTTING EDGE. CREDIT DERIVATIVES

Being two-faced over counterparty credit risk

A recent trend in quantifying counterparty credit risk for over-the-counter derivatives has involved taking into account the bilateral nature of the risk so that an institution would consider their counterparty risk to be reduced in line with their own default probability. This can cause a derivatives portfolio with counterparty risk to be more valuable than the equivalent risk-free positions. In this article, ***Jon Gregory*** *discusses the bilateral pricing of counterparty risk and presents a simple approach that accounts for default of both parties. He derives results and then argues that the full implications of pricing bilateral counterparty risk must be carefully considered before it is naively applied for risk quantification purposes*

Counterparty credit risk is the risk that a counterparty in a financial contract will default prior to the expiry of the contract and fail to make future payments. Counterparty risk is taken by each party in an over-the-counter derivatives contract and is present in all asset classes, including interest rates, foreign exchange, equity derivatives, commodities and credit derivatives. Given the recent decline in credit quality and heterogeneous concentration of credit exposure, the high-profile defaults of Enron, Parmalat, Bear Stearns and Lehman Brothers, and writedowns associated with insurance purchased from monoline insurance companies, the topic of counterparty risk management remains ever-important.

A typical financial institution, while making use of risk mitigants such as collateralisation and netting, will still take a significant amount of counterparty risk, which needs to be priced and risk-managed appropriately. Over the past decade, financial institutions have built up their capabilities for handling counterparty risk and active hedging has also become common, largely in the form of buying credit default swap (CDS) protection to mitigate large exposures (or future exposures). Some financial institutions have a dedicated unit that charges a premium to each business line and in return takes on the counterparty risk of each new trade, taking advantage of portfolio-level risk mitigants such as netting and collateralisation. Such units might operate partly on an actuarial basis, utilising the diversification benefits of the exposures, and partly on a risk-neutral basis, hedging key risks such as default and forex volatility.

A typical counterparty risk business line will have significant reserves held against some proportion of expected and unexpected losses, taking into account hedges. The recent significant increases in credit spreads, especially in the financial markets, will have increased such reserves and/or future hedging costs associated with counterparty risk. It is perhaps not surprising that many institutions, notably banks, are increasingly considering the two-sided or bilateral nature when quantifying counterparty risk. A clear advantage of doing this is that it will dampen the impact of credit spread increases by offsetting the associated increase in required reserves. However, it requires an institution to attach economic value to its own default, just as it may expect to make an economic loss when one of its counterparties defaults. While it is true that a corporation does 'gain' from its own default, it might at first glance appear unusual to price this component. In this article, we will make a quantitative analysis of the pricing of counterparty risk and use this to draw conclusions about the validity of bilateral pricing.

Unilateral counterparty risk

The reader is referred to Pykhtin & Zhu (2006) for an excellent overview of measuring counterparty risk. We denote by $V(s, T)$ the value at time s of a derivatives position with a final maturity date of T. The value of the position is known with certainty at the current time $t (< s \le T)$. We note that the analysis is general in the sense that $V(s, T)$ could indicate the value of a single derivatives position or a portfolio of netted positions[1], and could also incorporate effects such as collateralisation. In the event of default, an institution must consider the following two situations:

- $V(s, T) > 0$. In this case, since the netted trades are in the institution's favour (positive present value), it will close out the position but retrieve only a recovery value, $V(s, T)\delta_C$, with δ_C a percentage recovery fraction.
- $V(s, T) \le 0$. In this case, since the netted trades are valued against the institution, it is still obliged to settle the outstanding amount (it does not gain from the counterparty defaulting).

Wrong-Way Risk

- It is typical to assume independence between
  - Default probability of counterparty
  - Exposure at default
- But in reality often a strong relationship between exposure and default
  - Buying out of the money put options
  - Buying CDS protection
  - FX products with local currencies
- Wrong way risk challenges
  - Correlation and dependency are not the same thing
  - Wrong-way risk might be quite subtle (interest rates and default rates, airline oil hedging)
  - Wrong-way risk can be massive (monolines)

Counterparty Risk and Basel 2

- Basel 2 requires capital to be held against derivatives exposures
- Based on Effective EPE
- Covers
  - Default risk
  - Credit migration risk (through maturity adjustment factor)
- Alpha factor adjusts for
  - Exposure volatility
  - Correlation of exposures
  - Size of portfolio (and granularity)
  - Wrong way risk

Alpha	Origin
1.0	Infinitely large portfolio and independent exposures (theoretical result only)
1.4	Supervisory value
1.2	Supervisory floor when bank uses own model for estimate
1.05 - 1.10	Typical value for large portfolios
> 2.5	Possible value for concentrated portfolios

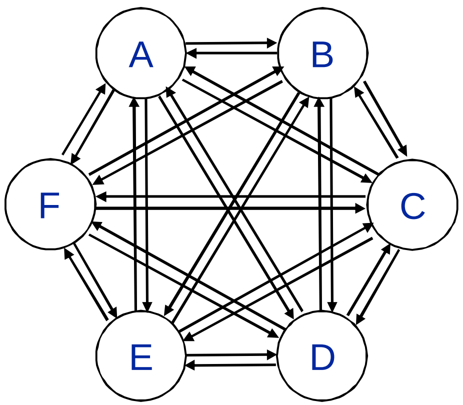
Basel 3 Proposal – CVA “VAR”

- Previous Basel 2 rules only account for default losses (and to some extent credit migration losses)
- Simple capital add-on for CVA risk (bond equivalent)
  - Notional of bond is given by EAD (according to whichever method is used)
  - Spread is the one used to calculate CVA (actual or proxy)
  - Maturity of bond is maximum effective maturity of all netting sets for that counterparty
- Risk is then defined as a market risk charge
  - The portfolio of bond equivalents for each counterparty
  - VAR type 99% confidence level and 1-year period (may use scaled 10-day)
  - Accounts for hedging using single name CDS and CCDS (or similar instruments) only
- Accounts mainly for credit spread volatility risk of CVA

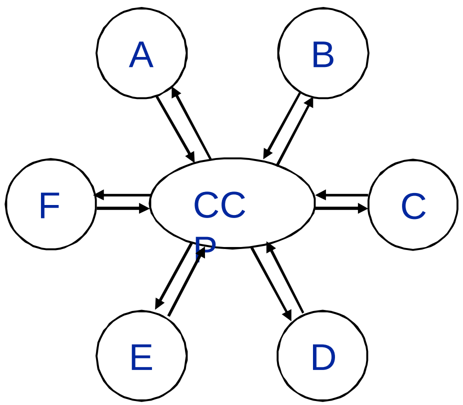
Rationale for Central Clearing

- The sudden realisation that counterparty risk is everywhere
  - Failure of key institutions and bail-outs
  - Increased focus on systemic risk
  - Credit default swaps and other credit derivatives
  - Failure of counterparty risk mitigation methods (SPVs, rehypothecation)
- Central counterparty (CCPs) intermediates counterparty risk
  - Reduce exposures and mitigate potential domino effects if a counterparty defaults

<u>Bilateral netting</u>



<u>Multilateral netting</u>



Advantages of Central Clearing

- Loss mutualisation
  - Reserve fund
  - Contributions from members
  - Third party insurance
  - Reduces systemic risks (chain reaction caused by a single counterparty default)
- Independent valuation
  - Due to daily margining requirements
- Capital reduction
  - Reductions proposed under Basel 3
- Legal and operational efficiencies
  - Collateral, netting and settlement functions of a CCP
- Liquidity
  - Enhanced market entry

Disadvantages of Central Clearing

- Cost
  - Cost of entry (via margin requirements etc) prohibitive for some counterparties
  - Cost will be higher in CCP cleared markets compared to bilateral ones (Pirrong [2009])
- Standardisation
  - Custom products are not possible (even small changes such as different maturity date)
- Legal and operational risks
  - Integrity of netting is absolutely critical across all jurisdictions
- Too big to fail
  - Homogenisation is not necessarily a good thing - think of Greece as a CCP member and the Euro currency as the CCP
  - False sense of security
    - CCP failure would be catastrophic