Panorama des problématiques actuelles relatives à l'évaluation des swaps

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An overview of current issues in the pricing of swap contracts

- The new regulatory framework: A typology of swap contracts
- New pricing and risk management issues with swap contracts
  - *A focus on FVA (Funding Valuation Adjustments)*
- Market infrastructure
  - *Systemic risk implications of CCPs*
  - *Non mandatory cleared swap contracts*
- Next on the agenda: trade repositories, SEF

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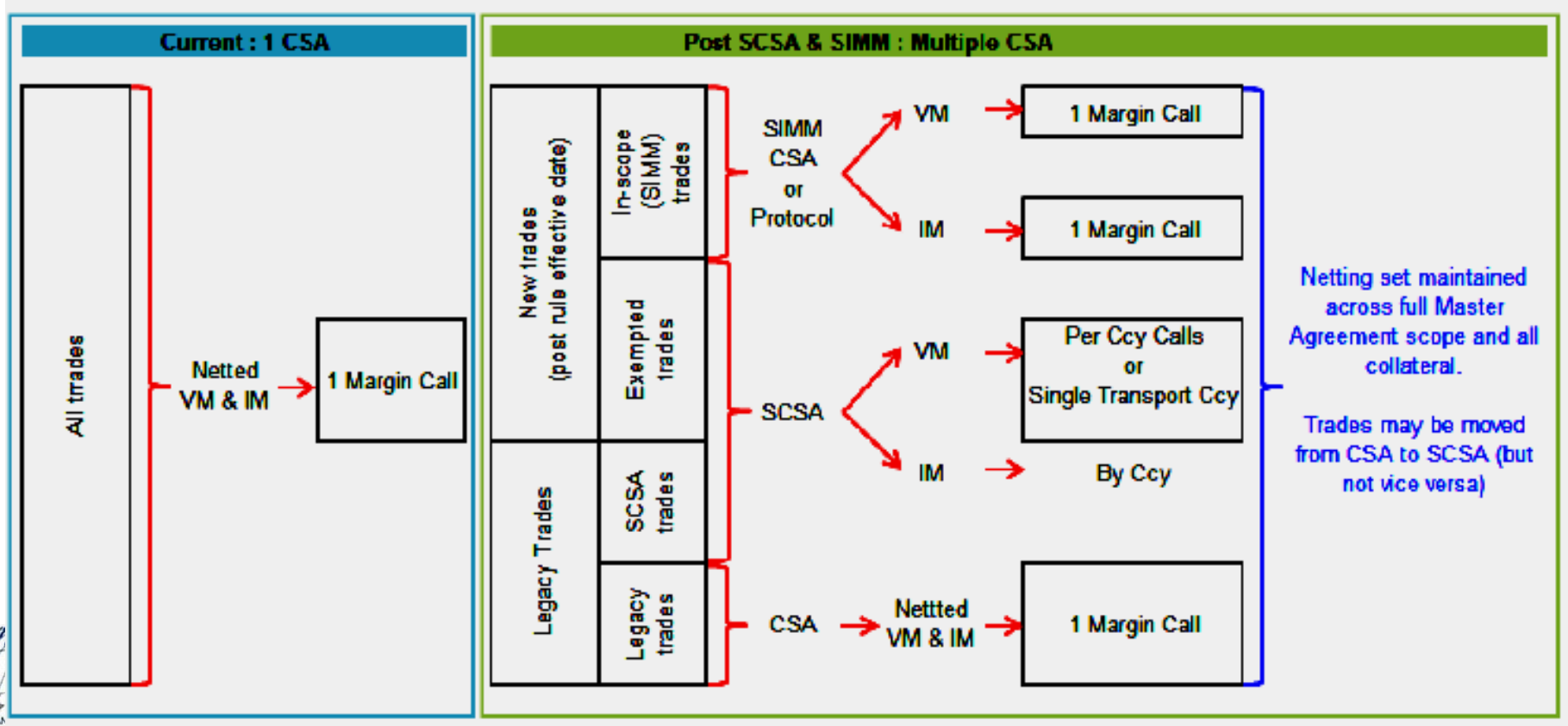
A typology of swap contracts: Swap markets are by far the largest financial market

- Vanilla swaps cleared through CCPs
  - *IRS: LCH, CME, …*
  - *CDS : ICE, …*
  - *Mandatory clearing for vanilla swaps*
  - *Variation margins + initial margins*
    - specific to CCP, time varying rules, …
  - *Different supervisory bodies : CFTC, SEC, EBA, …*
- Non mandatory cleared swaps
  - *Current ISDA + CSA*
  - *Variation margins + bilateral IM to be implemented*
- Exemptions
  - *Sovereigns (unilateral CSAs), FX, covered bond swaps, structured product swaps (no VM)*

A typology of swap contracts

- Regulations are not retroactive
  - *Legacy trades, new non exempt trades, exempt trades*
  - *Single CSA or multiple CSA for legacy and new trades?*



New pricing and risk management issues with swap contracts

- Tradable instruments, complete markets, pricing rules for collateralized contracts.
- Liquidity impact of collateral flows: where do we stand? Funding specificities of swap contracts, prudent valuation, disentangling LVA and CVA.
- Different lending and borrowing rates: a zero-sum systemic game among dealers?
- Consistency between internal pricing models and settlement prices computed by CCPs
  - *Additive and recursive valuation rules.*
- Trade contributions when pricing rule is not linear (asymmetric CSAs)
  - *BSDE, Euler's and marginal price contribution rules.*

A focus on FVA (funding valuation adjustments)

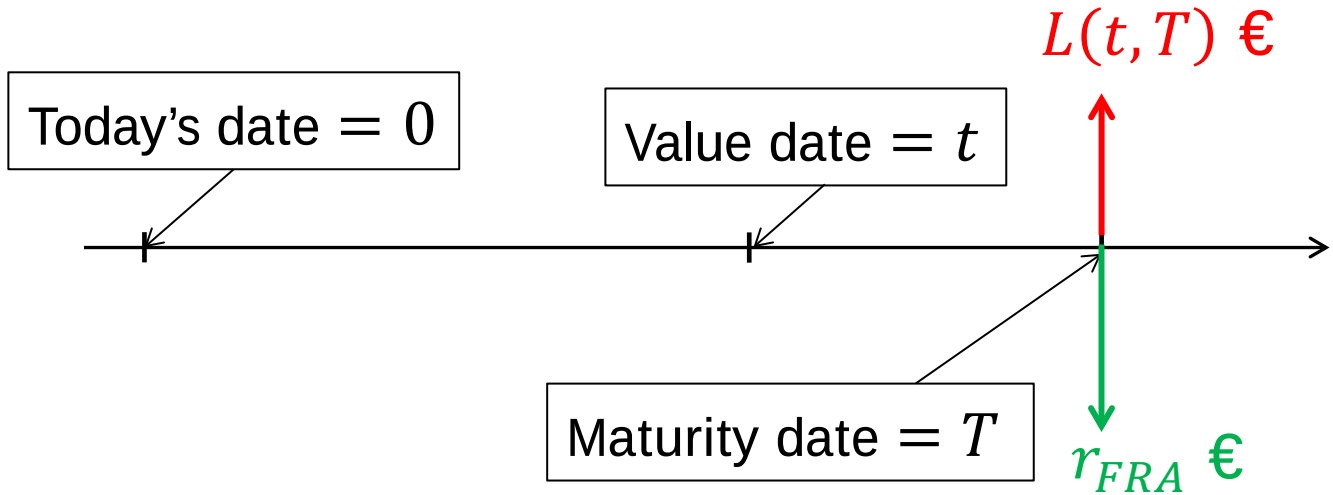
- From Risk magazine, March 2013
  - *Bank accounting departments are struggling to work out how, and whether, to recognise the funding valuation adjustment (FVA) trading desks argue is a key component of derivatives prices.*
  - *Auditors are nervy about vetting a number that can run into the hundreds of millions of dollars, but which may be constructed differently at every institution*
  - *John Hull and Alan White argued that adding FVA to the price of a trade violates a rule known as the law of one price.*
    - *The FVA debate*, Risk Magazine, 2012
      - http://www.risk.net/risk-magazine/analysis/2188684/risk-
    - http://www.youtube.com/watch?v=pEjRCoAz0-g

A focus on FVA (funding valuation adjustments)

- *"It Cost JPMorgan $1.5 Billion to Value Its Derivatives Right"*
  - http://www.bloomberg.com/news/2014-01-15/it-cost-jpmorgan-1-5-billion-to-value-its-derivatives-right.html
- *"JP Morgan takes $1.5 billion FVA loss"*
  - http://www.risk.net/risk-magazine/news/2322843/jp-morgan-takes-usd15-billion-fva-loss
- *"If you start with derivative receivables (…) of approximately $50 billion,*
- *Apply an average duration of approximately five years and a spread of approximately 50 basis points,*
- *That accounts for about $1 billion plus or minus the adjustment".*
  - Marianne Lake, JP Morgan CFO

A focus on FVA (funding valuation adjustments)

- Funding books of uncollateralized swaps: the puzzle
  - For simplicity, leave aside CVA/DVA and focus on FVA/LVA
  - Pure liquidity effects, no double counting issue between DVA and LVA
- *Mercurio (2009): forward Libor is only the forward price of Libor*



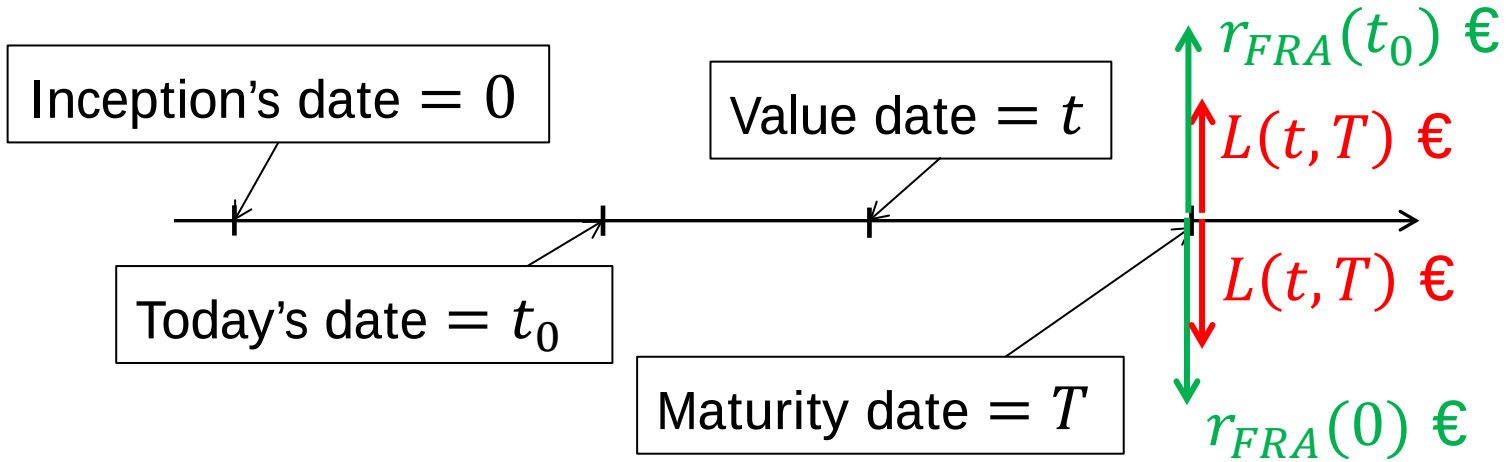
- ***r_{FRA} is the forward price of unknown Libor as seen from today's date.***

A focus on FVA (funding valuation adjustments)

- r_{FRA} is the forward price of unknown Libor as seen from today's date.
  - *The price is specific to the two parties involved in the trade*
    - Includes all credit / debit valuation adjustments
    - The default close-out amount is subject to legal uncertainty
    - Uncollateralized trade
      - no extra cash-flows due to collateral payments
    - Pure forward contract: no upfront premium paid at trade inception
  - *Funding books of uncollateralized swaps: the puzzle*
    - Consider a legacy FRA with given fixed rate r_{FRA}
    - Enter an at the money FRA with opposite direction

A focus on FVA (funding valuation adjustments)

- Funding books of uncollateralized swaps: the puzzle
  - *Consider a legacy FRA with given fixed rate* r_{FRA}
  - *Enter an at the money FRA with opposite direction at* t_0



  - *Cancels out floating rate payments, only left with a fixed cash-flow of* $r_{FRA}(t_0) - r_{FRA}(0)$ *paid at T*
  - ***No funding need at any point in time*** *(only forward contracts)*

A focus on FVA (funding valuation adjustments)

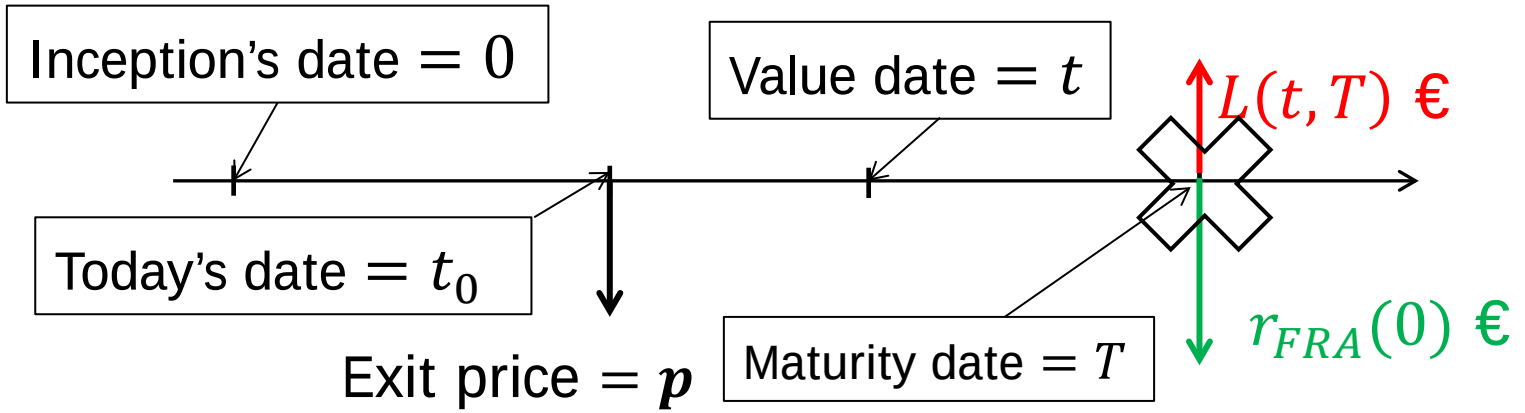
- Computing the present value of a legacy FRA trade
  - *Present value of previous at the money FRA equals zero since no upfront premium is paid (pure forward contract)*
    - Hedging floating rate cash-flow with <u>at the money</u> FRA does not create or destroy value
  - *Present value of legacy trade implies discounting a fixed cash-flow of* $r_{FRA}(t_0) - r_{FRA}(0)$ *paid at T*
- What discount rate to be used is the question
  - *FRA rates are forward prices but cannot be locked*
    - due to possible defaults (Mercurio (2009))
  - *Cannot be chained to compute discount rates as in finance textbooks*
  - *Use of different curves to compute forward and discount rates*
    - Two curves, one price idea (Bianchetti, 2010)
      - http://www.risk.net/digital_assets/1565/bianchetti.pdf

A focus on FVA (funding valuation adjustments)

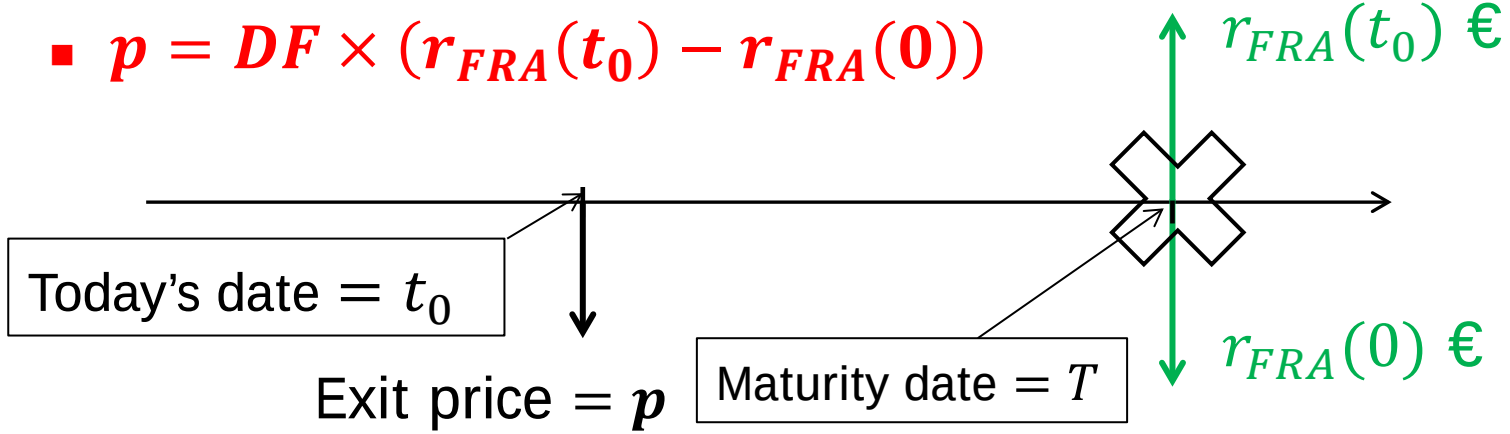
- Funding books of uncollateralized swaps: the puzzle
  - *What discount rate to be used is the question*
    - Model based approach further discussed and compared with
    - Market based approach
  - *Market based approach based on the concept of exiting the legacy trade against some cash at exit date*
  - *The cash paid to exit the trade is the price of the FRA*
    - Discount factors are inferred from such market prices
  - *Exiting the FRA is implemented through a novation trade*
  - *Related concept is the trading of out of / in the money FRA with upfront premiums*
    - Lack of novation trades?

A focus on FVA (funding valuation adjustments)

- Using novation trades to compute the fair value of a FRA
  - *What is a novation trade? Lack of novation trades?*



- $\boldsymbol{p = DF \times (r_{FRA}(t_0) - r_{FRA}(0))}$



A focus on FVA (funding valuation adjustments)

- From JP Morgan Fourth Quarter 2013 Financial Results

- The Firm implemented a Funding Valuation Adjustments ("FVA") framework this quarter for its OTC derivatives and structured notes, reflecting an industry migration towards incorporating the cost or benefit of unsecured funding into valuations
  - For the first time this quarter, we were able to clearly observe the existence of funding costs in market clearing levels
  - As a result, the Firm recorded a $1.5B loss this quarter
- FVA – which represents a spread over LIBOR – has the effect of "present valuing" market funding costs into the value of derivatives today, rather than accruing the cost over the life of the derivatives
  - Does not change the expected or actual cash flows
- FVA is dependent on the size and duration of underlying exposures, as well as market funding rates
- The adjustment this quarter is largely related to uncollateralized derivatives receivables, as
  - Collateralized derivatives already reflect the cost or benefit of collateral posted in valuations
  - Existing DVA for liabilities already reflects credit spreads, which are a significant component of funding spreads that drive FVA
- Current quarter reflects a one-time adjustment to the current portfolio
  - The P&L volatility of the combined FVA/DVA going forward is expected to be lower than in the past
- Refinements to the valuation approach will be made as appropriate, based on market evidence

http://files.shareholder.com/downloads/ONE/2956498186x0x718041/2a52855e-8269-4cfb-9ab9-d226e5d43844/4Q13presentation.pdf

A focus on FVA (funding valuation adjustments)

FVA for Uncollateralized Trades

J.P.Morgan

- **For uncollateralized trades, any future positive cash flow is equivalent to investors are purchasing a bond issued by the counterparty, hence its value should simply be given by** $TV = Z^{+}e^{-(r+s_c)T}$
- **For uncollateralized trades, any future negative cash flow is equivalent to investors are issuing a bond to the counterparty, hence its value should simply be given by** $TV = Z^{-}e^{-(r+s_u)T}$
- **When netting is allowed, then**

$$\begin{aligned} TV &= Z^{+}e^{-(r+s_c)T} - Z^{-}e^{-(r+s_u)T} \\ &= Ze^{-rT} - Z^{+}e^{-rT}\left(1-e^{-s_cT}\right) + Z^{-}e^{-rT}\left(1-e^{-s_uT}\right) \\ &= RV - CVA + DVA - FVA + Residual \end{aligned}$$

where

$$\begin{aligned} RV &= Ze^{-rT} \\ CVA &= Z^{+}e^{-rT}\left(1-e^{-c_cT}\right) \\ DVA &= Z^{-}e^{-rT}\left(1-e^{-c_uT}\right) \\ FVA &= Ze^{-rT}\left(1-e^{-bT}\right) \end{aligned}$$

and *b* is cash-synthetic basis (assumed to be same for both counterparty and investor)

- **In general, FVA can be approximated through**

$$CVA = \int EEPV(t)P_c(t)\tilde{c}_c(t)dt \qquad DVA = \int RevEEPV(t)P_u(t)\tilde{c}_u(t)dt \qquad FVA = \int MEPV(t)\tilde{b}(t)dt.$$

CVA, FVA and Counterparty Credit Risk, Liu, JP Morgan, August 2013

Deutsche Bank

A focus on FVA (funding valuation adjustments)

- Negative bond cds basis could imply positive fva effect?
  - *Deutsche Bank Corporate Banking & Securities 4Q2013*
  - *Fourth quarter results were also affected by a EUR 110 million charge for Debt Valuation Adjustment (DVA) and a EUR 149 million charge for Credit Valuation Adjustment (CVA)*
  - *Which offset a **gain** of EUR 83 million for Funding Valuation Adjustment (FVA).*
  - *FVA is an adjustment being implemented in 4Q2013 that reflects the implicit funding **costs** borne by Deutsche Bank for uncollateralized derivative positions.*
- **Volatile FVA would eventually lead to a capital charge**
  - *As for CVA …*
  - *Need to embed these in AVA charges?*

A focus on FVA (funding valuation adjustments)

- Funding books of uncollateralized swaps
  - *"If you start with derivative receivables (…) of $50 billion …"*
    - To fund or not to fund derivative receivables is the question
  - *Vanilla IR swaps do not involve upfront premium*
  - *Therefore, no need of Treasury at inception*
    - Treasury involved in fixed and floating leg payments
  - *Above $50 billion were not funded through the balance sheet*
    - Do not interfere with prudential liquidity ratios
  - *Receivables mainly result from accumulated margins*
    - Bid – offer on market making activities
    - Cash in directional trades
  - *Use of specific funding liquidity premium can be challenged*
    - Differentiation of fair value and prudent valuations (AVA)?

A focus on FVA (funding valuation adjustments)

- Funding books of swaps: Model based approaches
  - *In the case of fully collateralized contracts*
    - With no slippage risk at default
    - Discount rates are tied to the (expected) rate of return of posted collateral
      - Say EONIA or Fed funds rates in the most common cases
    - Calibration can be done on market observables with little adaptation and thus little model risk
      - Collateralized OIS and Libor swaps, possibly futures' rates
  - *This contrasts the case of uncollateralized contracts*
    - Modern math finance contributors (see references) use a funding spread but are short when it comes to figures
    - We miss out-of the money swap prices to calibrate discount factors

A focus on FVA (funding valuation adjustments)

- Funding books of swaps: Model based approaches
  - *The funding rate conundrum*
    - In the default-free setting of Piterbarg (2010, 2012), the funding/lending rates essentially acts as the usual short-term rate
    - ... In non linear approaches
      - Castagna (2013), Crépey (2012) Pallavicini et al. (2012), etc.
    - Funding spread is viewed as a difference to unobserved default-free rate
      - EONIA and fed fund rate include a default component
    - May or may not include an unobserved default component
      - One day maturity CDS are not traded
      - When well defined, short-term default intensity is unobserved
    - These approaches are not operational

New pricing and risk management issues with swap contracts

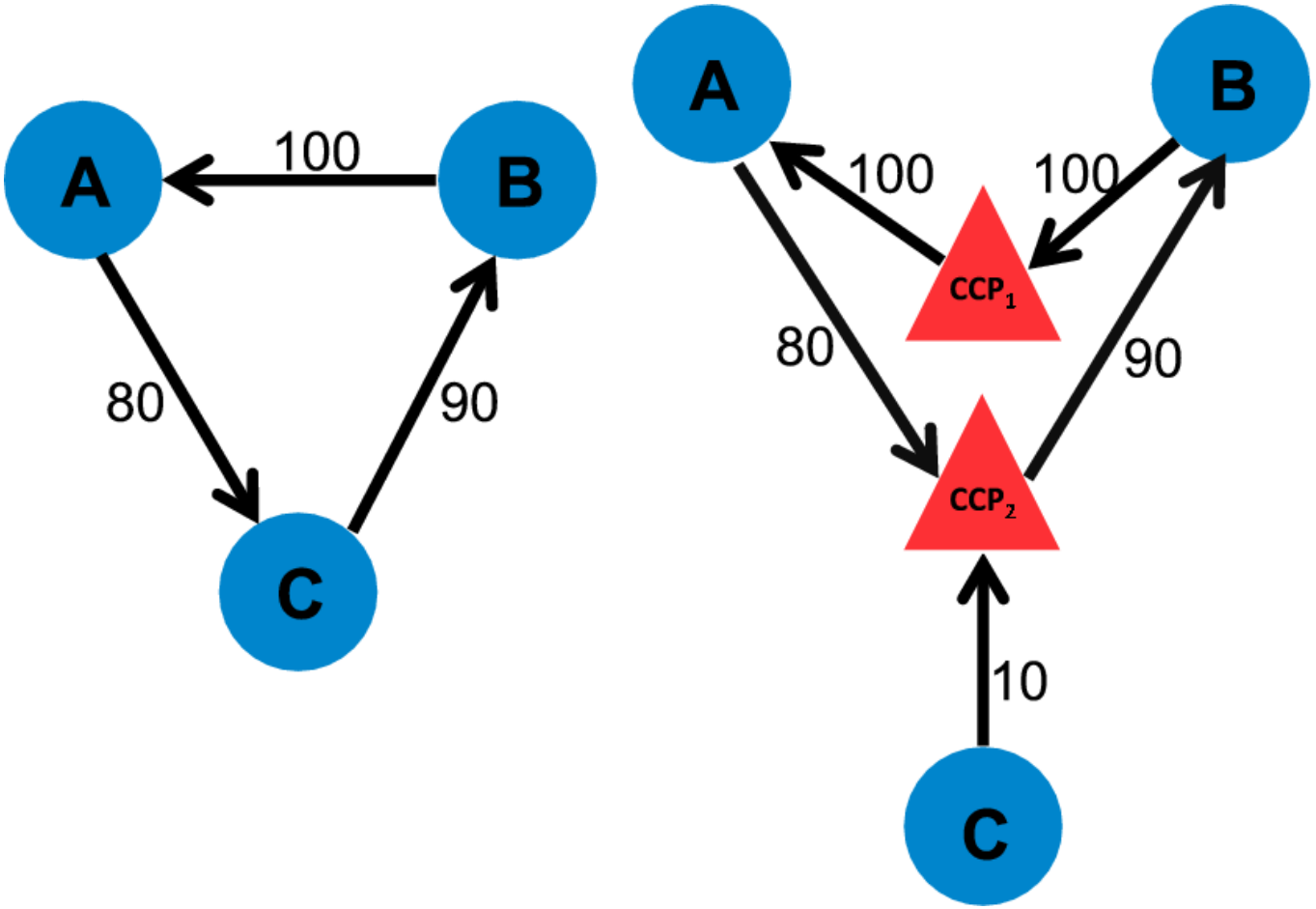
- Trade contributions when pricing rule is not linear (asymmetric CSAs)
  - *See "An overview of the valuation of collateralized derivative contracts", section 5.2*
  - *Marginal price of Z within portfolio X :* $\frac{P(X+\varepsilon Z)-P(X)}{\varepsilon}$
  - *Euler's price contribution rule*
  - *If* $P(\lambda \times X) = \lambda \times P(X)$
  - *Compute* $E[P'(X)Z]$
  - $P'(X)$*: Stochastic discount factor at the portfolio and CSA level*
  - *Adapting El Karoui et al (1997), it can be proved that the two approaches lead to the same price contribution of trade Z within portfolio X*

Systemic risk implications of CCPs

- Market fragmentation, interoperability, waterfalls and pooling of counterparty risks
- Initial margin vs capital protection
- CCP governance
  - *Rehypothecation of posted securities (and credit risk)*
  - *Clearing membership*
  - *Data processing and model risk when computing clearing prices*
  - *Product scope*
  - *Implication of competition among CCPs.*
- Initial margin procyclicality
  - *Volatility scaling*
  - *Haircut dynamics*
  - *Eligible collateral, thresholds.*

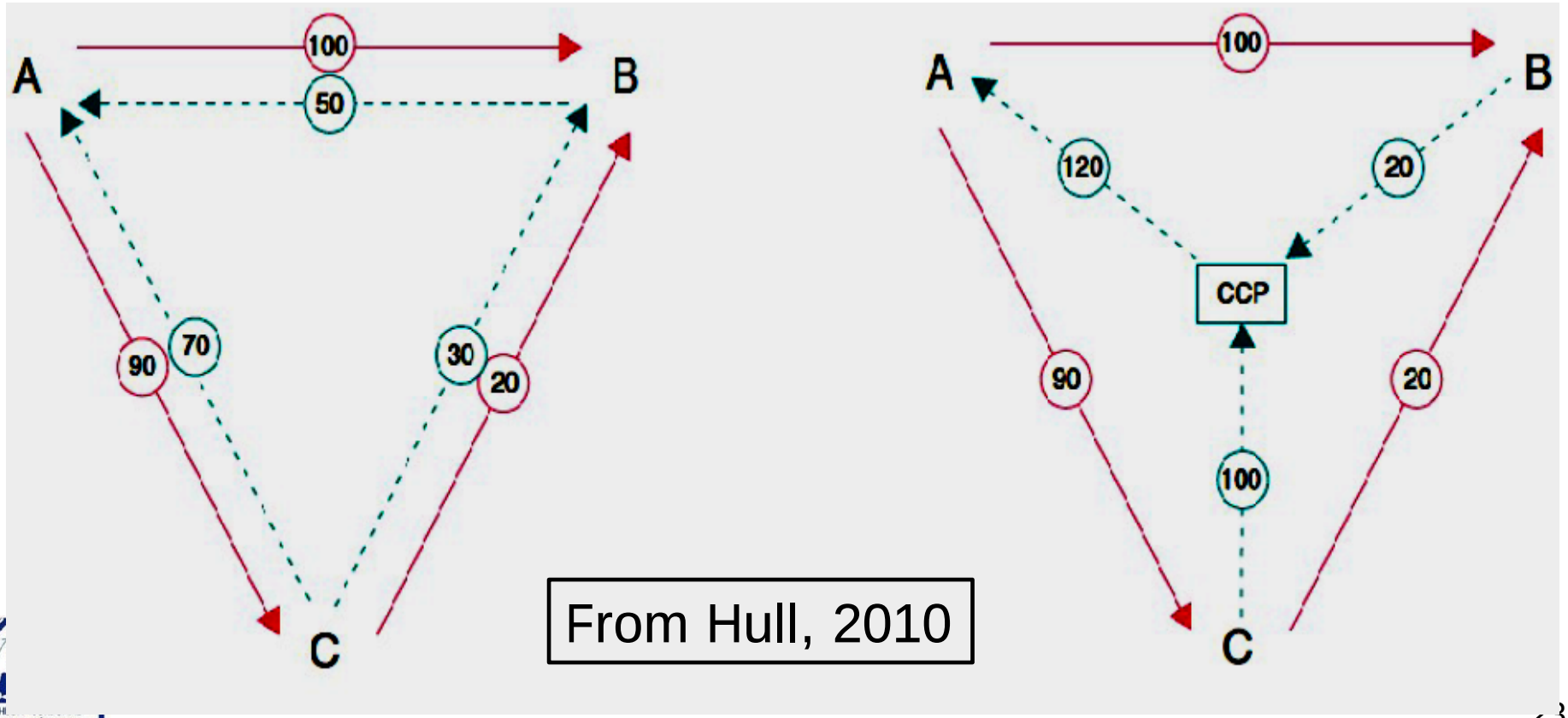
Systemic risk implications of CCPs / Market fragmentation

- Market fragmentation (LCH vs CME)



Systemic risk implications of CCPs / Market fragmentation

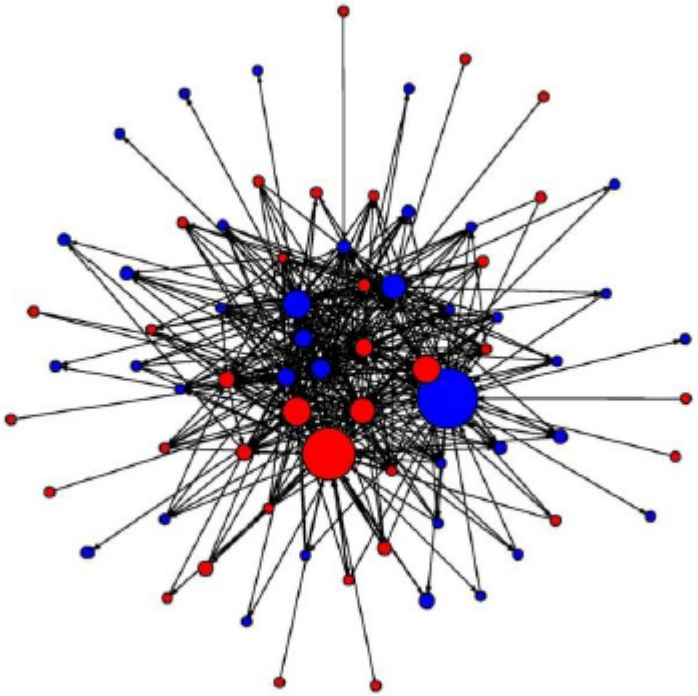
- If only a subset of swaps is centrally cleared, this can result in an increase of counterparty risk exposure
  - *Roughly, half of IRS are out of scope of central clearing*

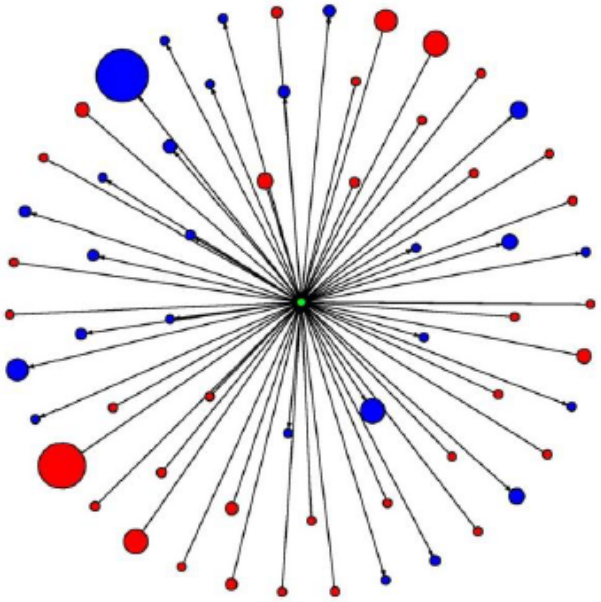


From Hull, 2010

Systemic risk implications of CCPs / counterparty risk on CCPs

- "Interconnectedness and Systemic Risk: Lessons from the Financial Crisis and Policy Implications"
  - *Remarks by Janet L. Yellen*
    - American Economic/American Finance Association Luncheon





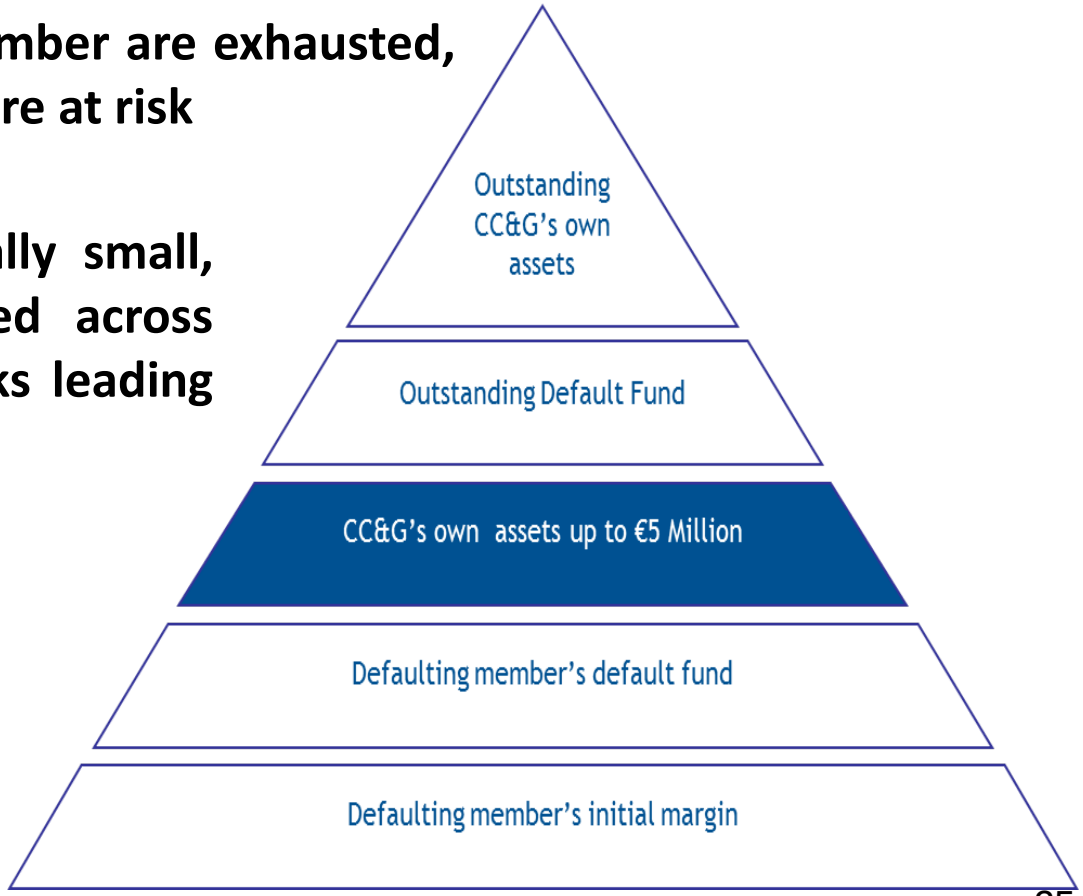
http://www.federalreserve.gov/newsevents/speech/yellen20130104a.htm

Systemic risk implications of CCPs / Increased Interconnectedness

- What we do we know about waterfalls and default of clearing member resolution?

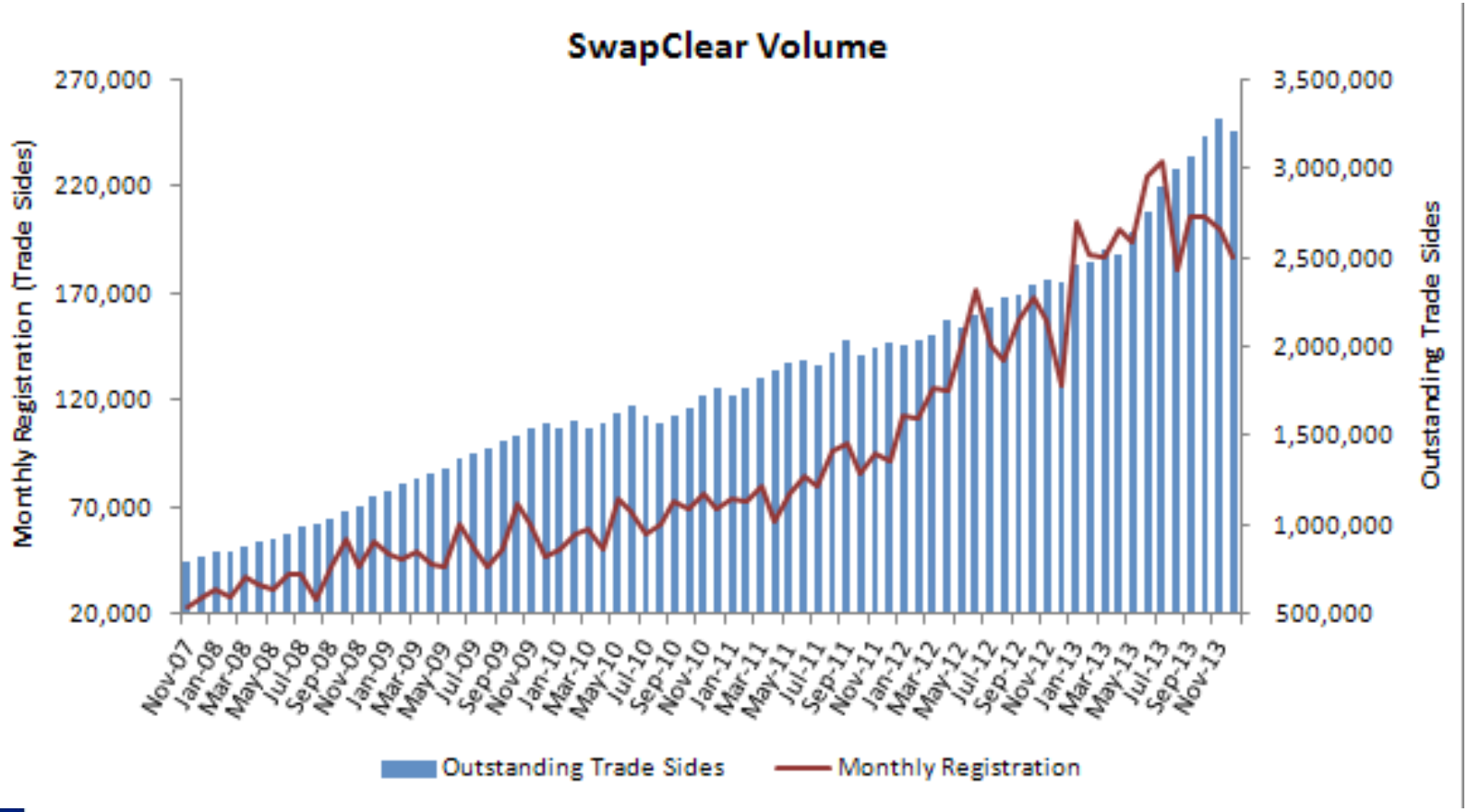
Once IM and DF of defaulting member are exhausted, funds of other clearing members are at risk

Since CCP's own funds are usually small, counterparty risks are dispatched across clearing members: pooling of risks leading to an increase of systemic risk



Systemic risk implications of CCPs

- Is increase in central clearing driven by regulation?



Systemic risk implications of CCPs

- CCP governance: a special private company
  - *Who is at risk? Stockholders, clearing members, …*
    - LCH Clearnet 2009: Clearing members 82.85%, Exchanges 17.15%
    - LCH Clearnet 2012: LSE 57%
      - LCH.Clearnet has ended a three-month search for a new CEO with the appointment of a Citigroup executive to fill the role.
      - http://www.efinancialnews.com/story/2013-10-22/suneel-bakhshi-lch-new-ceo?ea9c8a2de0ee111045601ab04d673622
  - *Who should regulate CCPs?*
    - In the US, SEC (security based swaps, e.g. single name CDS)
    - CFTC: other swaps such as index CDS
    - Netting or non netting of single name and index CDS for ICE IM computations
    - The Fed as a possible lender of last resort
  - *What are the incentives?*

Systemic risk implications of CCPs

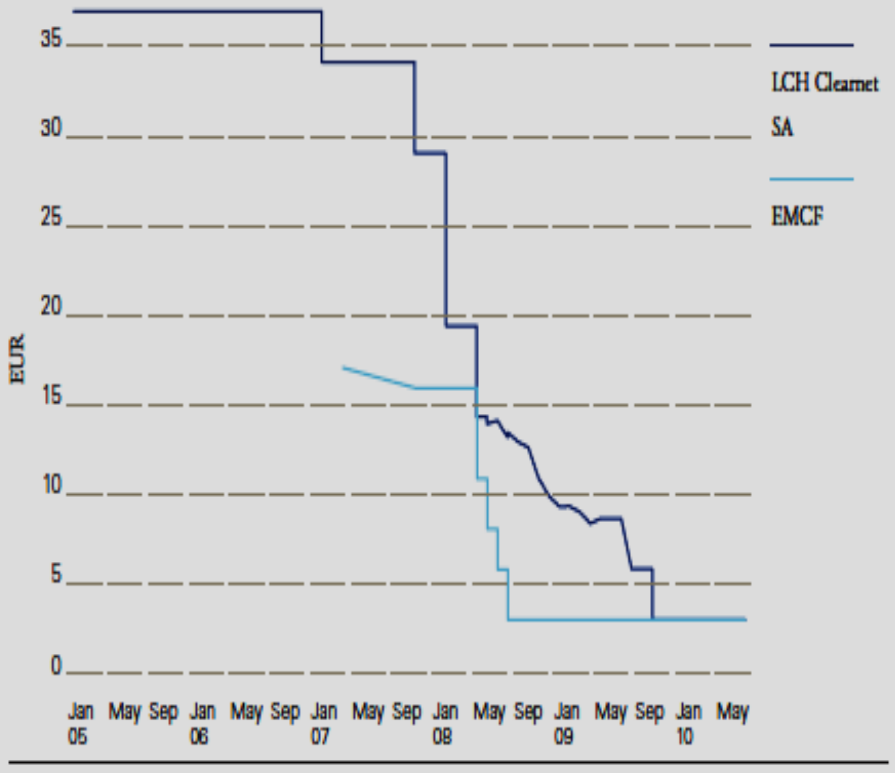
Is there a
"race to the bottom"
in central counterparties
competition?

- Evidence from LCH.Clearnet SA,
EMCF and EuroCCP

DNB
Occasional Studies

Siyi Zhu

Figure 2 Average CCP clearing fees for Dutch stocks [9]



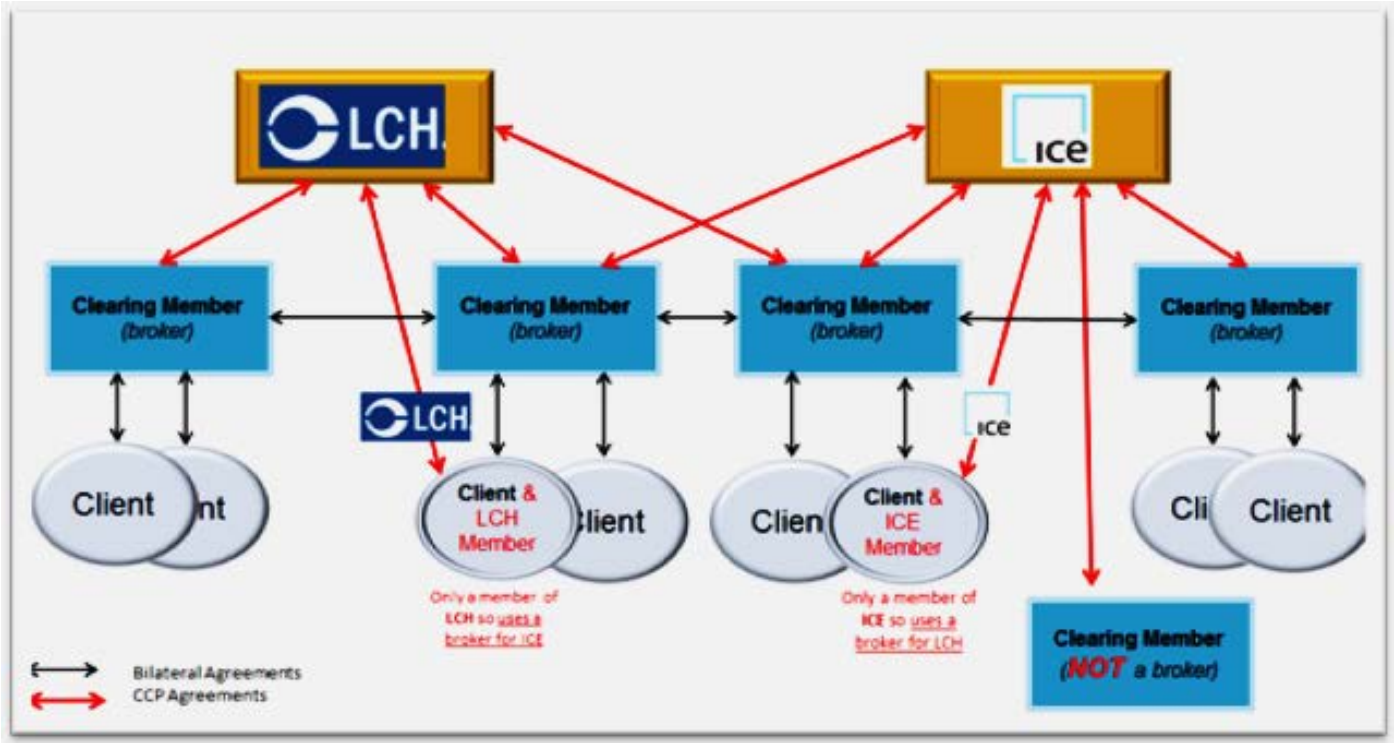
Systemic risk implications of CCPs

- Initial margin (IM) procyclicality
  - *Volatility scaling*
    - If returns are scaled by current volatility, IM will be magnified during periods of market stress
    - Collateral shortage, enhanced systemic liquidity risk
    - If IM is not market sensitive, CCPs will be at risk
  - *Haircut dynamics (especially on government bonds)*
    - During times of market stress, haircuts for lower quality assets will jump
    - Shortage of good quality collateral as during the run on repos
    - This can be magnified by thresholds on eligible collateral.
- Runs on (supersystemic) CCPs IM
  - *Reducing CVA (IM exposure) on a distressed CCP can be achieved by closing-out trades and novating them to a competing CCP*

Access of CCPs to central bank liquidity?

Systemic risk implications of CCPs

- Increased complexity and fragmentation?
  - *CCP interoperability?!*
  - *ICE single name and index CDS, CFTC ruling*
  - *Client clearing*

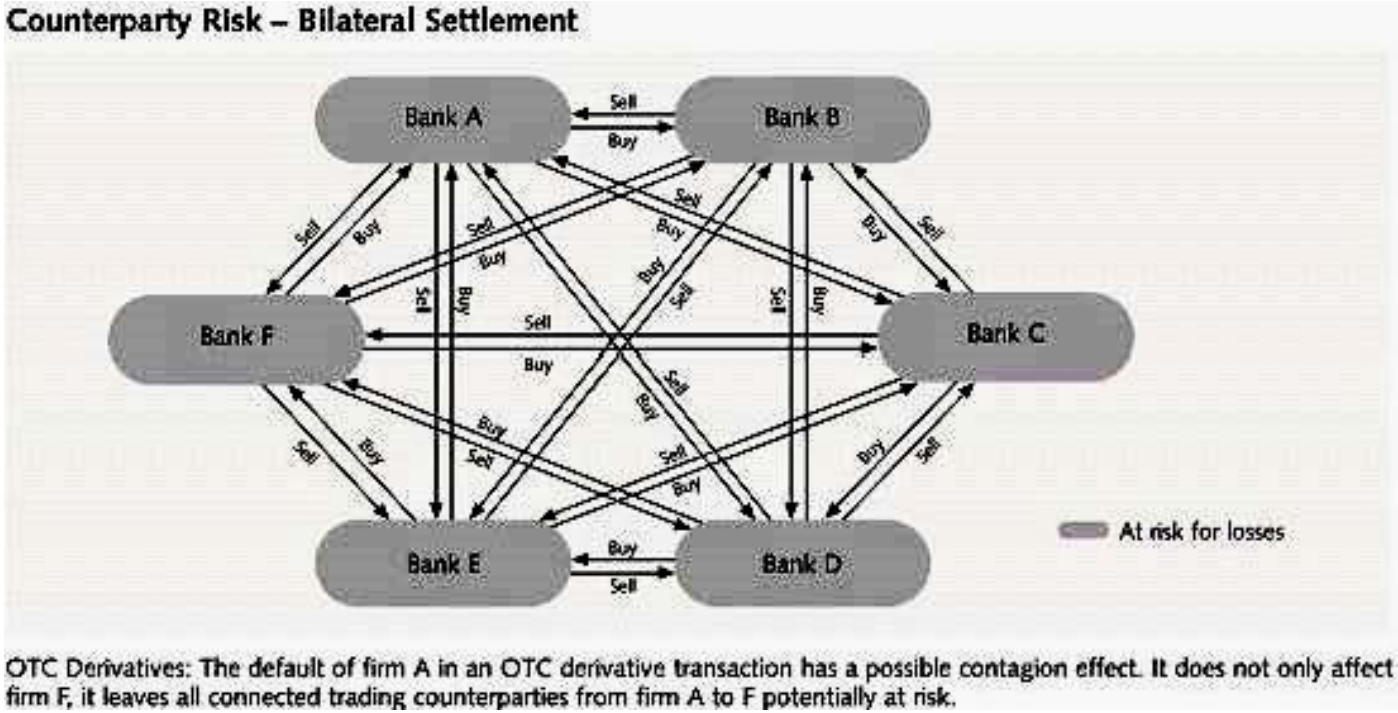


Non mandatory cleared swap contracts

- Scope of Dodd-Frank / EMIR, exemptions
  - *Unilateral CSAs and sovereign credit risk exposure?*
  - *Covered bond swaps, etc.*
- Which model for bilateral IM?
- Hedging recognition for IM computations
  - *CFTC ruling*
- Multilateral default resolution
  - *Tri-optima tri-reduce*
    - http://www.trioptima.com/services/triReduce/triReduce-rates.html
  - *Multilateral vs bilateral IM*
    - Sub-additivity of risk measure based initial margins.

Non mandatory cleared swap contracts

- Which model(s) for bilateral IM?
  - *ISDA SIMM Initiative (Standard Initial Margin Model)*
    - ISDA, December 2013



OTC Derivatives: The default of firm A in an OTC derivative transaction has a possible contagion effect. It does not only affect firm F, it leaves all connected trading counterparties from firm A to F potentially at risk.

  - *To be compared with internal models or CCP IM models*

Non mandatory cleared swap contracts

- For (too rough) computations, the need for bilateral IM might blow up to 1 trillion$
  - After a phase-in period
  - *Collateral shortage?*
    - New QIS? Monitoring working group?
- Apart from liquidity and pricing issues, major concerns about systemic counterparty risk
  - *Collateral held in a third party custodian bank*
    - Which becomes highly systemic (wrong way risk)
    - Increased interconnectedness within the banking sector
  - *IM cannot be seized by senior unsecured debt holders*
    - Lowers guarantees to claimants of collateral posting company
    - Moral hazard issues

Non mandatory cleared swap contracts

- Hedging recognition for IM computations
  - *Let us consider an exotic swap sold by a dealer*
    - Swap cannot be centrally cleared
  - *Contract ruled by a CSA (with small Independent Amount)*
  - *Due to Variation Margins, counterparty risk reduces to slippage risk*
  - *If hedging vanilla swap can be bundled with exotic swap, slippage risk will reduce to second order risks (gamma, vega, correlation risks …)*
    - First order directional risks at default are eliminated
  - *Exemption of vanilla hedging swap from mandatory clearing would result in a more efficient counterparty risk management*

Non mandatory cleared swap contracts

- Multilateral default resolution
  - *Case of one (or more) major dealer defaulting*
  - *In a disordered default process, each surviving party would use collected bilateral IM to wipe out open positions with defaulted party*
  - *⇒ turmoil in the underlying market*
  - *Tri-reduce algorithm from tri-optima is a pre-default compression process*
  - *Idea is to make the compression process contingent to default (through a series of contingent CDS)*
  - *To minimize non-defaulted counterparty exposures*
  - *Efficient use of collateral* $\sum_i IM(X_i) \rightarrow IM(\sum_i X_i)$ *fully protects the netting set of non-defaulted counterparties as is the case with central clearing.*

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