

# REWIRING REPO

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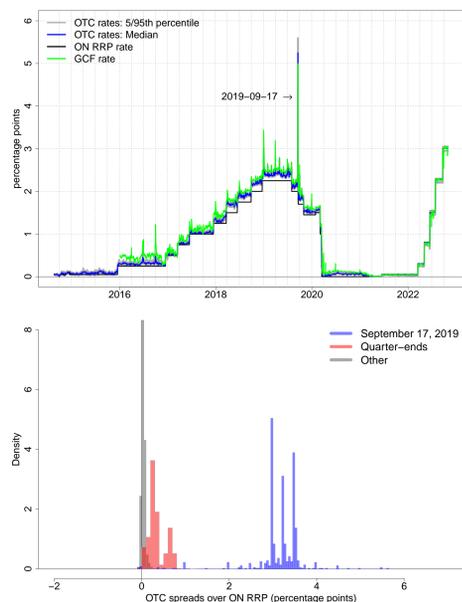
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## Abstract

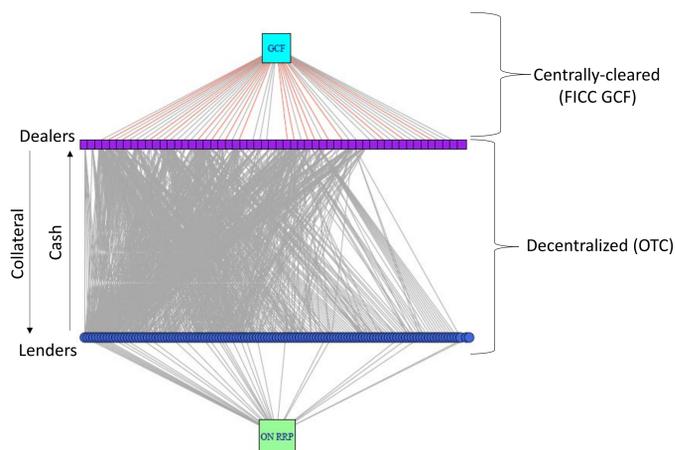
We develop a model of the repurchase agreement (repo) market with strategic interactions among dealers who compete for funding in a decentralized OTC market and have access to an anonymous centrally-cleared interdealer market. We show that such “wiring” of the repo market combined with dealer’s strategic competition for funding could result in market inefficiencies and instability. The model allows us to disentangle supply and demand factors that determine the clearing of excess demand for cash in the centrally-cleared market. We estimate the supply and demand factors along with the supply and demand elasticities. We determine conditions under which the market could become unstable as a result of strategic complementarity of actions and the endogenous market clearing conditions in the centrally-cleared market. Our results are important in designing efficient market interventions to stabilize the market as well as in understanding how monetary policy tools such as the ON RRP and the Standing Repo Facility (SRF) affect repo markets.

## Repo Market Instability

- The repo market experienced significant instability at quarter-ends and on September 16-18, 2019 spreads increased by more than 300 bps or 10 times normal range.
- Instability required interventions of the Federal Reserve outside a financial crisis and establishment of a permanent liquidity facility, the Standing Repo Facility (SRF).



## Market Wiring



Decentralized ( $\mathcal{T}$ ):

- Trading relationships are long-term
- Most, but not all, dealers borrow from lenders
- No dealer has relationships with all lenders

Centrally-cleared ( $\mathcal{C}$ ): Anonymous interdealer with CCP in the middle:

- Most, but not all, dealers are connected to the GCF market.
- Some dealers are only connected to the GCF market

ON RRP ( $\mathcal{O}$ ): Lenders [money funds] lend to the Fed

- Some, but not all, lenders lend to the Fed

## Model Summary

- $\mathcal{T} = (D \cup L, E)$  market: dealers (borrowers)  $D$ , cash lenders  $L$ , long-term relationships  $E$ .

$$\min_{q_{i\mathcal{C}}, \{q_{ik}\}_{k \in L_i}} \left\{ \sum_{k \in L_i} q_{ik}(c_k + \gamma_k \sum_{j \in D_k} q_{jk}) + \rho_{\mathcal{C}} q_{i\mathcal{C}} + \frac{\beta_i}{2} (q_{B_i} - \bar{q}_i)^2 \right\}$$

$$\bar{q}_i = q_{i\mathcal{C}} + \sum_{k \in L_i} q_{ik} \geq 0, q_{ik} \geq 0, \forall k \in L_i$$

- Lenders have increasing cost curves  $r_k = c_k + \gamma_k \sum_{j \in D_k} q_{jk}$
- Dealers borrow or lend in the  $\mathcal{C}$ -market taking  $\rho_{\mathcal{C}}$  as given

$$q_{i\mathcal{C}} = q_{B_i} - q_{i\mathcal{T}}(\rho_{\mathcal{C}}) - \frac{1}{\beta_i} \rho_{\mathcal{C}}$$

- $\mathcal{C}$ -market clears excess cash demand and supply at  $\rho_{\mathcal{C}}$ :  $\sum_{i \in D} q_{i\mathcal{C}} = 0$
- Market equilibrium exists and is unique.

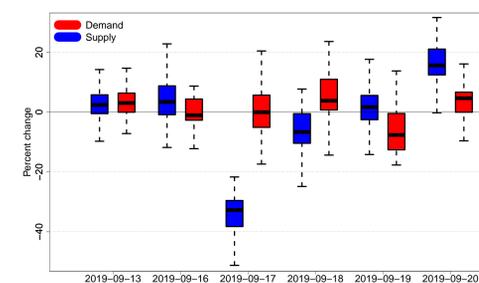
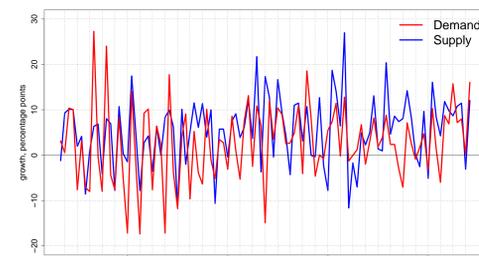
$$q_{ik}^* = \begin{cases} \sum_{j \in E} \frac{\psi_{ik,jl}}{2\gamma_l + \beta_j} (\beta_j q_{B_j} - c_l) & \text{no } \mathcal{C}\text{-market} \\ \sum_{j \in E} \frac{\psi_{ik,jl}}{2\gamma_l} (\rho_{\mathcal{C}} - c_l) & \mathcal{C}\text{-market.} \end{cases}$$

where  $\psi_{ik,jl}$  and  $\tilde{\psi}_{ik,jl}$  are equilibrium weights capturing strategic interactions between any  $ik$  and  $jk$ , where  $\sum_{jl} \psi_{ik,jl}$  is the Katz-Bonacich centrality of dealer-lender  $ik$ .

## Model Results

- The introduction of a centrally-cleared market improves funding costs of dealers for most wirings
  - However, with  $\mathcal{C}$ -market, higher connectedness in the OTC market increases funding costs due to strategic interactions of dealers.
  - With  $\mathcal{C}$ -market, equilibrium quantities and rates are more sensitive to supply shocks of more central dealer-lender relationships.
- These mechanisms of how central-clearing could influence market efficiency and financial stability are novel and do not rely on credit and counterparty risk.
- Introduction of SRF can dampen the fluctuations due to demand and supply shocks.

## Empirical Analysis



- The repo market is subject to significant variation in supply and demand.
  - Quarter-ends characterized by significant drops in demand and supply due to foreign dealer leverage requirements.
  - The September 16-18 2019 stress period appears to be driven by a large supply shock.
  - The supply shock propagated through more central dealer-lender pairs.
- Estimate lender supply and dealer demand elasticities.
  - For every \$100 billion in additional funding, 17 bps higher funding costs.
  - For every 10 bps increase in  $\rho_{\mathcal{C}}$ , there is \$580 million decline in GCF borrowing and \$280 million increase in lending.
- Test for strategic substitutability of dealer actions.
  - Dealers sharing common lenders reduce borrowing by about 30 cents for every dollar borrowed by competitors.

\* This article represents the views of the authors and not the views of the Board of Governors of the Federal Reserve System.