Intraday Liquidity and Money Market Dislocations

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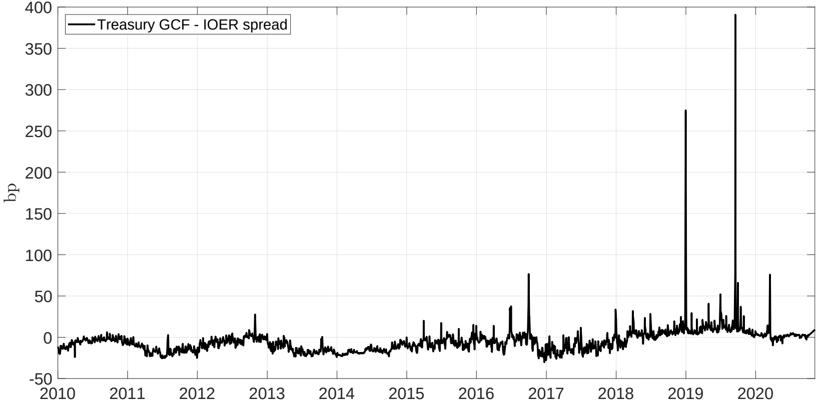
Chicago Booth

Repo Spikes



Treasury GCF - IOER spread
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400
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2010
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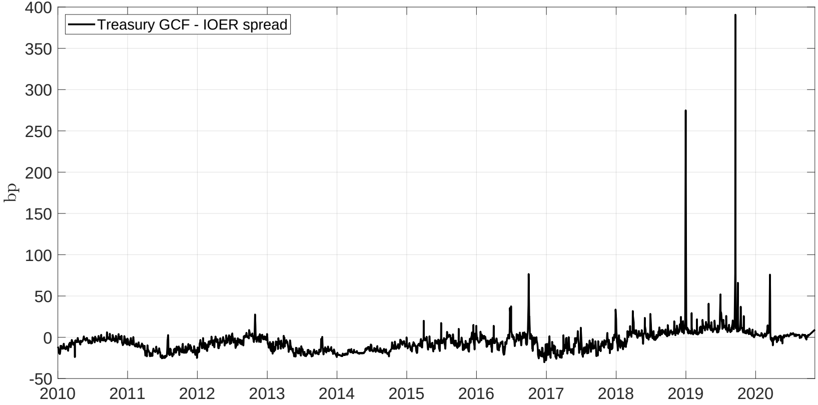

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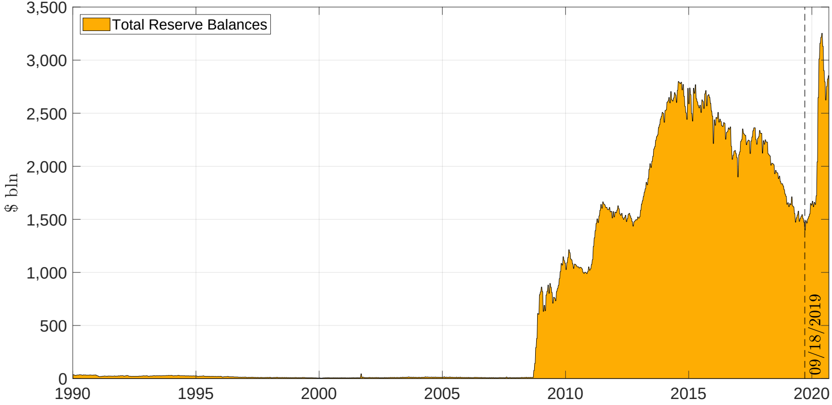
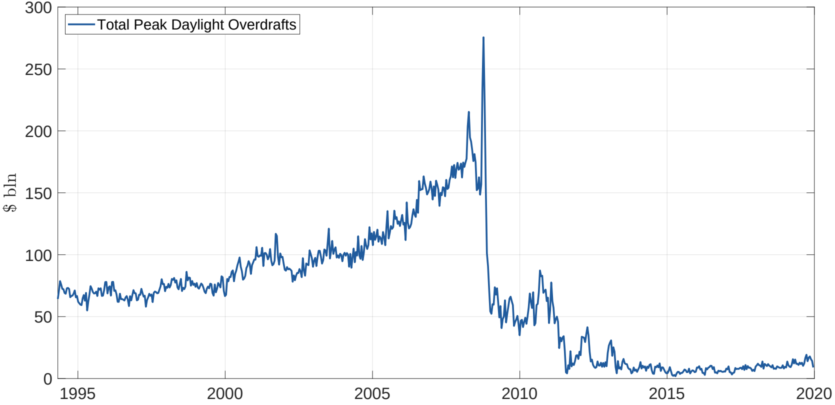
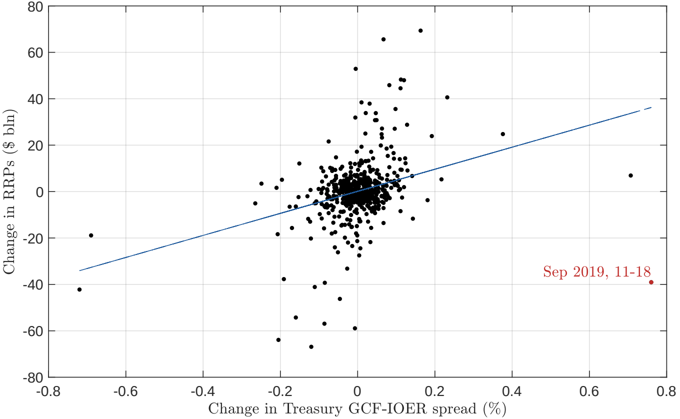
Reserves Supply



Average Peak Daylight Fed Overdrafts



Bank Repo Lending vs. Repo Spreads



Motivation

- Repo spikes remain a mystery.
  - ▷ Why the non-linearities?
  - ▷ Repo market is a core funding market for shadow banks

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  - ▷ Repo market is a core funding market for shadow banks

- Explanations put forward point to intraday liquidity:

"[W]e have $120 billion in our checking account at the Fed, and it goes down to $60 billion and then back to $120 billion during the average day. But we believe the requirement under CLAR and resolution and recovery is that we need enough in that account, so if there's extreme stress during the course of the day, it doesn't go below zero. If you go back to before the crisis, you'd go below zero all the time during the day. So the question is, how hard is that as a red line? That will be up to regulators to decide, but right now we have to meet those rules and we don't want to violate what we told them we are going to do."

Jamie Dimon, JPMorgan Chase Co CEO, Oct 13, 2020.

This Paper

Research question: What drives money market dislocations?

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Macro-banking model of the repo market with:

- repo market between banks and preferred habitat shadow banks
- transactions settled with reserves: intraday flows
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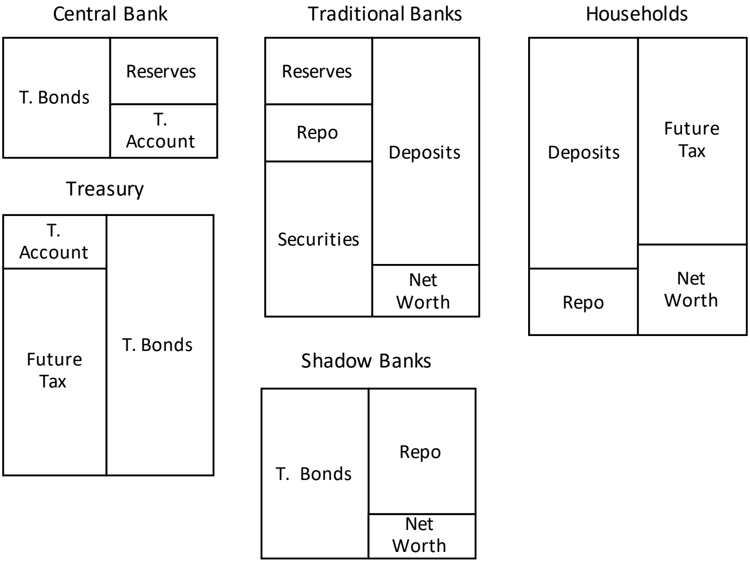
Main findings:

- intraday liquidity requirements $\rightarrow$ inelastic kink in repo supply
- larger T-bonds-reserves balance $\rightarrow$ higher probability of repo spike
- higher spike probability $\rightarrow$ increase in T-bond spreads

$\Rightarrow$ consistent with empirical evidence on Treasury volumes and settlements, as well as September 2019 and March 2020 events

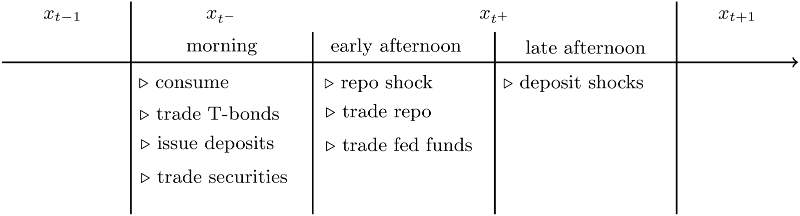
Model

Balance Sheets



Environment

- Discrete time with two sub-periods: morning and afternoon
- Notation for morning variables x_{t^-} and afternoon variables x_{t^+}
- Risk-neutral households, traditional and shadow bankers
- Households' liquidity preference shock: aggregate uncertainty for repo supply



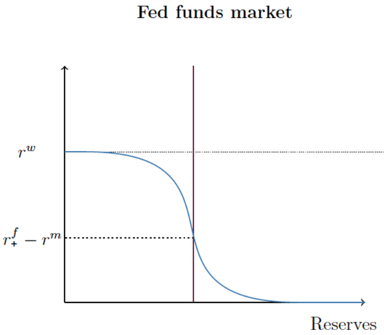
Results

Benchmark without LST

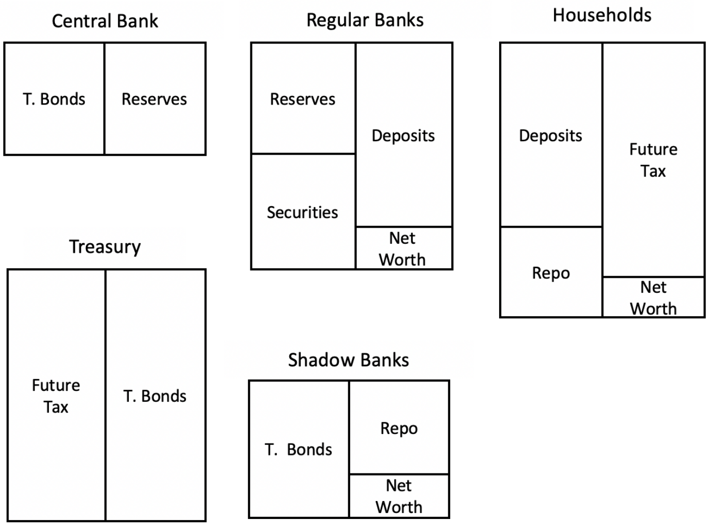
Proposition 1 In an economy in which LST never binds, the repo rate is always equal to the fed funds rate, and both of these rates are bounded by the interest on reserves below and the discount window rate above:

$$r^m_{t^-} \leq r^p_{t^+} = r^f_{t^+} \leq r^m_{t^-} + r^w.$$

Money Markets without LST



Repo Markets without LST



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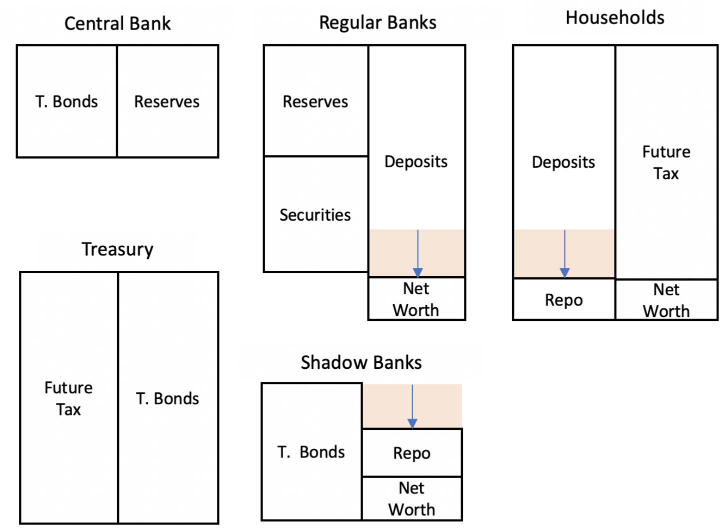

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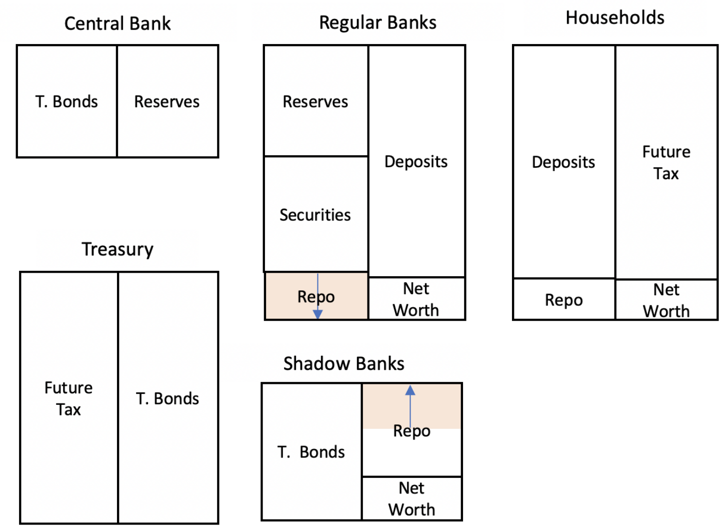

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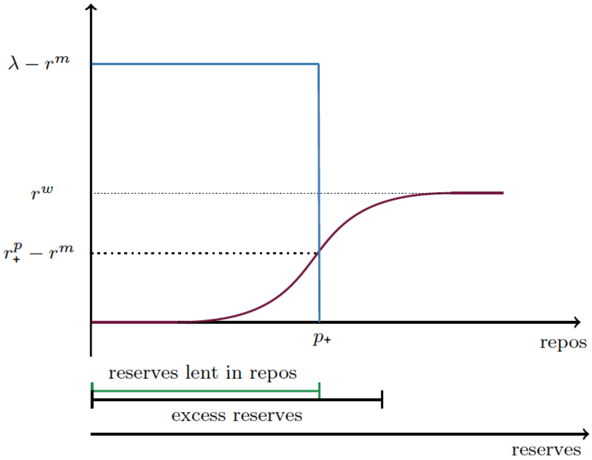

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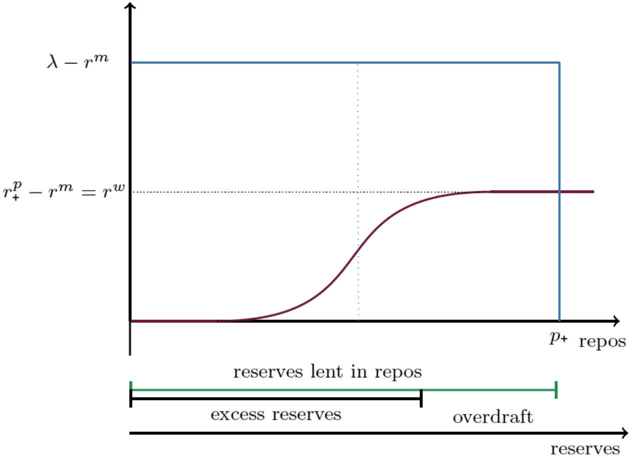


Change of Regime

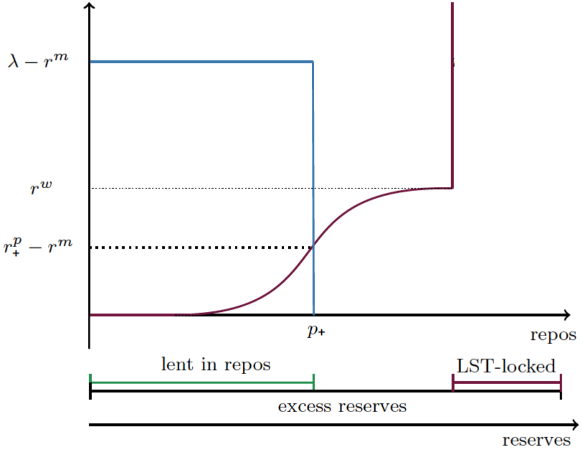
Proposition 2 When LST is binding:

- the repo rate jumps above the discount window rate;
- there is no transaction in the fed funds market.

▷ Discount window provides *overnight* liquidity ▷ no arbitrage with repo market

▷ LST removes the elasticity of the currency provided by intraday overdrafts at the Fed

Repo Markets with LST



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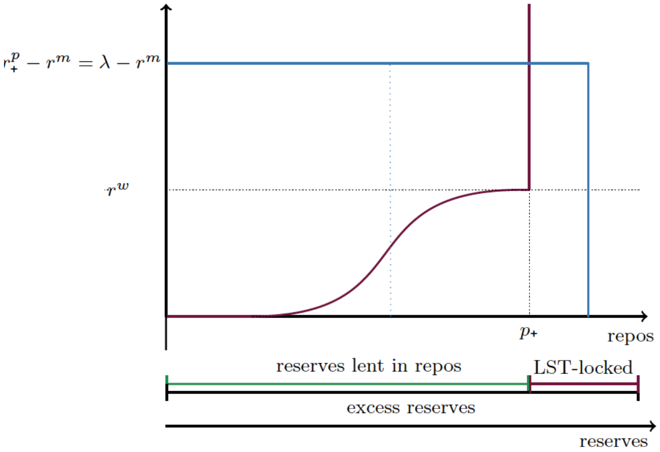
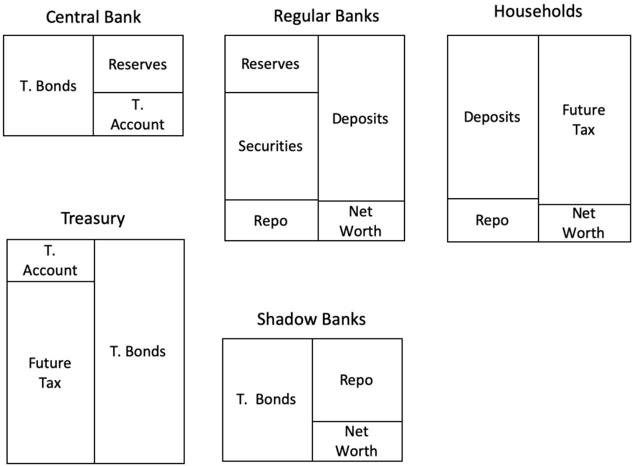


Fiscal Policy

Proposition 3 In an economy in which LST is sometimes binding, an increase in the quantity of T-bonds increases the probability of a repo spike through three channels:

- more T-bonds increase the demand for shadow bank repo financing;
- a larger treasury account decreases the supply of reserves available to banks.
- a larger spot issuance of T-bonds increases the settlement needs for reserves;

Treasury Issuance



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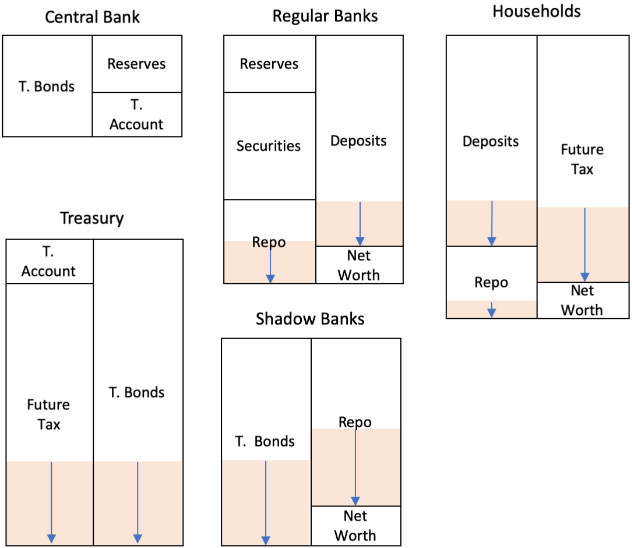
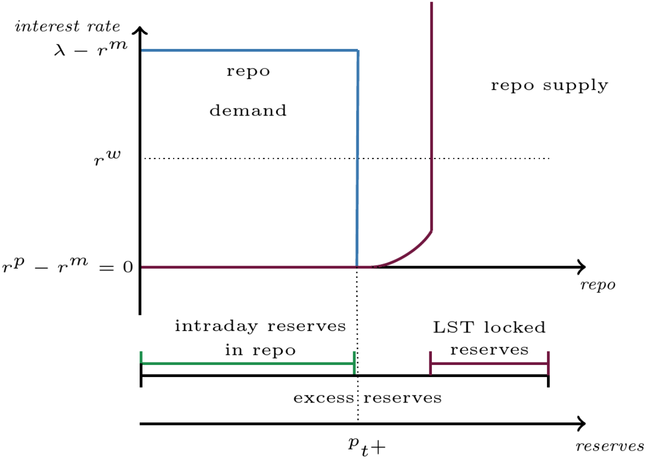


Fiscal Policy 1



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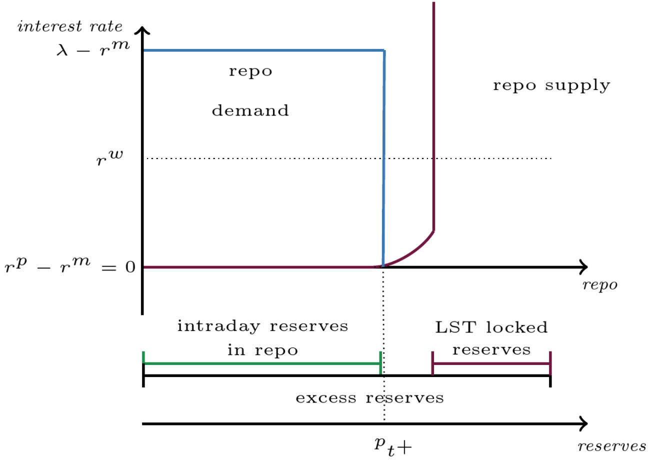

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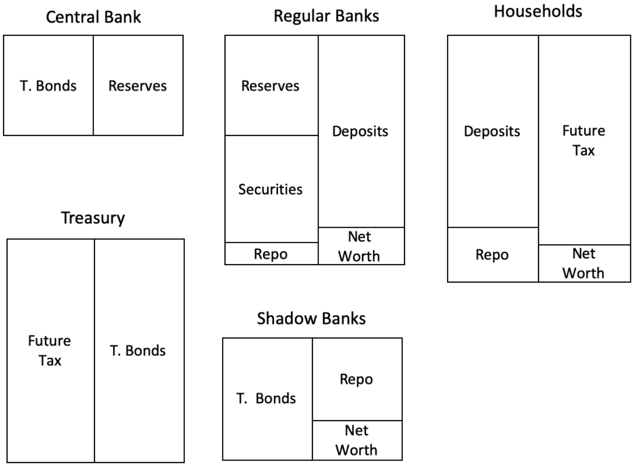

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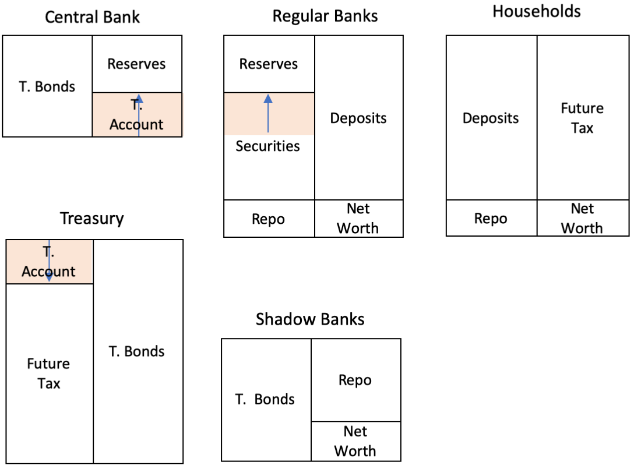
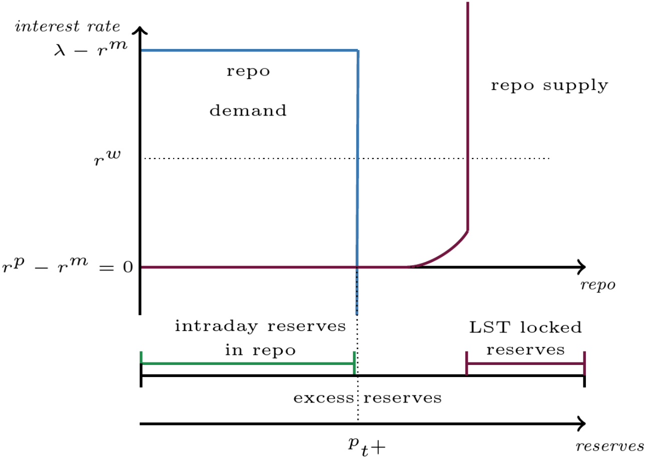


Fiscal Policy 2



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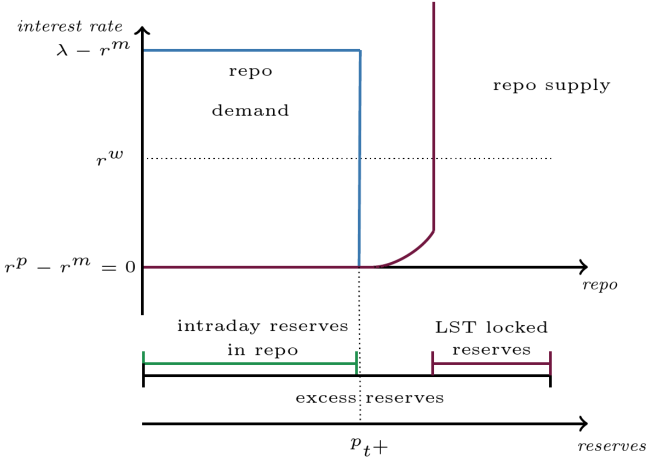

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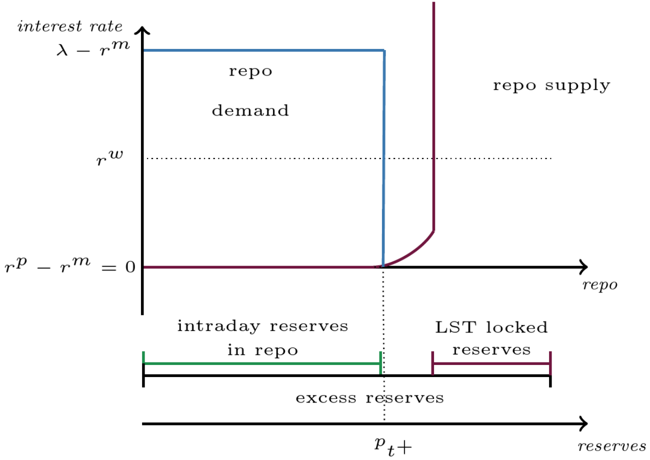

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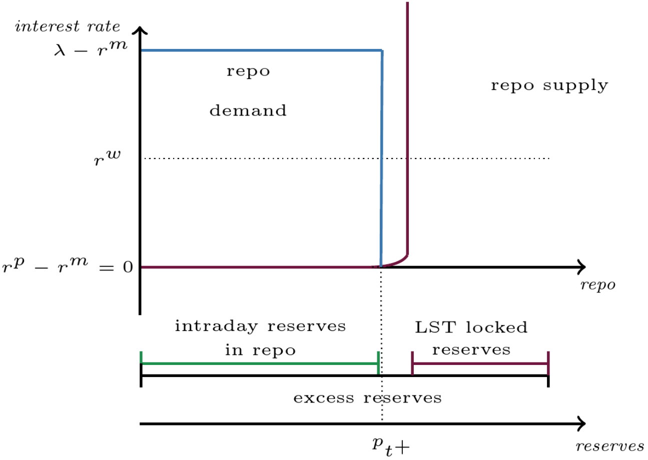
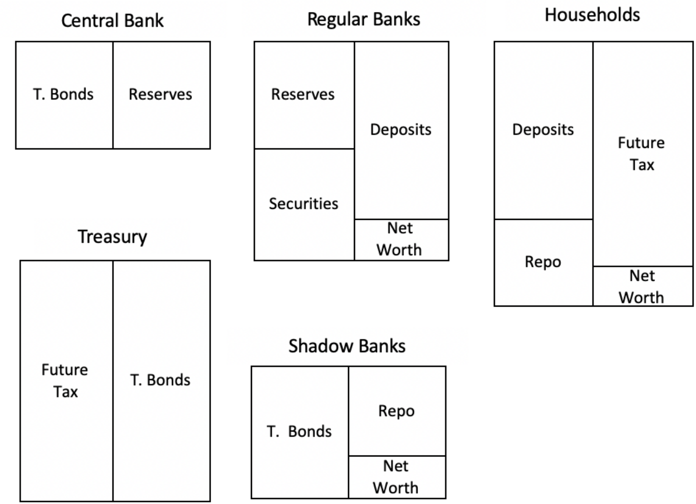


Monetary Policy

Proposition 4 In an economy in which LST is sometimes binding, a reduction in the central bank portfolio increases the probability of a repo spike through two channels:

- a lower quantity of reserves restricts traditional banks repo lending capacities;
- a larger quantity of T-bonds has to be absorbed by shadow banks.

Treasury Account



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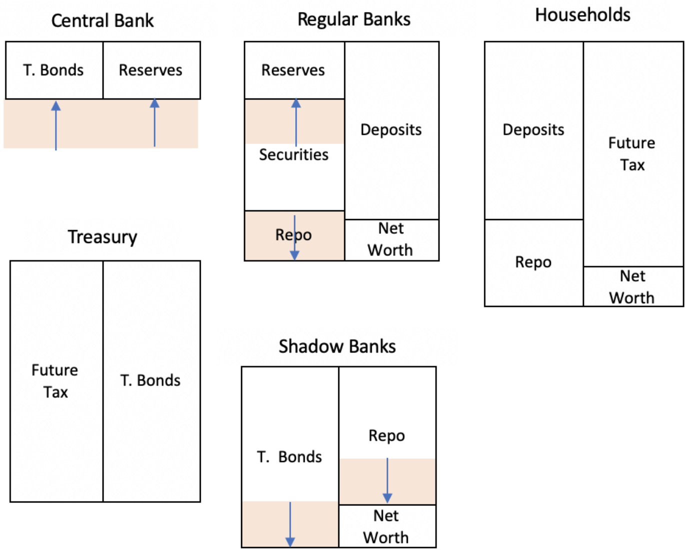

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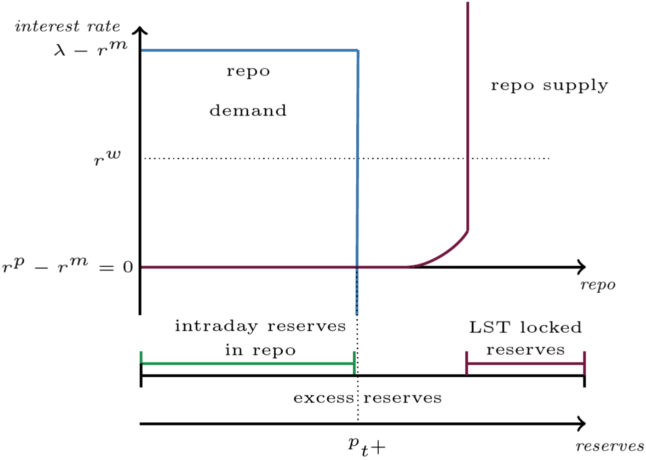

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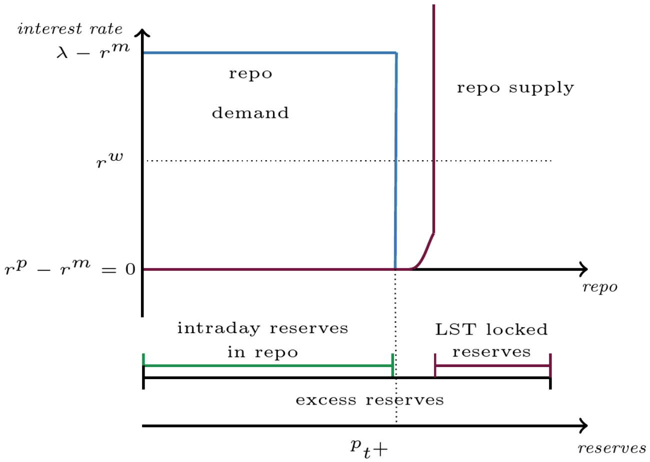


Treasury Bonds Yields

Proposition 5 In an economy in which LST is sometimes binding, an increase in the probability of a repo spike is associated with an increase in T-bond yields.

$$r^b_{t^-} = (1 - \phi^p_{t^-})\mathbb{E}\big[r^p_{t^+}\big|\phi^p_{t^+} = 0\big] + \phi^p_{t^-}\mathbb{E}\big[r^p_{t^+}\big|\phi^p_{t^+} = 1\big]$$

▷ Moneyness of Treasuries comes from use as collateral in repo markets

Conclusion

- We propose a theory to explain recent disruptions in money markets
- The theory is consistent with four empirical puzzles
  - non-linearities $\rightarrow$ hard constraint $+$ additive effects of fiscal and monetary policy
  - spikes despite large reserves $\rightarrow$ intraday scarcity during large settlement days
  - no increase in daylight overdraft $\rightarrow$ LST prevents reserves from falling to zero
  - banks reducing repo lending $\rightarrow$ LST more binding during large settlement days
- Illustrates the need for a permanent repo facility as recently introduced by the Fed

Appendix

Related Literature

Repo markets and regulation: Duffie and Krishnamurthy (2016); Anbil and Senyuz (2016); Munyan (2017); Bech and Keister (2017); Andersen, Duffie and Song (2018); Macchiavelli and Pettit (2018)

$\rightarrow$ highlight the role of intraday liquidity regulation

September 2019 events: Afonso, Cipriani, Copeland, Kovner, La Spadan, and Martin (2020), Poszar (2019); Avalos, Ehlers, and Eren (2019); Correa, Du, and Liao (2020); Yang (2020); Copeland, Duffie, and Yang (2021);

$\rightarrow$ general equilibrium model in which aggregate quantities <u>and</u> flows matter

Monetary policy implementation: Poole (1968); Klee and Bech; (2011); Afonso and Lagos (2015); Bianchi and Bigio (2016); Schneider and Piazzesi (2016)

$\rightarrow$ focus on transmission to the repo market

March 2020 events: He, Nagel, and Song (2021); Ma, Xiao, and Zeng (2020); Duffie (2020); Schrimpf, Shin, and Sushko (2020)

$\rightarrow$ connect Treasury spreads to repo through shadow banks balance sheets

Liquidity Regulation

Liquidity Coverage Ratio (LCR):

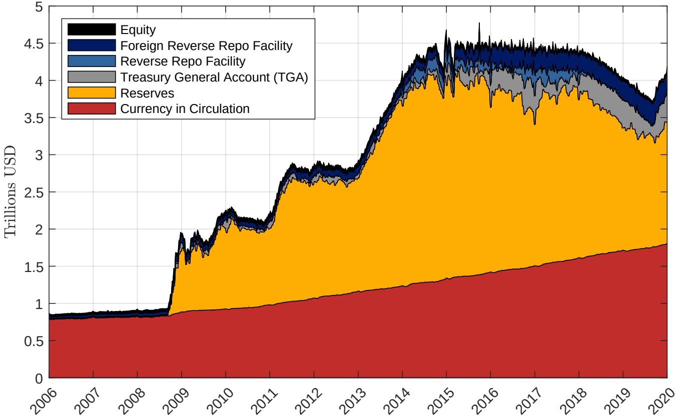
- banks have to hold enough liquid assets to cover cash outflows for 30 days
- HQLA level 1: reserves and Treasuries → substitutes
- HQLA level 2: highly rated MBS, covered bonds and corporate debt securities
- computed on monthly average of end-of-day balance-sheets for US banks

Liquidity Stress-Tests (LST):

- Regulation YY's enhanced prudential standards and Resolution Liquidity Adequacy and Positioning
- applies on top of LCR
- requires banks to pre-fund <u>gross</u> daily outflows in <u>reserves</u>

→ time-varying and depends on expected flows

Tapper + Large Treasury Account $\rightarrow$ Less Reserves



Policy Options

Option 1: Open a Repo Facility:

- acts as a discount window but for shadow banks
- amounts to setting a second outside option at rate λ^f for shadow banks
- requires the Fed to increase its balance sheet on demand

Option 2: Open an Intraday Borrowing Facility:

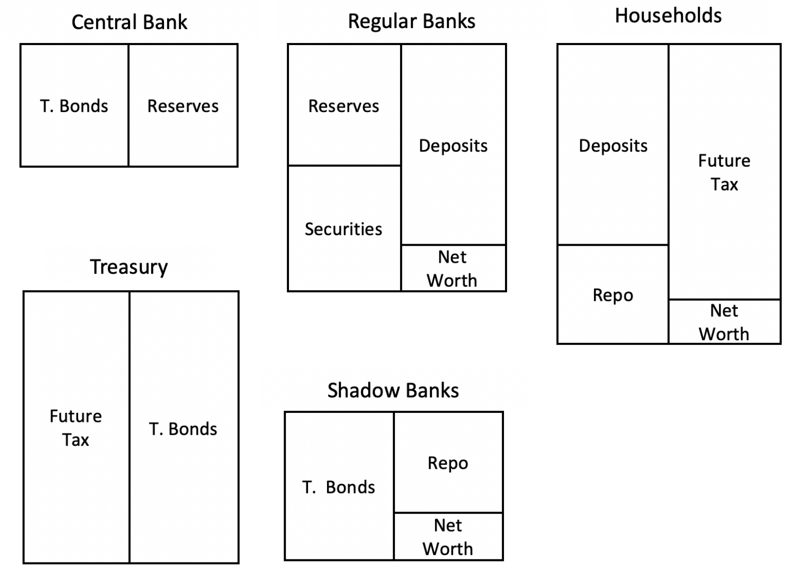
- allows banks to borrow intraday before reaching zero
- reintroduce elasticity of intraday reserves

Option 3: Allow Expected Discount Window Borrowing to Count for LST:

- allows any collateral eligible at discount window to count for LST
- reintroduce substitutability between reserves and other liquid assets
- inelasticity still there but not binding with much more liquid assets

▷ One is necessary if the Fed wants to (one day) reduce the size of its balance sheet.

Repo Facility



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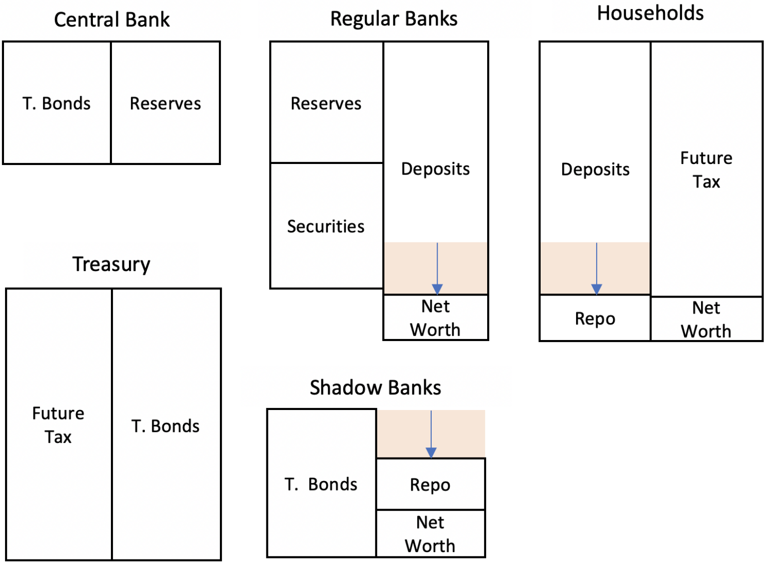

Repo Facility