Discussion of

"Emergence and Fragility of Repo Markets"
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Views expressed in this presentation are our own, and do not reflect the opinions of the Federal Reserve Bank of New York or the Federal Reserve System.

Research question

- Why did repo market grow so large?
- Is repo inherently fragile, even when backed by safe collateral?
- How can policy help?

- To answer these questions, also ask,
  - What is the role of repo?

Overview of basic results

- The paper develops a model of an over-the-counter bond market where bond dealers and cash investors choose to arrange repurchase agreements (repos) endogenously
- Repos are arranged ex-ante using a price discount on cash investors' bonds
- Because of multiple equilibria, there exists an equilibrium where the repo market disappears
- A central-bank loan facility (e.g. PDCF) or a central counterparty (CCP) can block this equilibrium

Model

- Discrete time OLG model with infinite horizon
- Unit continuum of risk-neutral investors are born each period and die next period
  - Endowment when young
  - Consume when old
- Unit continuum of infinite-lived risk-neutral dealers
  - No endowment, can consume each period
- Large supply of one-period T-bills pay return 1 + r
- Unit supply of console Treasury bonds pay coupon d each period

Brokered market, dealer markets, and repo

- **Brokered** market: young (Y) and old (O) may enter and may match to trade with each other
- Alternatively to the brokered market:
  - Old may enter dealer buyer market and may match with a dealer
  - Young may enter dealer seller market and may match with a dealer
- **Probability of matching** for any agent (young/old/dealer) is given by the fraction of the agent's own type in the market relative to the fraction of the other agent type in the market
- Dealer **repo (RP)** market: young buying a bond **with repo** from a dealer can choose to match when old with probability one with the same dealer who can then **repurchase** the bond
- **Nash bargaining** with equal bargaining power in all matches
- **Interdealer (ID)** market: dealers trade bonds and borrow/lend funds with each other in Walrasian market

Assumptions

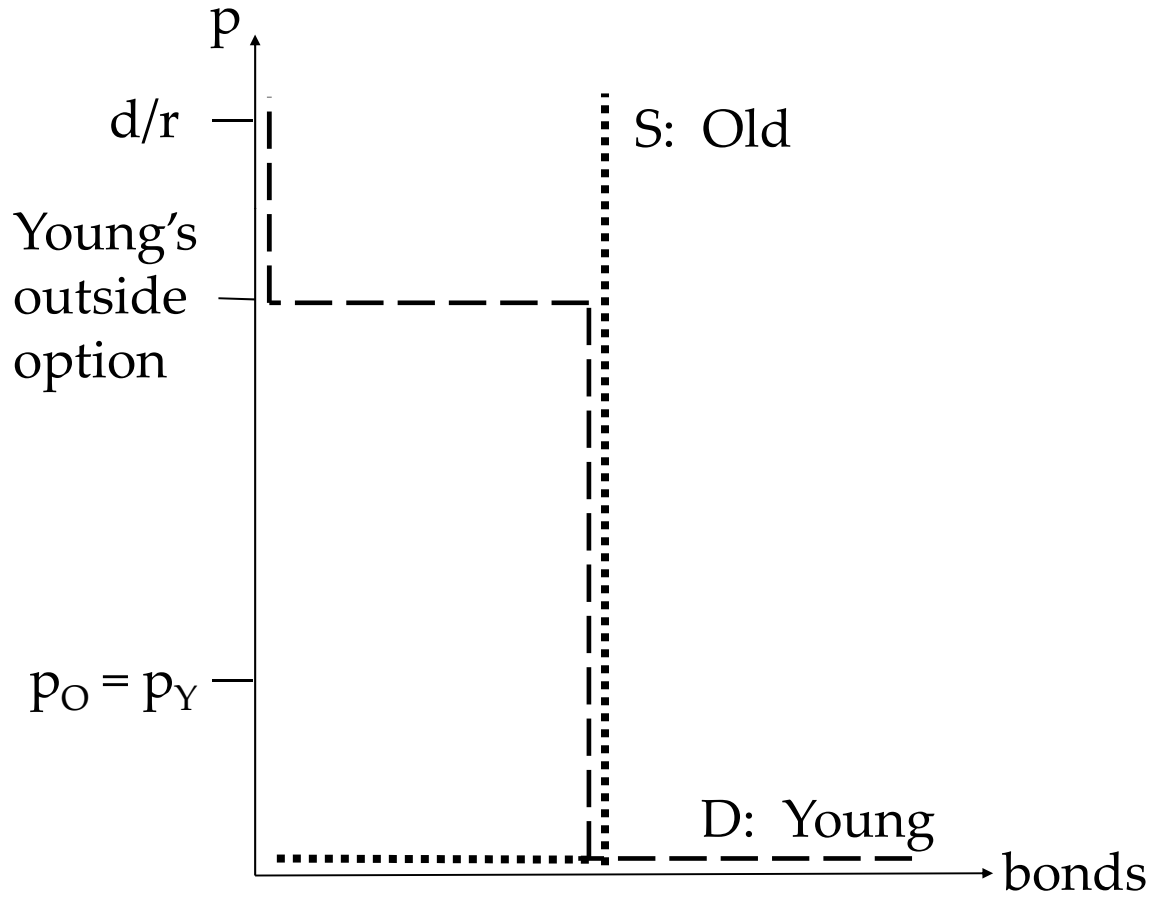
- Young and old can enter only one market per period and only trade once, in the brokered market or a dealer market
- Dealer can enter each type of dealer market once per period
- Dealer can trade unlimitedly in the interdealer market

- Implication: interdealer market gives the dealer's relevant marginal outside option for trading with young and old

- I will look at stationary prices, which is the focus of the paper

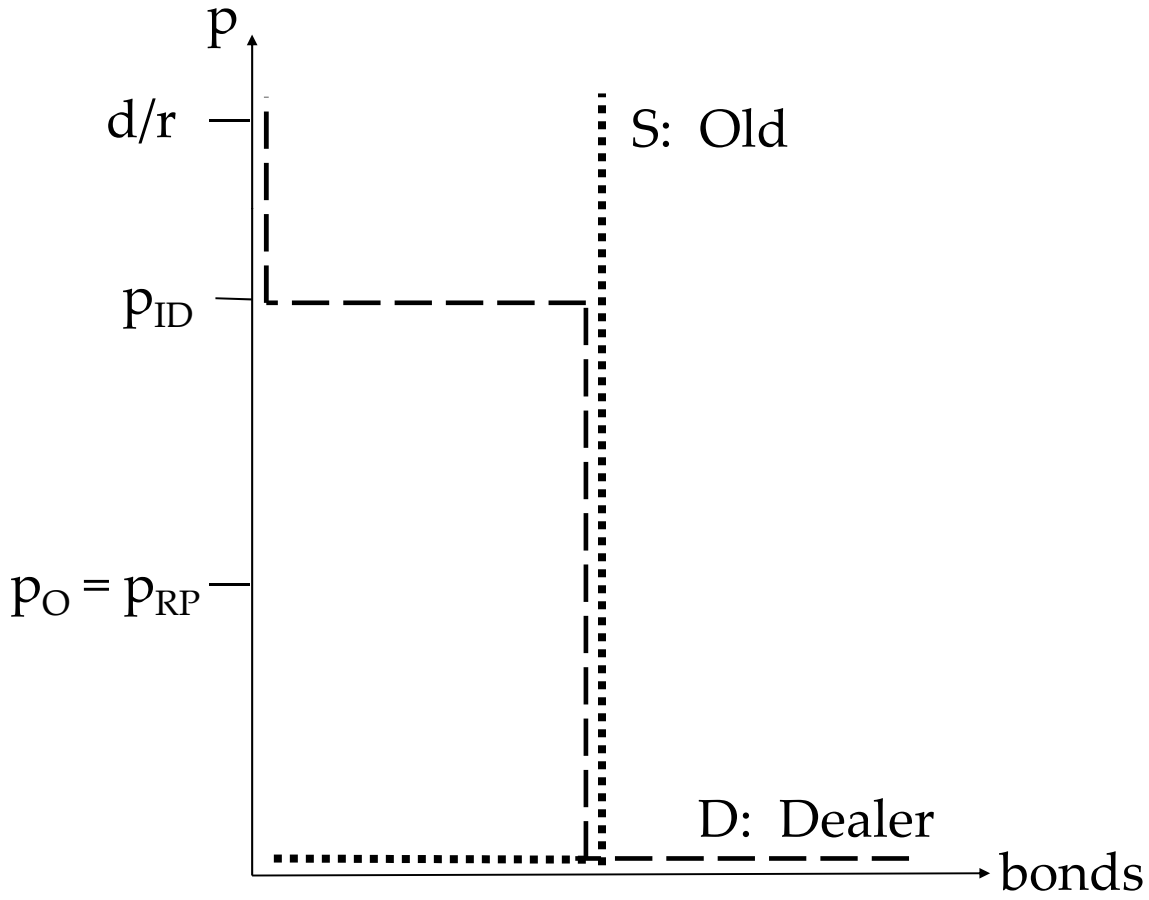
Results: Brokered market with young and old

- Price below "competitive price" of d/r…
  …Young's outside option in T-bills gives greater effective bargaining power



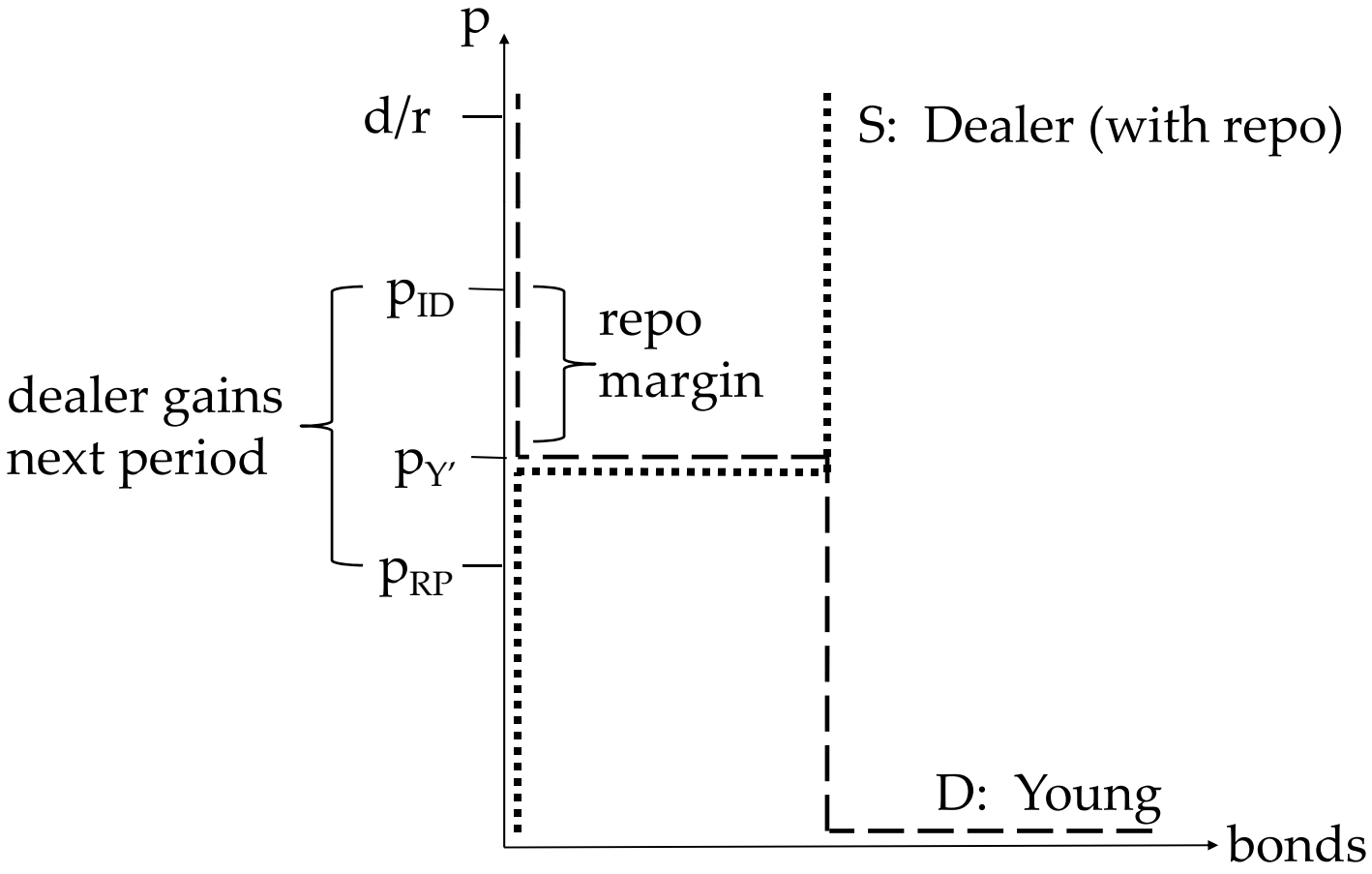
Results: Dealer market with old (repo or not)

- Old investor gets a higher price because dealer only has a marginal outside option conditional on buying from the old investor



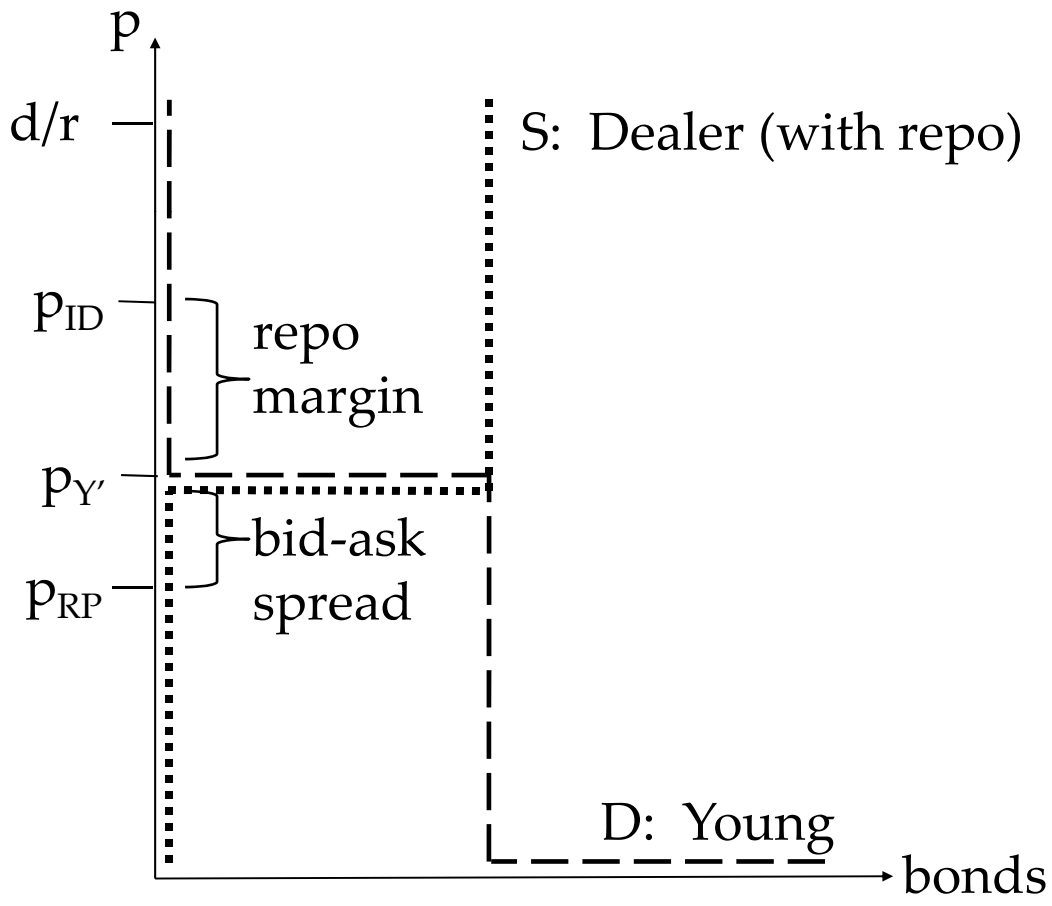
Results: Dealer market with young (with repo)

- Dealer loses to young the repo margin, which equals the gains of $\beta(p_{ID}-p_{RP})$ from PV of repurchase with old next period



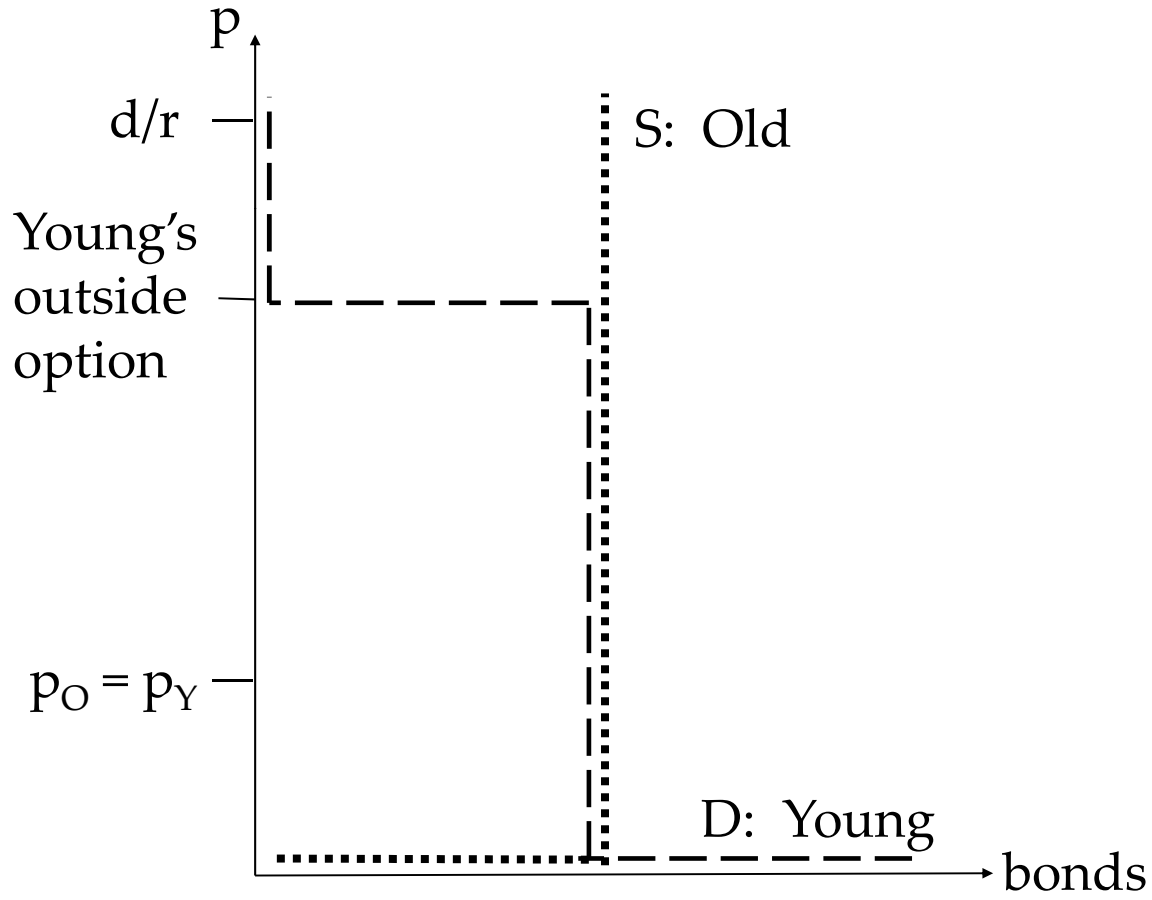
Results: Dealer market with young (with repo)

- Dealer profit is repo bid-ask spread each period, taken from investors



Fragility: Investors switch from dealer to broker

- Old receives lower price in broker market vs in dealer market, but young pays lower price as well. Investors don't lose dealer spread



Policy

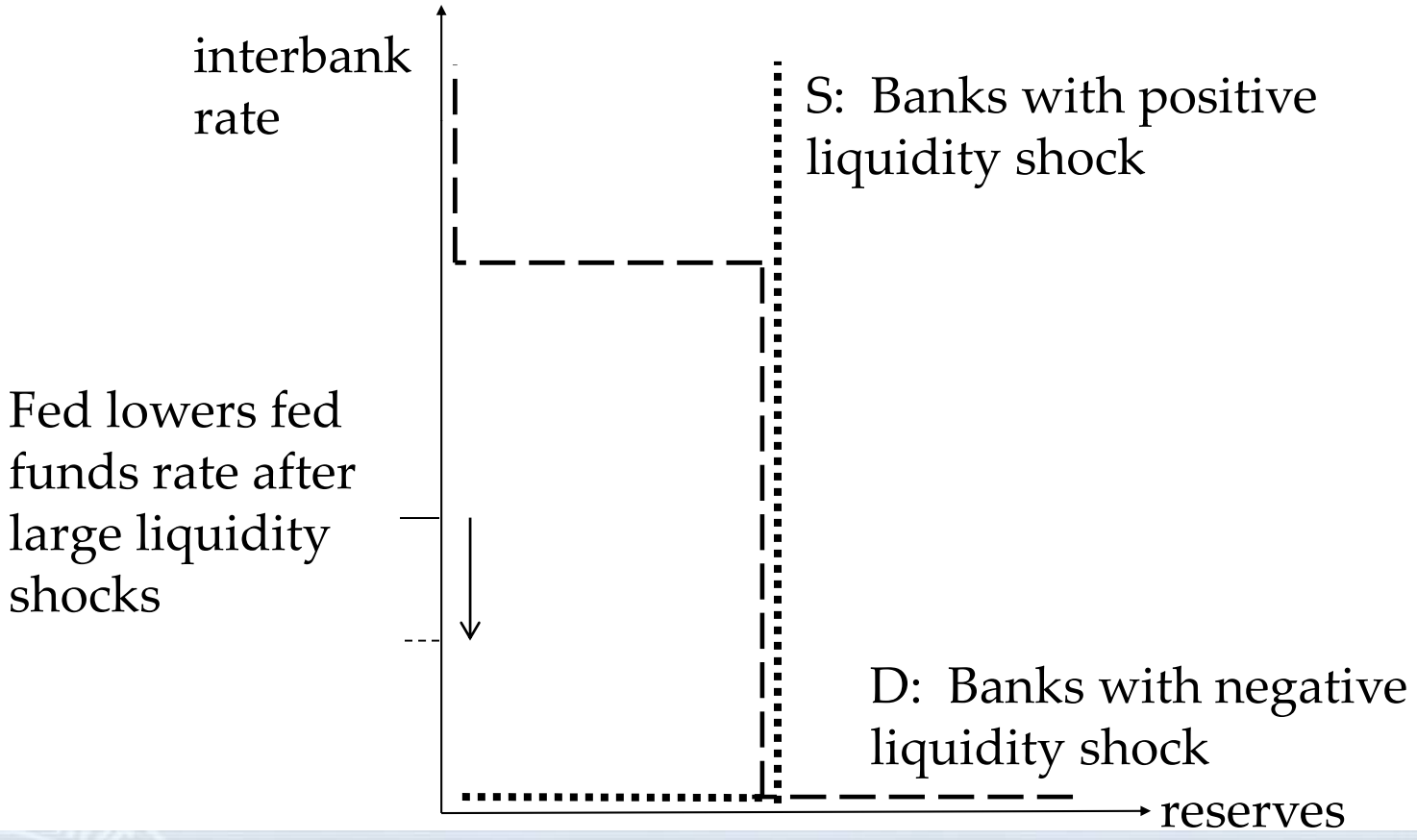
- Primary Dealer Credit Facility (PDCF)
  - Central bank blocks the broker market with interdealer loans below 1.5+r
  - Maintains high bond market price, preventing old going to the brokered market
  - PDCF introduced in March 2008 prevented a complete repo-market collapse
- Central Counterparty (CCP)
  - A clearing house that uses novation to guarantee repurchase price for the investor and becomes counterparty for the dealer
  - Same payoff as an old investor, but blocks equilibrium without repos because it would be able to guarantee repurchase price

Comments: Insightful results of model

- Repo is coordination mechanism to overcome search frictions
- Investors want to store wealth in a short-term form not subject to liquidation costs
  - Liquidity discount because of search cost leading to loss of bargaining power (and implicit inability to contract)
  - No uncertainty of liquidity shocks or asymmetric information necessary, as in:
    - Diamond and Dybvig (1983), Gorton and Pennachi (1990), Dang, Gorton and Holmstrom (2009)

Liquidity implies inelastic supply & demand

- Multiple bond prices (interest rates) clear the market
  - Bargaining power and search costs determine prices
- Freixas, Martin, Skeie (2011): central bank sets optimal rates



Why is repo fragile in this model?

- Coordination problem of OLG investors
  - With several differences from Martin, Skeie, von Thadden (2011)
- No actual liabilities
- Solely about which market OLG investors transact in:
  - Through brokers in cash market (bonds) instead of through dealers in repo market
  - But investors are **better off** in cash market than repo market
- Liquidity in cash and repo markets are substitutes, not complements
  - Is this correct, especially for Treasuries? Testable.
  - May apply better for repo on less liquid assets than Treasuries
  - May be closer to search markets with derivatives versus underlying assets
- Traditional rigidities in asset search models from trading only once per period

Contrasting results on repo fragility

- Martin, Skeie, von Thadden (2011)
- Run on overnight liabilities of dealer if profits are too low to provide enough capital buffer
- Asset side of dealer's balance sheet is also important
  - Tradeoff for fragility: assets are illiquid but provide profit buffers against runs
- Large differences in fragility of various repo markets
  - Tri-party repo (Bear and Lehman borrowing) was fragile when margins didn't adjust, which resulted in a discrete run
    - Additionally, clearing banks' intraday liquidity provided run incentives
  - Bilateral repo (hedge fund borrowing) was not fragile precisely because margins did increase in a more gradual way
  - PDCF prevented asset firesales. Sustaining cash market liquidity also sustains repo market liquidity as a complement.

Additional comments

- Repo collapse is just a transfer of rents and is not inefficient
- Repurchase price assumed to be renegotiable
  - In reality, repos are contractible prices. Would this imply more stability?
- Counterintuitive implication
  - Repo may be **more** stable because money market funds can't switch to cash market and hold longer dated Treasury bonds
  - Runs occur only in most extreme forms when money fund investors run and switch to Treasuries
- Robustness?
  - Are results robust to an epsilon number of agents in other markets?
  - Equilibria depend on an agent not being able to unilaterally deviate to another market since no one to match with there
  - Is a pairwise-stability equilibrium concept considering bilateral deviations more suitable?

Conclusion

- Innovative paper that studies repo markets based on search frictions
- Several intriguing and striking results
- Testable implications for counterintuitive and contrasting results
- Open questions about robustness and how best to apply the model