Comparing the pre-settlement risk implications of alternative clearing arrangements

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Plan

- Motivation
- Review literature
- Outline analytical framework
- Results
- Conclusions
Motivation

Explore two distinct recent trends in clearing arena:

• Expansion in range of products cleared through CCPs.
  ➢ E.g. Equities, OTC swaps and repos through LCH

• Horizontal consolidation of CCP clearing
  ➢ E.g. LCH/Clearnet; CME/CBOT.
Existing Literature

• Historical evolution of different clearing arrangements and risks that arise from clearing. (Moser 98, Hills et al. 99, Kroszner 99, BIS 04).

• Competition/efficiency implications (Tapking & Yang 04, Koepppl & Monnet 06)

• Models applied to set appropriate margin levels. (Knott & Mills 02 summarises)
Our Approach

Use simulations to quantify pre-settlement risks and costs under alternative bilateral and multilateral arrangements.

Compare:

1. Magnitude and distribution of replacement cost losses.

2. Magnitude of total pre-settlement costs replacement costs + collateral costs.
Clearing Arrangements

**Bilateral Clearing:** Bilateral netting of positions.

**Ring Clearing:** Multilateral netting preserving individual counterparty exposure.

**CCP Clearing:** Multilateral netting with novation to a CCP.
Key results

Bilateral → Multilateral: Risks and costs significantly reduced due to netting effects.

2 CCP → 1 CCP: Risks and costs significantly reduced due to margin pooling.

Tiering: Heterogeneity in credit quality can lead to restricted direct membership and the emergence of tiered structures.
Analytical Framework

- Replacement cost losses are a function of price changes, margin policy and agent defaults.
  - Generate vector of price changes.
  - Generate exogenous default vector.
  - Model margin setting using an optimisation approach following Baer, France and Moser (2003).
**Bilateral to multilateral clearing**

- Replacement cost losses and total pre-settlement costs reduced by multilateral netting benefits.
- Netting benefits increasing in the # of CCP participants (at a decreasing rate).
- Losses more concentrated under ring arrangement compared to CCP clearing.
  - System of 20 agents → Largest CCP participant bears 25% of losses
  - Largest ring participant bears 89% of losses
Multilateral Netting Benefits

![Graph showing the relationship between the number of participants and the netting ratio. The netting ratio increases as the number of participants increases.]
2 CCP to 1 CCP

- Multi-product CCP: captures diversification, or margin-pooling, benefits

- Replacement cost losses lower when assets are cleared through a consolidated CCP

- The scale of these benefits will depend on both
  - the correlation of asset price changes
  - the correlation of agents’ positions in each asset
The effect of changing correlations

![Graph showing the effect of changing correlations on replacement cost loss. The graph plots price correlation on the x-axis and replacement cost loss (1CCP/2CCP) on the y-axis. The line indicates how replacement cost loss changes with varying price correlation, with a red line representing position correlation = 0.](image)
The effect of changing correlations

Replacement Cost Loss: 1CCP/2CCP

Price Correlation

Position Correlation = 0
Position Correlation = 0.5
Position Correlation = 1
Portfolio-based margining

- Margin reflects *actual* portfolio positions and *actual* correlations between asset prices.

- Returns margin-pooling benefits to the trader as collateral, net reduction in pre-settlement costs.

- Replacement cost losses increased.
Heterogeneity in Credit Quality

Introduce 2 agent types: high risk and low risk.

Compare 3 possible arrangements:

• **Tailored margin**: set on basis of each agent’s credit quality. CCP incurs monitoring cost.

• **Single margin rate**: based on average default probability of members, no restrictions on access.

• **Restricted access**: only low risk agents are direct members, single margin rate based on their default probability. Tiered arrangement.
Heterogeneity Results

<table>
<thead>
<tr>
<th>CCP Clearing Arrangement</th>
<th>High Credit Quality</th>
<th>Low Credit Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tailored Margin</td>
<td>X+M</td>
<td>X+M</td>
</tr>
<tr>
<td>Single Margin Rate</td>
<td>1.6X</td>
<td>0.8X</td>
</tr>
<tr>
<td>Restricted Access</td>
<td>1.1X</td>
<td>0.9X</td>
</tr>
</tbody>
</table>

If $M > 0.1X$, a tiered CCP arrangement may emerge.
Conclusions

• Multilateral netting benefits are important – vary with $\sqrt{(n-1)}$

• Losses more concentrated under multilateral ringing

• Consolidation of CCPs captures margin pooling benefits
  ➢ Scale of these benefits depends on the asset price and trading position correlations
  ➢ Benefits increased if margin set on a portfolio basis

• Restricted access may be a natural response to heterogeneous credit profile of agents.