The Default Management of Central Counterparty Clearing House (CCP)

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Agenda

• Introduction: Central Counterparty Clearing House (CCP)
• Risk to CCP
• CCP Loss Waterfall Structure
• Initial Margin
• Default Fund/Clearing Fund
• Recovery Mechanisms
• Default Probability Assessment
About CCP

• provide services related to guarantee of contracts, clearance and settlement of trades, and management of risk for their members and associated exchanges.

• organized as departments of their affiliated exchanges/independent legal entities

• serve one exchange/variuous exchanges

• public corporations/owned by their member clearing firms/by exchanges
The Most Important Role of CCP

When deals struck between exchange members
• interpose itself between counterparties to contracts traded in one or more financial markets
• become the buyer to every seller and the seller to every buyer
• ensure the future performance of open contracts
• guarantee the financial stability of the market
Clearing Members (CM)

a clearing member

- must be a member of the exchange
- have access to the clearing house for the settlement of transactions
- non-member firms must work with CMs in order to settle their own transactions
## CMs for CME OTC-IRS Clearing Service

<table>
<thead>
<tr>
<th>Bank of Montreal</th>
<th>Morgan Stanley &amp; Co. LLC</th>
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<tr>
<td>Barclays Capital Inc.</td>
<td>Nomura Securities International, Inc</td>
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<td>BNP Paribas Securities Corp.</td>
<td>Rabo Securities USA Inc.</td>
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<td>Citigroup Global Markets Inc.</td>
<td>RBC Capital Markets LLC</td>
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<td>Credit Agricole Corporate and Investment Bank</td>
<td>Royal Bank of Canada</td>
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<td>Credit Suisse Securities (USA) LLC</td>
<td>SG Americas Securities Inc.</td>
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<td>Credit Suisse International</td>
<td>Societe Generale</td>
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<td>Deutsche Bank Securities Inc.</td>
<td>The Bank of Nova Scotia</td>
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<td>Goldman, Sachs &amp; Co.</td>
<td>The Royal Bank of Scotland plc</td>
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<td>HSBC Securities (USA) Inc.</td>
<td>The Toronto-Dominion Bank</td>
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<td>J.P. Morgan Securities LLC</td>
<td>UBS Securities LLC</td>
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<td>Merrill Lynch Pierce, Fenner &amp; Smith Inc.</td>
<td>Wells Fargo Securities, LLC</td>
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Potential Risk to CCP

- Default of clearing members
- Settlement bank failures
- Investment risk
- Operational risk
- Legal risk
The key role of CCPs in mitigating counterparty risk and contagion has in turn cast them as systemically important financial institutions whose eventual failure may lead to potentially serious consequences for financial stability. --- [7] CONT, Rama. "The end of the waterfall: default resources of central counterparties." (2015).
Buy ABC Futures from B
Sell ABC Futures to C
Buy ABC Futures from A
Sell ABC Futures to A
Buy ABC Futures from B
Sell ABC Futures to C

Buy ABC Futures from A

CCP

Sell ABC Futures to A
Default Risk Management

- zero sum of long and short positions
- both parties pay an initial margin and a clearing contribution to default fund
- each member periodically pays or receives a variation margin (VM) corresponding to the variation of market value of its open positions (zero sum)
- the CCP are affected by market risk of member portfolios when one or more clearing members default
A Receives VM_CCP

A Pays VM_a

B Pays VM_b

C Receives VM_a

Liquidate Positions of B over a liquidation period

CCP is exposed to losses
Default Risk Management

If one or more clearing members default

• default members fail to pay the variation margin
• CCP liquidates their open positions (auction)
• CCP continues to honor all variation margin payments to open positions of non-defaulted members

CCP exposes itself to losses.
Bankrupt CCP in the history

- Paris (1973) failed relating to unmet margin calls after a decrease in sugar prices on the futures exchange.
- Kuala Lumpur (1983) failed relating to unmet margin calls after a decrease in palm oil futures prices on the commodity exchange.
- Hong Kong (1987) failed relating to unmet margin calls on equity futures due to the October 1987 “Black Monday”
Default of CMs

Recent examples in the Chicago Mercantile Exchange (CME)
• Refco (2005); Lehman Brothers (2008); MF Global (2011)

Examples in the LCH.Clearnet
• Drexel Burnham Lambert (1990); Woodhouse, Drake and Carey (1991); Barings (1995); Griffin (1998); Lehman Brothers (2008); MF Global UK ltd (2011); Cyprus Popular Bank Co Ltd (2013)
Default Probability Assessment

• CCP defaults when the available default fund cannot absorb the uncollateralized losses.

\[ P(\text{CCP Default}) = P(\text{Uncollateralized Losses} > \text{available default fund}) \]
Initial margin of defaulting member

Default fund contribution of defaulting member

Contribution of CCP capital

Default fund contributions of other members

Contribution of CCP capital

Default fund replenishment by non-defaulted members

Recovery regime

Resolution regime
SGX-DC Clearing Fund “waterfall” structure

Available Financial Resources

Defaulted broker’s margin

Defaulted broker’s clearing fund contribution

SGX’s contribution in first layer

Non-defaulting brokers’ contributions (Same contract class)*

SGX’s contributions in the intermediate layer

Non-defaulting brokers’ contributions (Different contract class)*

Any other contribution by SGX-DC to the Clearing Fund

Clearing Fund

Clearing Fund Contributions by Clearing Members

Security Deposit
• For cleared derivatives, higher of S$1m or 3.3% of Member’s 3month risk margin
• For OTCF, higher of US$5m or 6% of Member’s 3month risk margin

Funded Further Assessment
• For cleared derivatives, 75% of Security Deposit
• For OTCF, 100% of Security Deposit

~ S$750 million

Figures as at 30 June 2015

* Apportionment of resources result in a more equitable manner of usage of the Clearing Fund. Clearing Members receive a greater degree of protection from losses in contract classes in which they are not active.

^ Quantum is subjected to quarterly review.
1. LCH LTD held margin collateral with a market value of €130bn on 29 July 2016.
2. The size of each prefunded Default Fund and an indicative allocation of dedicated capital are as at 29 July 2016.
3. Assessments are callable up to the value of each member's Default Fund contribution at the time of the default.
4. Further resources are available in the service continuity phase as determined by the LCH LTD Rulebook.
Margin Requirement

- calculated based on a measure of market risk for the clearing member's positions over the risk horizon

choices of the risk measure:

- scenario based approaches, such as CME's “Standard Portfolio Analysis Approach” (SPAN), which evaluate the worst loss of the portfolio across a range of scenarios

- statistical risk measures, such as Value at Risk (VaR) or Expected Shortfall (ES) or variants of these; usually computed at a confidence level not less than 99%.

the risk horizon depends on the asset class being cleared (1 day or more)
• “Cover one” ------- the CCP should assess its exposure to the default of each Clearing Member, by evaluating the potential liquidation cost of the member’s portfolio across a range of plausible stress scenarios. The CCP should then ensure that the size of the Default Fund exceeds the largest exposure to any member.

• “Cover two” (after 2008), sometime described as “covering the default losses from the (two) largest member(s)”, actually covers the default losses from the two members to which the CCP has the largest exposure.
Default Fund contributions across Clearing Members plays an important role in the incentives it generates for Clearing Members

• proportional to the exposure of the CCP to the default of the Clearing Member

Other

• proportional to initial margin, open interest or trading volume
Recovery Mechanisms

Variation Margin Haircut (VMGH)

• When haircutting variation margin, CCP reduces the amount it is due to pay participants with in-the-money positions, while continuing to collect in full from those participants with out-of-the-money positions

• a temporary means for recovery of the CCP's default resources

Contract tear-ups

• close certain unbalanced open positions provides a further backstop against continued losses

• partial or total

Initial Margin Haircut
Default Probability Assessment

Joint Default of Clearing Members

• determine the default probability for all CMs by their ratings (CreditMetrics)
• default correlation (Gaussian Copula/T-Copula)
Default Probability Assessment

Initial Margin and Default

• initial margin --- use the risk measure regulated by CCP (confidence level, risk horizon)

• default fund/initial margin --- relative to total clearing volume
Default Probability Assessment

Distribution of total losses over a liquidation period

- Assumption on liquidation period should be longer than the risk horizon for Initial Margin calculation
- Underlying Risk Factor Models (historical VaR/ES, parametric approximate distribution (t-distribution/Pareto distribution to show fat tail)
Conclusions

The PD of CCP is very small, usually just several bps

- larger PD for higher default probability of CM and higher default correlation
- larger PD for longer liquidation period
- larger PD for lower initial margin (larger risk horizon/smaller confidence level)
- larger PD for the P&L distribution of the risk factor over the liquidation period with fatter tail
- larger PD for less default fund
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THANKS