(In)efficient repo markets

Tobias Dieler\textsuperscript{1} \quad Loriano Mancini\textsuperscript{2} \quad Norman Schürhoff\textsuperscript{3}

\textsuperscript{1}University of Bristol

\textsuperscript{2}Swiss Finance Institute, USI Lugano

\textsuperscript{3}Swiss Finance Institute, University of Lausanne, CEPR

FSB NBFI Conference

9 June 2022
Repo markets: Efficiency vs. Resilience

**Fact 1** Repo is important short-term funding market (daily outstanding repo >$2T)

**Fact 2** Repo markets rely on liquid collateral in crisis times (Infante & Saravay 2020)


**Fact 4** Several repo market structures exist with different resilience (Mancini et al. 2016)

---

**Figure:** Repo operations New York Fed
Our paper

- Research questions
  - What are the trade-offs between different repo market structures?
  - What is the optimal repo market design?
  - What is the role of collateral across different markets?

- Existing repo market structures trade off
  - Efficient resource allocation
  - Resilience to runs

- Both trading & clearing mechanisms impact tradeoff
Repo trading & clearing mechanisms affect welfare

<table>
<thead>
<tr>
<th>Trading</th>
<th>Clearing</th>
<th>direct</th>
<th>central</th>
</tr>
</thead>
<tbody>
<tr>
<td>non-anonymous</td>
<td>OTC repo market (bilateral &amp; tri-party U.S. customer repo)</td>
<td>Clearinghouse (reform proposals, e.g., Duffie (2020))</td>
<td></td>
</tr>
<tr>
<td>anonymous</td>
<td>COB without novation (MTFs with ex-post name give-up)</td>
<td>CCP = COB + novation + default fund (GCF Repo &amp; FICC DVP via e.g. BrokerTec, EUREX, LCH.Clearnet)</td>
<td></td>
</tr>
</tbody>
</table>

- Existing repo markets combine different trading & clearing mechanisms
- COB ⇒ Anonymous non-discriminatory repo pricing
- Novation ⇒ CCP becomes legal counterparty
- Default fund ⇒ Insurance against borrower default
Model in a Nutshell

- Borrowers have ex-ante identical, ex-post heterogeneous long-term technologies (LTT) for which they need financing
- Maturity mismatch: LTT is financed with short-term loans
- Demand-side asymmetric info & supply-side funding scarcity
  - Borrowers learn over time their technology’s quality
  - Lenders are subject to funding shock
- Risk-free asset can be used as collateral
- Pecking order: Liquidation of collateral is cheaper than LTT
Borrowers and first-round lenders negotiate \((c_1, \ell_0)\).

Second-round lenders are subject to funding shock \(f\).

Payoffs \(R^\omega\) from LTT & \(\kappa_2\) from collateral realize.

Borrowers invest \(i_0\) in illiquid LTT.

Borrowers observe \(\text{LTT } \omega \in \{L, H\}\).

Borrowers repay loans with new loan \((c_2, \ell_1)\), collateral \(\kappa_1 w_1\) and LTT \(\lambda z_1\).
Constrained first best: Non-anonymous OTC

- Inefficient liquidation of $L$-type LTT beyond collateral $\frac{\kappa_1}{2}$
- **Narrow run** on $L$-type for $f \geq f^{OTC}$
- Decentralized non-anonymous trading puts burden of funding shock on low-quality borrowers
Pooling equilibrium: Anonymous COB

- One-fits-all loan in anonymous market has bright & dark side
  - Anonymity provides insurance for $f \leq \kappa_1$, but reduce total revenue due to inefficient liquidation of $H$'s LTT for $f > S$
  - Leads to systemic run for large funding shocks $f \geq f^{CCP}$

![Diagram showing net welfare against funding shock $f$ with regions for First best, OTC, COB without novation]
**Novation**

- **Novation excludes insolvent borrowers**
  - Prevents systemic runs
  - No effect on resource allocation nor on run threshold
CCP = COB + novation + default fund

- **Novation** prevents systemic runs
- **Default fund** increases resilience to narrow runs
- **OTC market** dominates CCP over range $f \in (S, f^{OTC})$
Collateral quality and run resiliency

CCP market’s resilience to run is more sensitive to collateral quality than OTC market’s resilience when LTT is illiquid

- Recall, $f^{OTC} < f^{CCP}$: Might expect that marginal increase in collateral value would benefit borrowers in OTC market most

- Not true when LTT is illiquid! In CCP markets, high-quality borrower is forced to partially liquidate LTT, which is the most valuable asset in the economy, and hence its liquidation is particularly costly
Participants transfer both safe collateral & risky assets into escrow accounts

Collateral transfer resembles collateral upgrade by ECB & Fed (Carlson & Macchiavelli, 2018)
Conclusion

- Repo markets trade off efficient allocation of liquidity with resilience to runs.

- Trading & clearing mechanisms impact allocation-resilience tradeoff.
  - Common mechanisms are inefficient & welfare rankings depend on funding tightness.
  - Clearing OTC markets centrally & hybrid trading in CCP markets improve welfare.
  - Welfare is maximized with a two-tiered guarantee fund.

- Liquid collateral improves allocation & resilience to runs.

- Model helps to reconcile the convenience yield puzzle.
Repo market reform #1: Hybrid trading in a CCP

- Alternative reform is to modernize trading mechanism
- Switch from anonymous to non-anonymous trading at $S$
  - Similar to upstairs market for equities
- Improves resource allocation for $f > S$
Repo market reform #2: Centrally cleared OTC

Central clearing of repos improves run resilience
But, central clearing leaves resource allocation unaffected!
Collateral convenience yield

- Why is an asset used as collateral instead of being sold on the spot market (Parlatore, 2019; Madison, 2020)?

In OTC markets, when a run becomes likely, ex-ante convenience yield increases (decreases) in the funding shock if expected borrower quality is low (high).

- GFC: Expected borrower quality was low due to large positions in ABS on banks’ balance sheets

- Covid-19: Banks were better capitalized & had higher creditworthiness than during GFC

- Support for empirical evidence showing that convenience yield increased during GFC & decreased in Covid-19 (He et al. 21)
“Market participants have voiced concerns that in anonymous CCP markets low-quality borrowers can hide amongst high-quality borrowers.” (Financial Times, July 7, 2013 & January 8, 2018)

Collateral has a skin in the game effect which prevents risk hoarding in anonymous COB markets
Literature


- Interbank market: Heider et al. (2015), Martin et al. (2014a, b) and Brunnermeier and Pedersen (2009) – no CCP

- CCP: Kuong and Maurin (2021) – moral hazard & monitoring

Contribution:

(i) Ex-post heterogeneous borrowers in maturity mismatch model
(ii) Naturally, question arises of allocation vs. resilience tradeoff
(iii) Derive optimal repo market structure