The Role of Counterparty Risk in the Credit Crisis

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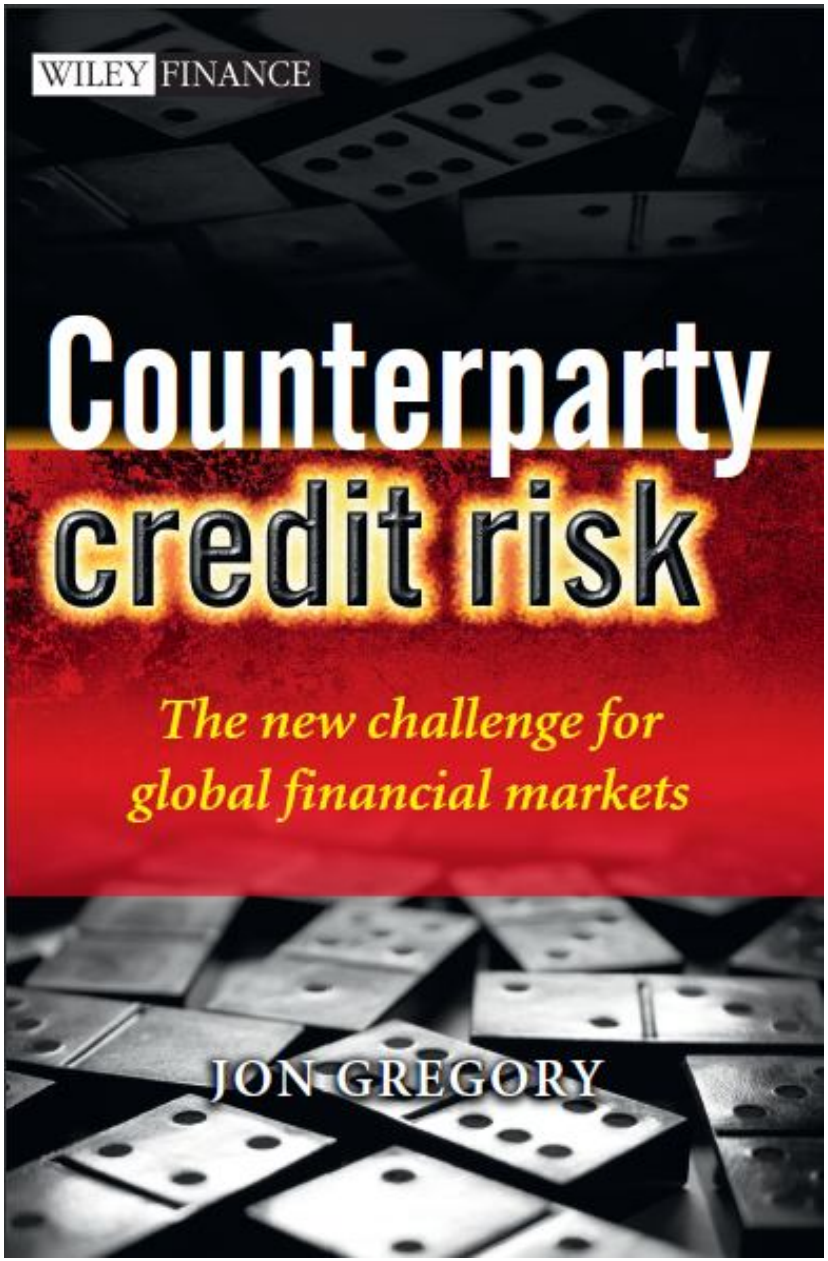

WILEY FINANCE
Counterparty credit risk
The new challenge for global financial markets
JON GREGORY

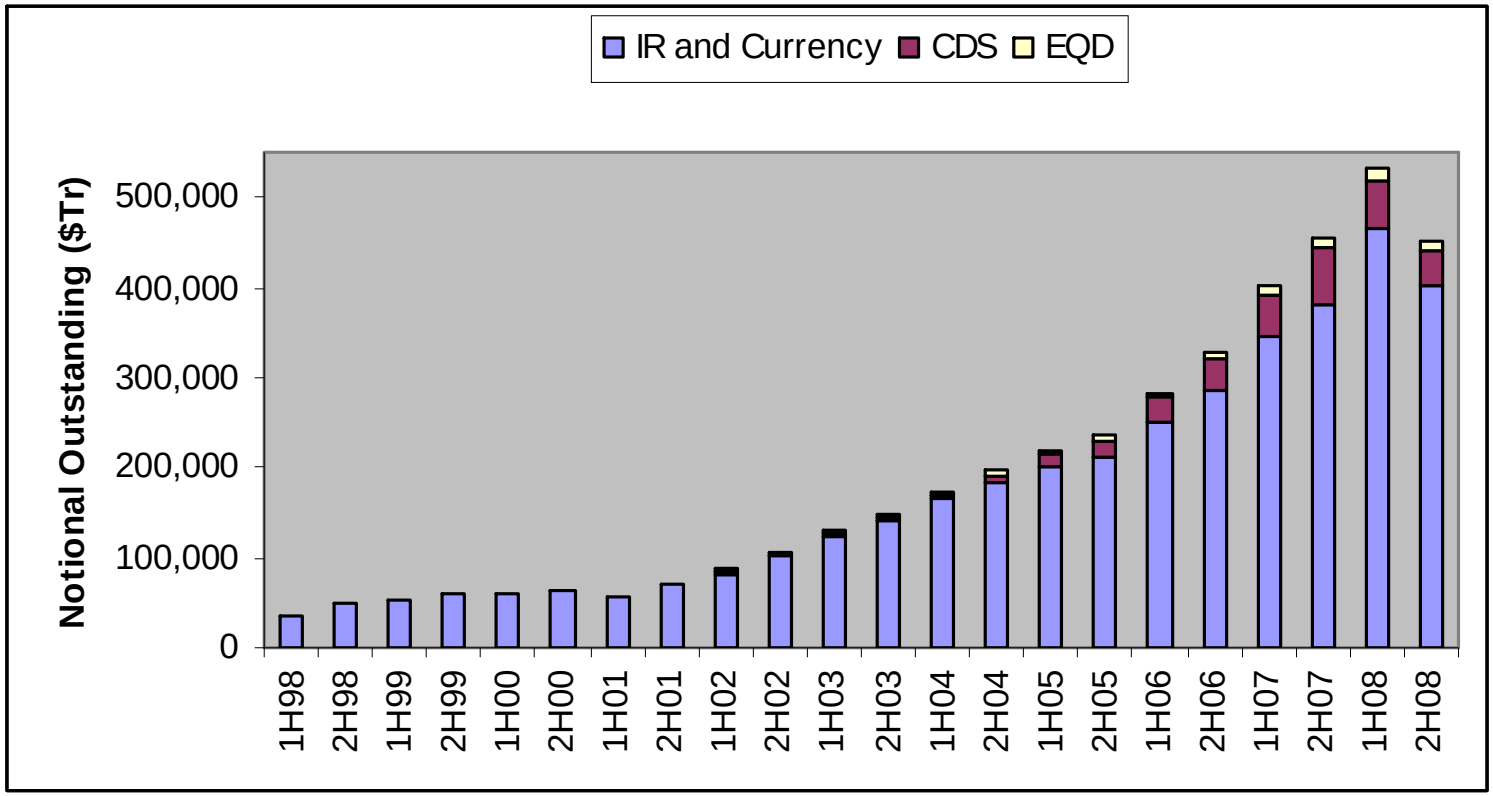
Lessons Learned (2007-2009)

- "Too big to fail" concept is flawed
- Triple-A counterparties do not necessarily represent minimal counterparty risk
- Legal risks need to be carefully considered (rehypothecation of collateral, SPVs, netting)
- Market participants will inevitably create wrong-way risks (hedge funds, monolines, banks)
- You can easily disguise and repackage counterparty risk (CCDS, gap risk, legal risk, …) but you **cannot easily get rid of it**

The Role of Counterparty Risk in the Credit Crisis

i) The OTC derivatives market in the context of counterparty risk

The Birth of OTC Derivatives



- OTC dominate exchange traded derivatives
- But credit crisis has curtailed strong growth in derivatives markets

OTC Derivatives Market

- Characteristics of the OTC derivatives market
  - Dominated by a relatively small number of large “dealers”
  - Potentially highly complex and customised products
  - Strong reliance on risk mitigation methods to allow gross credit exposure to grow exponentially
- The “too big to fail” assumption
  - Many market participants, consciously or not, considered the probability of many institutions failing to be zero
  - Monolines, large banks etc
  - This had the impact of obscuring a lot of counterparty risk

Mitigating Counterparty Risk

- There are many methods available to mitigate counterparty risk in the OTC derivatives market
  - Netting
  - Close-out
  - Additional termination events
  - Collateral
  - Hedging
  - (Central counterparties)
- Yet we still ended up in a major counterparty risk crisis

Birth of the Crisis

- Both exposure and default probability were underestimated
- Default probability
  - Lehman, monolines will never fail
  - Sometimes based on backwards looking rating based methods
- Exposure
  - Rehypothecation of collateral
  - Collateral quality
  - Poor assessment of wrong-way risk

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ii) Unilateral and bilateral counterparty risk

Unilateral Credit Value Adjustment (CVA)

- Allows the risky value of a derivative(s) to be represented as the risk-free value less a specific term
- This term is often referred to as the credit value adjustment (CVA)

$$CVA_{unilateral} \approx LGD_C \times PD_C \times EPE$$

Loss given default

Default probability

Discounted expected positive exposure

- This can be thought of as the expected value of the possible future losses on the contract or "netting set" of contracts
- Unilateral CVA is a **cost**

Unilateral CVA in the Old Days

	Credit Rating	Credit spread (bps)
Bank	Aa1/AA+	10-15
Corporate	A3/A-	200-300

- Bank is “too big to fail”
  - Bank charges corporate unilateral CVA
  - If corporate asks for banks default probability to be taken into account, they get laughed at
- No CVA charges in interbank market (all too big to fail)
- When bank credit quality deteriorates, market becomes gridlocked

Bilateral CVA

$$CVA^{I}_{bilateral} \approx \underbrace{LGD_C \times PD_C \times EPE}_{CVA_{unilateral}} - LGD_I \times PD_I \times ENE$$

Own loss given default

Own default probability

Expected Negative exposure

- Bilateral CVA is symmetric so counterparties agree on a price
- Example

	Our point of view	Counterparty point of view
CVA	3.480%	1.235%
Adjusted CVA	2.766%	0.799%
BCVA	1.967%	-1.967%

Does Bilateral CVA Make Sense?

- Bilateral CVA has been widely adopted
  - Many banks base CVA on their own default
  - Accountancy rules permit this (e.g. FASB 157)
- Bilateral CVA has some potentially unpleasant features
  - Total amount of CVA in the market sums to zero
  - Risky value may exceed risk-free value
  - Netting and collateral may increase CVA
  - Hedging this component is problematic

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 naïvely 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 collateralization 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 collateralization. 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 $t(s \geq t \geq T)$. 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 collateralization. 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.
- $V(s, T) \leq 0$. 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).

- How to monetarise bilateral CVA to justify paying for counterparty risk
  - Most institutions do this by selling CDS protection on correlated names

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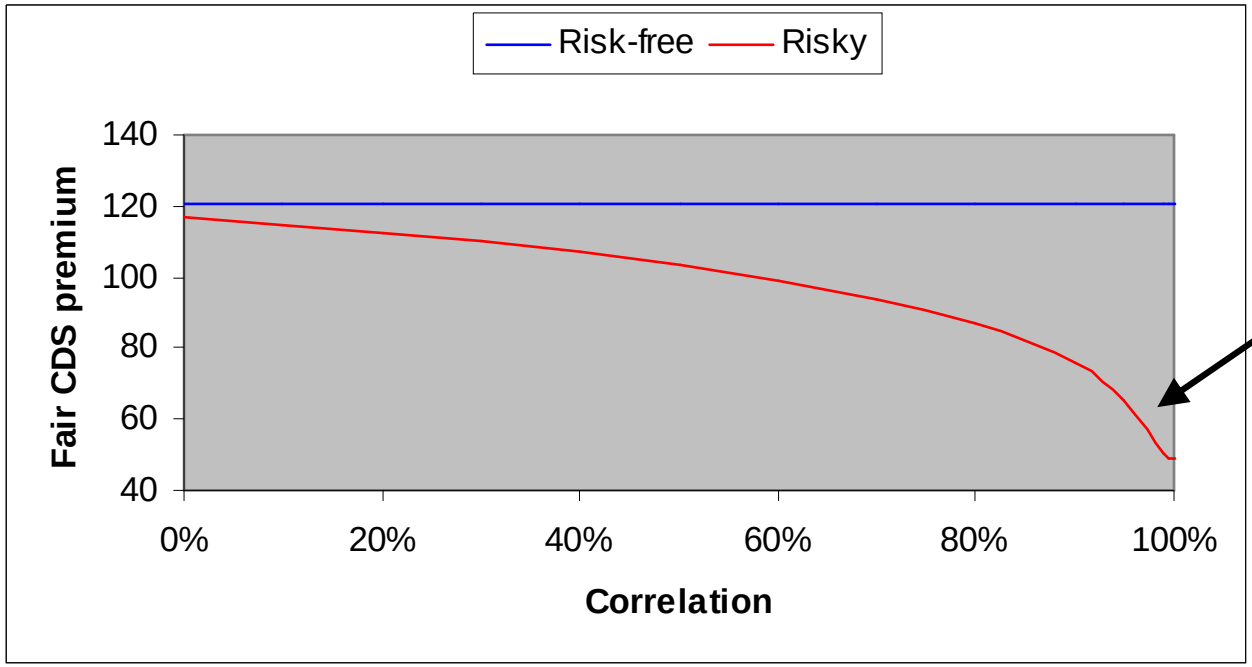
iii) Counterparty risk in credit default swaps and tranches

CDS Counterparty Risk

- Long protection CDS position has wrong-way risk
  - Positive MtM due to reference entity spread widening means counterparty credit quality is likely to be deteriorating

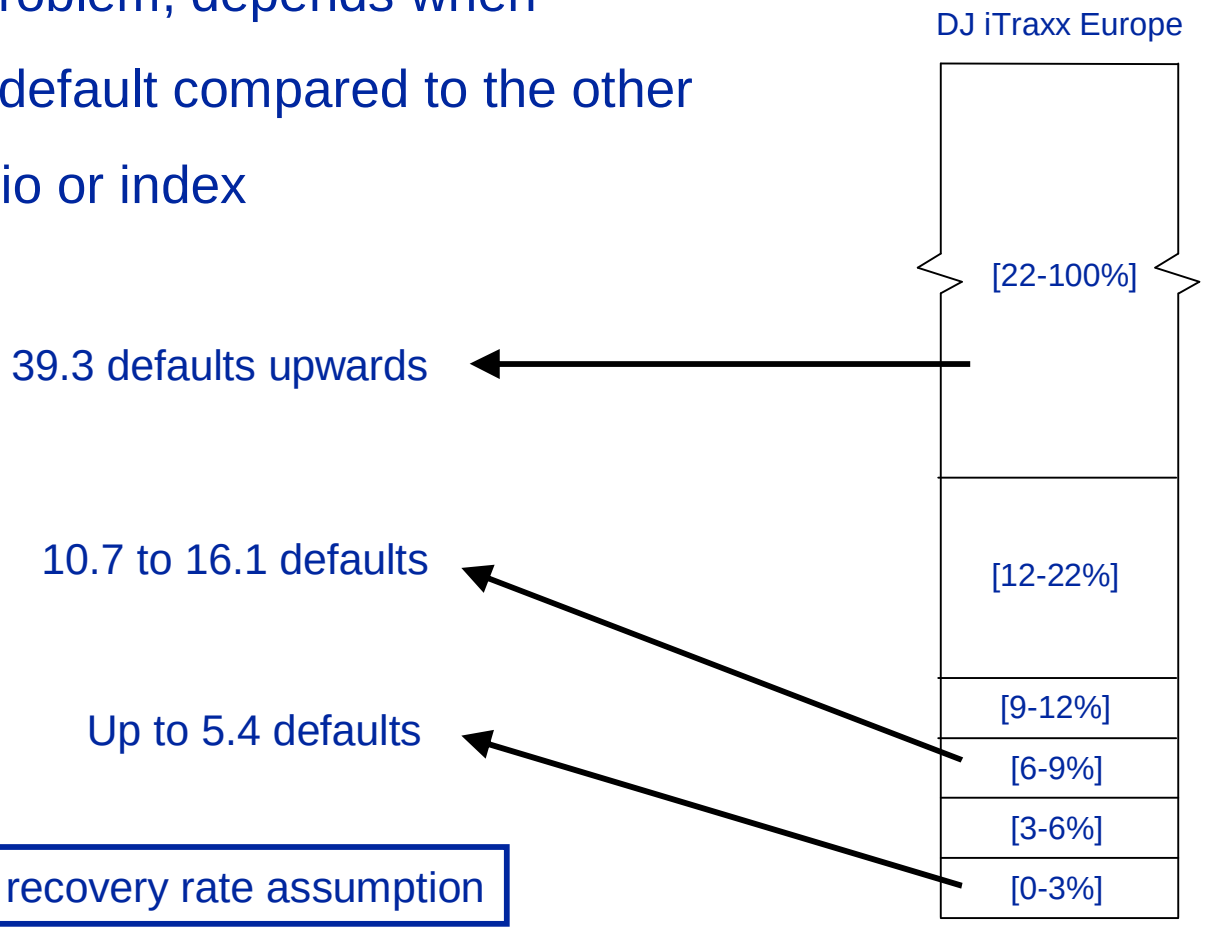


Best hedge for bilateral CVA

- Counterparty risk is easy to pass around but not easy to get rid of

Counterparty Risk on Tranches

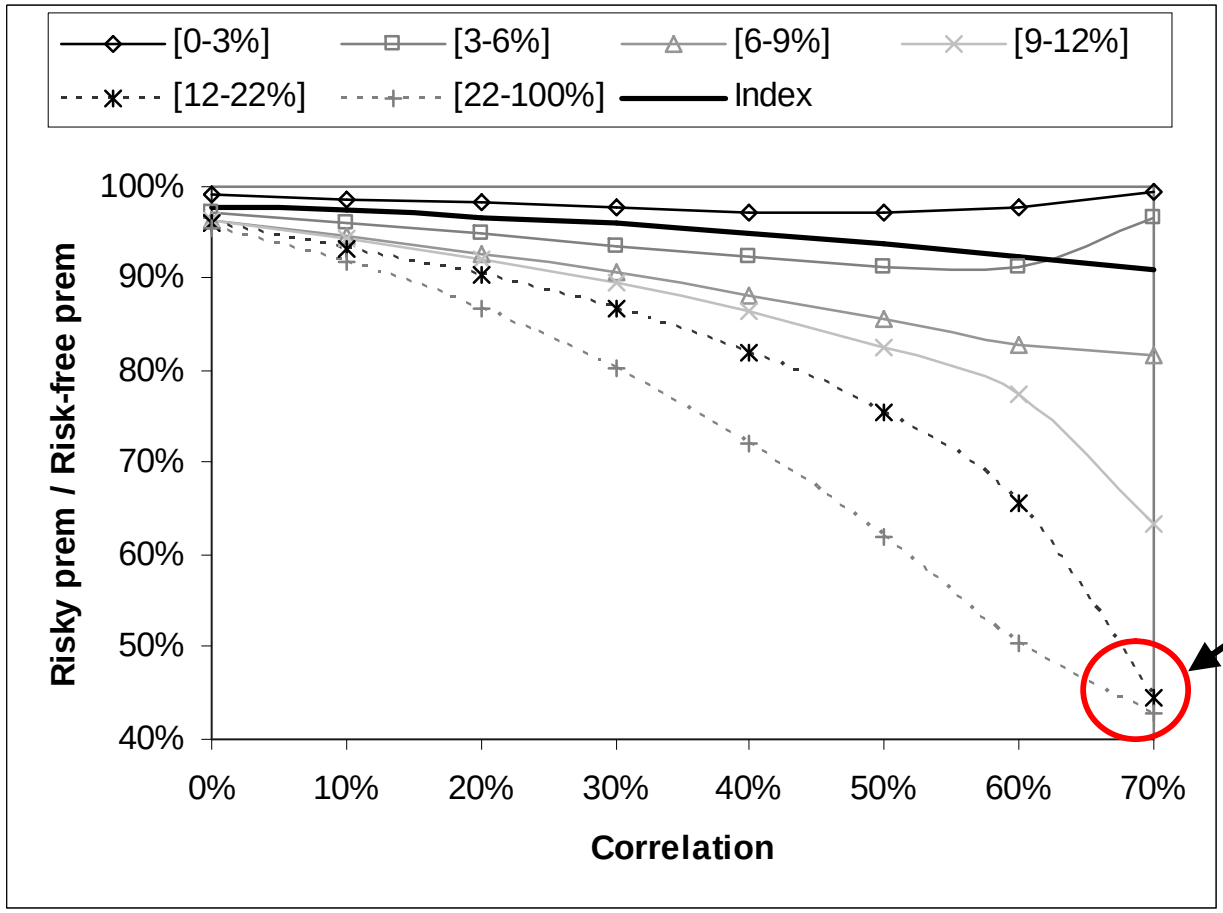
- More complicated problem, depends when counterparty would default compared to the other names in the portfolio or index



125 name portfolio, 30% recovery rate assumption

Counterparty Risk on Tranches

- Counterparty risk varies substantially across capital structure



Massive wrong-way risk
- worth little more than recovery value (40%)

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iv) Why monolines failed

Leveraged Super Senior Transactions

- Popular way of buying super senior protection via creation of triple-A product based on a super senior tranche in leveraged form
- Essentially, the wrong-way counterparty risk inherent in buying super senior protection is converted into so-called “gap risk”
  - Gap risk is market risk from being potentially unable to unwind the leveraged transaction in time
- But the gap risk was more severe than assumed by rating agencies and issuers
  - This can be proved theoretically via a thorough analysis of the cashflows
  - Was also shown empirically during the first period of the crisis (August 2007)

CUTTING EDGE. CREDIT DERIVATIVES

A trick of the credit tail

*Leveraged super-senior (LSS) trades represent a mechanism for packaging senior credit risk. Many LSS structures have been issued to date and yet there seems to be no formal pricing approach. In this article, **Jon Gregory** discusses the valuation of LSS protection in a model-independent framework. He argues that the 'equivalence' approach to pricing that seems widely used is not appropriate*

The structured credit market has grown rapidly in recent years with the use of synthetic collateralised debt obligations (CDOs), which allow issuers to sell a particular tranche of a portfolio hedged with more simple instruments such as single-name credit default swaps. One problem in the early development of the CDO market was the fact that correlation was a key input to the pricing but was a rather opaque quantity. The development of the index tranche market in 2004 provided a solution to this problem of observability, and has led to correlation trading across the capital structure for corporate credit portfolios and other asset classes such as asset-backed securities (ABSs), leveraged loans and commercial mortgage-backed securities.

problems arising from the market turbulence of July and August 2007, which created significant mark-to-market losses from a position taking super-senior credit risk (a result of spread widening and increases in implied correlation). Our focus will be a robust theoretical pricing study and not other qualitative aspects such as rating agencies' approaches and problems arising from the disruption in the Canadian conduit market.

The leveraged super-senior structure

The premise of the LSS structure is that super-senior spreads in unleveraged form do not have the correct risk-return profile for many investors since their premium is too small and the issuer therefore applies leverage to the product to create a more attractive return. The leverage in a LSS transaction reflects the fact that the investor's cash participation is less than the notional of the super-senior tranche. For example, a $10 million investment may be leveraged 10 times into a super-senior tranche with a notional of $100 million. The investor has sold protection on $100 of protection but posted only $10 initial collateral. Generally, for a leverage of x times, the investor will initially commit $1/x$ units of collateral, as illustrated in figure 1. LSS trades have mostly been structured on corporate credit but also, more recently, on ABS portfolios.

There needs to be a mechanism to mitigate the risk that the LSS issuer retains via the uncollateralised exposure. This is achieved using a 'trigger event', where the investor might have the option to de-leverage by posting more collateral but will otherwise face the structure being unwound by the issuer at prevailing market rates.

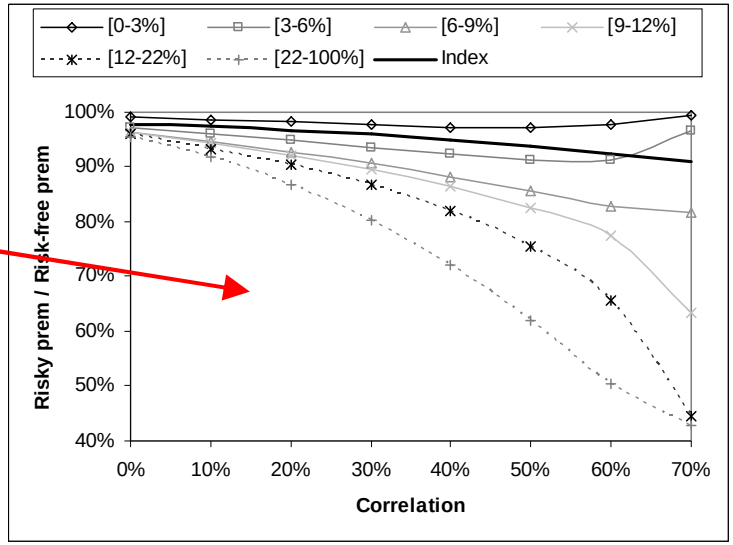
To understand the LSS trigger mechanisms, note that the value

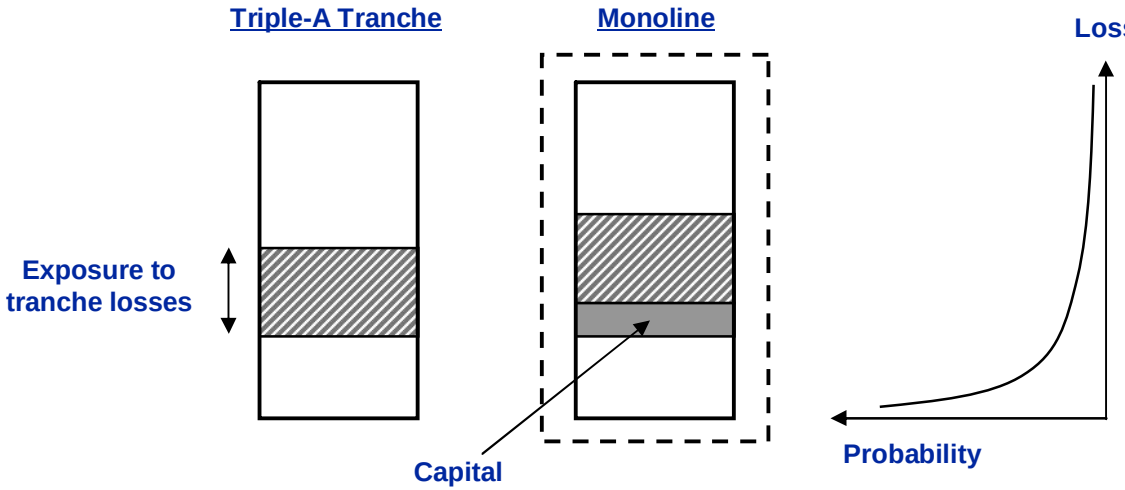
Monolines and CDPCs

- Super Senior Tranches of Credit Portfolios have (arguably) little or no default risk
- Monolines aim to take advantage of this “Free Lunch”
- To generate a good return they will need to be highly leveraged
- They therefore have to avoid the mark-to-market volatility of these tranches which can be significant
- They do this by attaining a triple-A rating but not posting collateral

Problem with Monolines

- Rating agency mistakes
  - It's not the absolute credit quality that is important
  - Seniority of tranche and correlation are more important
  - Basis for quantitative assessment of triple-A rating is flawed





Monoline Purchased Protection

- A monoline is a complex LSS structure
  - LSS with multiple clients and so overall leverage vis à vie a single client is unknown
- Monolines run a very concentrated portfolio
  - creating severe wrong-way risk
- They achieve a good rating via not posting collateral
  - Doesn't make sense
- Protection purchased from monolines is practically worthless
  - Can be proved theoretically
  - Like LSS has been proved empirically (e.g. Merrill Lynch $10.8 billion in writedowns)

CUTTING EDGE. CREDIT DERIVATIVES

A free lunch and the credit crunch

Monoline insurers act as triple-A guarantors of the senior risks in structured finance. A purchaser of credit insurance or protection from a monoline may argue that they take only a small amount of the counterparty risk that is a common side-effect of trading over-the-counter derivatives products. However, in this article ***Jon Gregory*** *argues that credit insurance purchased in this fashion carries significant counterparty risk and from a quantitative point of view has little or no value*

an LSS being worth the equivalent amount of standard protection minus some 'gap risk', it has a much smaller value corresponding to the collateralised protection plus a complex 'trigger option' arising from the protection buyer's right to unwind the structure via some predetermined mechanism. In this article, we argue that obtaining senior credit protection from a credit derivative product company (CDPC) or monoline can essentially be thought of as executing a more complex and opaque LSS structure. We then argue that the assumption that such protection can be priced via simply assuming a (small) counterparty risk adjustment is incorrect.

CDPCs and monolines

Monoline insurers are financial guarantee companies that are triple-A rated and provide insurance for investment-grade transactions in structured finance such as asset-backed securities (ABSs) and collateralised debt obligations. CDPCs are similar in concept but take on risk in the form of derivatives rather than insurance

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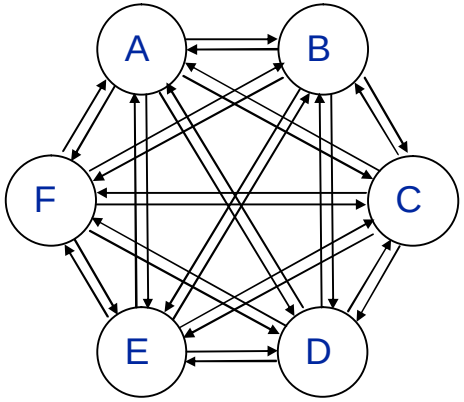
v) Will central counterparties improve the situation?

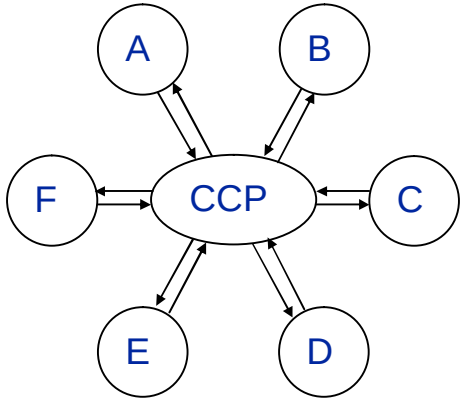
Advantages of Central Clearing (I)

- Multilateral netting reduces overall exposure in the market

Bilateral netting



Multilateral netting



- Other advantages of a central counterparty (CCP)
  - Loss mutualisation
  - Independent valuation
  - Capital reduction
  - Legal and operational efficiencies
  - Liquidity
  - Standardisation

Disadvantages of Central Clearing

- Homogeneity is not necessarily a good thing
  - No incentive to monitor the credit quality of your counterparty
  - Poor credit quality institutions may find it easier to build up large positions
  - Institutions with better than average risk management will lose out
- Cost
  - Cost of entry (margin requirements etc) may be prohibitive for some counterparties, overall costs in CCP cleared markets higher than bilateral ones (Pirrong [2009])
- Standardisation
  - Custom products not possible (even small changes such as non-IMM maturity date)
- Legal and operational risks
  - Integrity of netting is absolutely critical across all jurisdictions
- CCP failure
  - Would be catastrophic
- Will CCPs turn into another monoline story?

Conclusions

- Counterparty risk was always there but was not fully appreciated
- A VAR like revolution in counterparty risk management and CVA is required
- Simple ways of reducing counterparty risk don't work (for the market)
  - LSS trades
  - Monolines
  - Use of bilateral CVA
- Proper ways of reducing counterparty risk are not cheap or easy
  - Strong collateral requirements
  - Hedging
- Central clearing may offer some benefits but is not a magic solution