# (In)efficient repo markets

Tobias Dieler [1] Loriano Mancini [2] Norman Schürhoff [3]

[1]University of Bristol

[2]Swiss Finance Institute, USI Lugano

[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 3 Repo runs: a recurrent phenomenon (2008 Lehman, 2019 repo blowup, Covid-19)

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

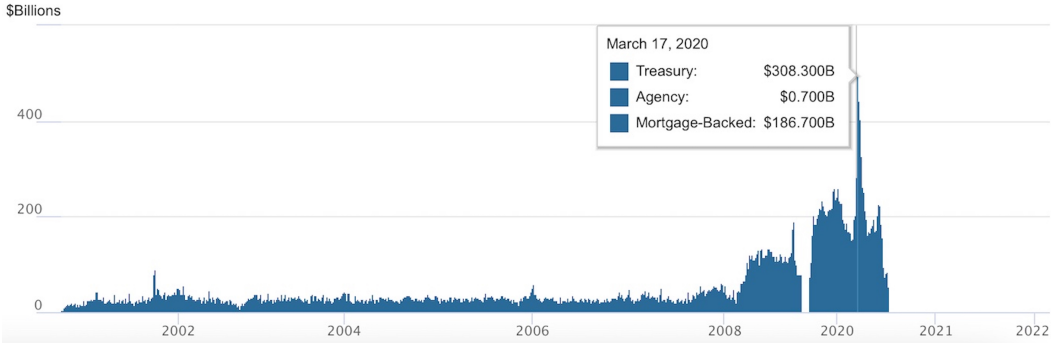



Figure: Repo operations New York Fed

# 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

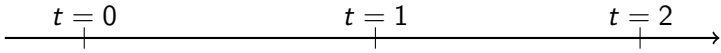
| Trading \ Clearing | **direct** | **central** |
|---|---|---|
| **non-anonymous** | OTC repo market<br>(bilateral & tri-party U.S. customer repo) | Clearinghouse<br>(reform proposals, e.g., Duffie (2020)) |
| **anonymous** | COB without novation<br>(MTFs with ex-post name give-up) | CCP = COB + novation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

- Existing repo markets combine different trading & clearing mechanisms
- COB $\Rightarrow$ Anonymous non-discriminatory repo pricing
- Novation $\Rightarrow$ CCP becomes legal counterparty
- Default fund $\Rightarrow$ 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

# Timeline




Borrowers and first-round lenders negotiate $(c_1, \ell_0)$.

Borrowers invest $i_0$ in illiquid LTT.

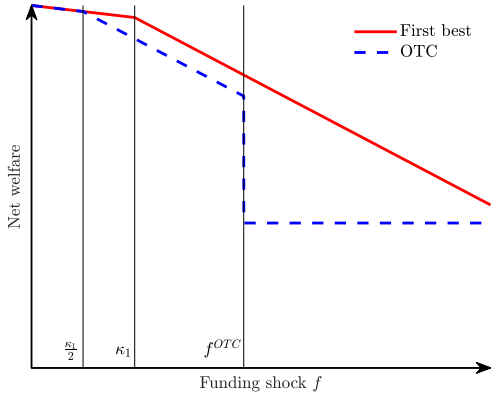
Second-round lenders are subject to funding shock $f$.

Borrowers observe LTT $\omega \in \{L, H\}$.

Borrowers repay loans with new loan $(c_2, \ell_1)$, collateral $\kappa_1 w_1$ and LTT $\lambda z_1$.

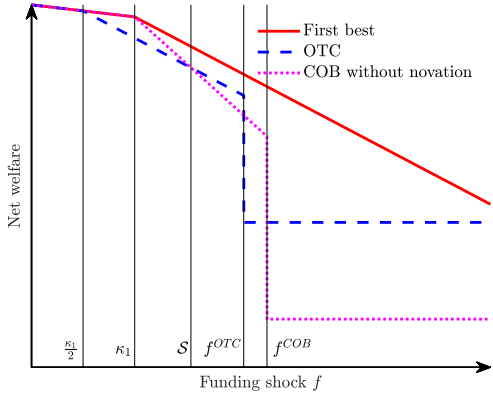
Payoffs $R^\omega$ from LTT & $\kappa_2$ from collateral realize.

# Constrained first best: Non-anonymous OTC



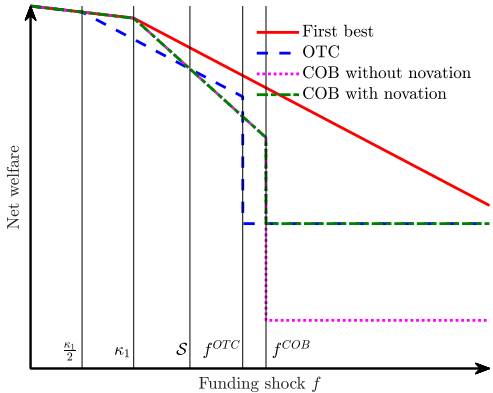

- Inefficient liquidation of $L$-type LTT beyond collateral $\frac{\kappa_1}{2}$
- Narrow run on $L$-type for $f \geq f^{OTC}$
- Decentralized non-anonymous trading puts burden of funding shock on low-quality borrowers

# Pooling equilibrium: Anonymous COB



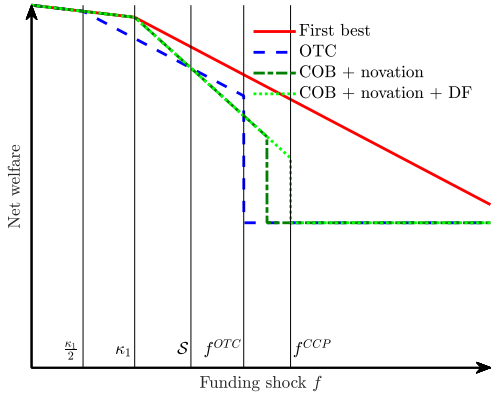

- One-fits-all loan in anonymous market has bright & dark side
  - Anonymity provides insurance for $f \leq \kappa_1$, but reduce total revenue due to inefficient liquidation of $H$'s LTT for $f > \mathcal{S}$
  - Leads to systemic run for large funding shocks $f \geq f^{CCP}$

# Novation




- Novation excludes insolvent borrowers
  - Prevents systemic runs
  - No effect on resource allocation nor on run threshold

# CCP = COB + novation + default fund



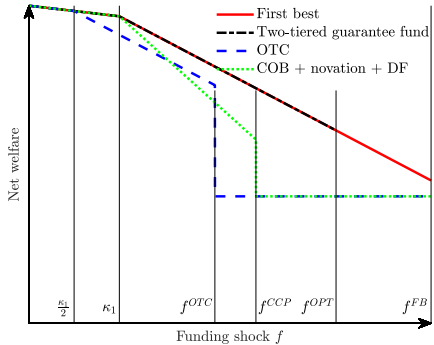

- Novation prevents systemic runs
- Default fund increases resilience to narrow runs
- OTC market dominates CCP over range $f \in (\mathcal{S}, f^{OTC})$

# 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

# Two-tiered guarantee fund

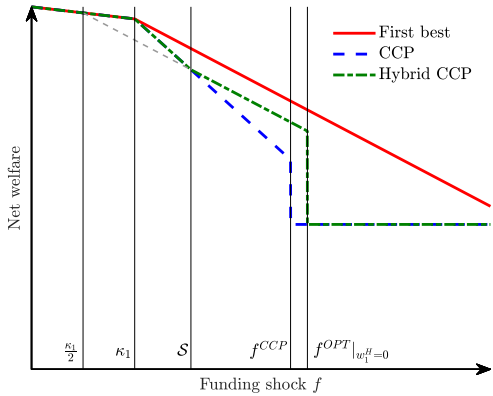



- Participants transfer both safe collateral & risky assets into escrow accounts
- Collateral transfer resembles collateral upgrade by ECB & Fed (Carlson & Macchiavelli, 2018)

# Conclusion

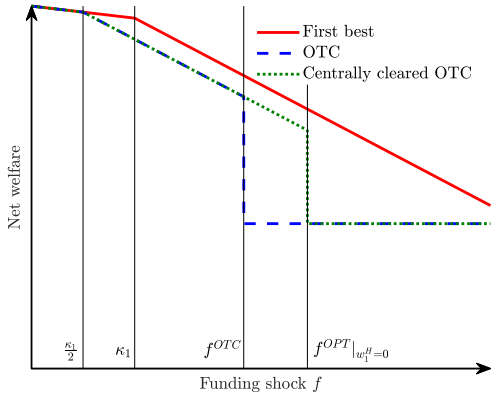
- Repo markets trade off efficient allocation of liquidity with resilience to runs
- Trading & clearing mechanisms impact allocation-resilience tradeoff
  - Common mechanisms are inefficient & welfare rankings depend on funding tightness
  - Clearing OTC markets centrally & hybrid trading in CCP markets 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 $\mathcal{S}$
  - Similar to upstairs market for equities
- Improves resource allocation for $f > \mathcal{S}$

# 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)

# Collateral scarcity and negative NPV

*"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

- Optimal opacity: Dang et al. (2017), and Goldstein and Leitner (2018) – *no runs*, Bouvard et al. (2015) – *different LTT*
- Maturity mismatch & runs: Diamond and Dybvig (1983), Postlewaite and Vives (1987), Allen and Gale (1998) Goldstein and Pauzner (2005) – *no asymmetric information*
- 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