Mutual Fund Liquidity Transformation and Reverse Flight to Liquidity

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Motivation

- Covid-19 crisis: traditionally liquid assets became strained from unusually high **selling** pressures
  - e.g. Haddad, Moreira, and Muir 20; Duffie 20; He, Nagel, and Song 20; Kargar et al. 20
  - **Reverse flight to liquidity**

- Conventional wisdom: **flight to liquidity** during market distress
  - high **buying** pressure for liquid assets

Heightened Selling Pressure in Treasury Market

Treasury discount $\downarrow$

= Interest swap yield + Treasury CDS - Treasury yield $\uparrow$

Motivation

▶ The conventional negative correlation between Treasury yield and VIX is reversed in Covid-19 crisis
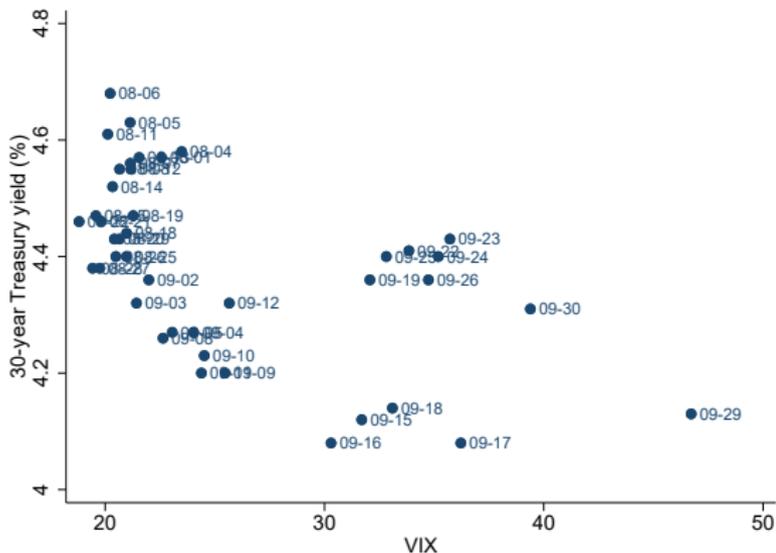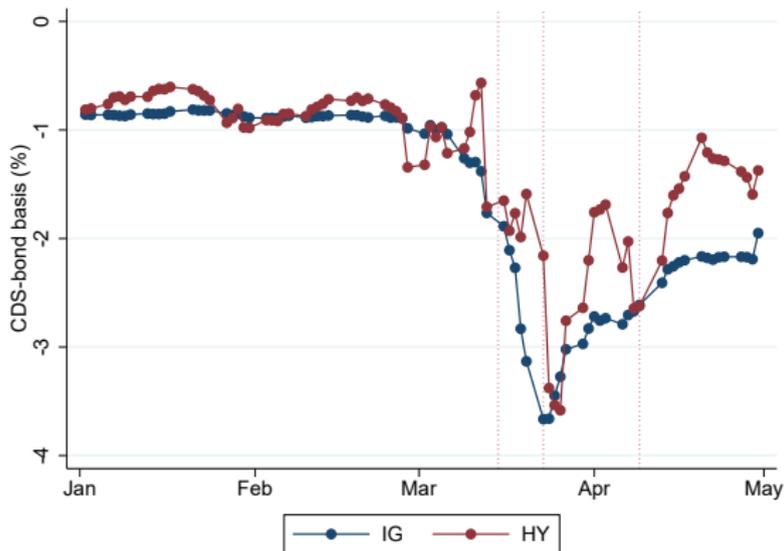
Figure: Treasury Yields and VIX in Jan-Apr 2020
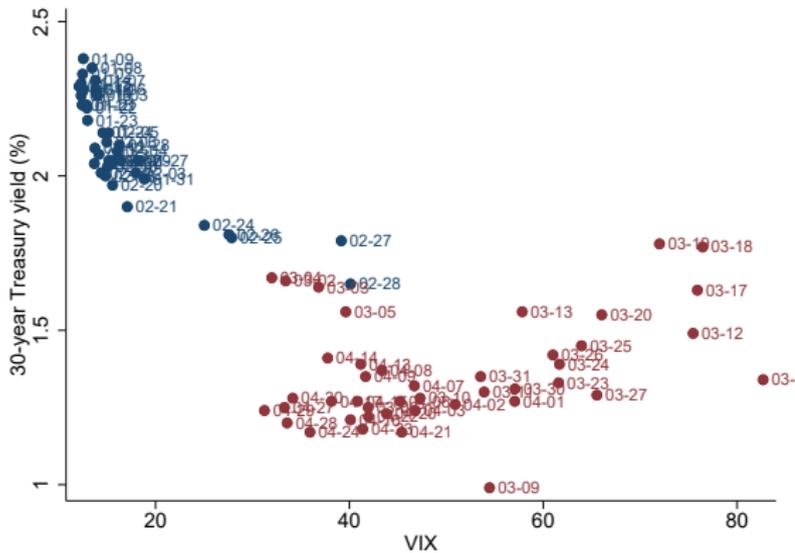
Motivation

▶ Conventional wisdom: flight to liquidity

Figure: Treasury Yields and VIX in Aug-Sep 2008

Heightened Selling Pressure in IG Corp Bonds

CDS-bond basis ↓

= corporate bond CDS spread ↑ - corporate bond spread ↑↑↑

Motivation

The market for U.S. Treasuries has long been viewed as the world's most liquid financial market. That presumption was questioned...

"Still the World's Safe Haven?" Darrel Duffie

What caused the reverse flight to liquidity phenomenon?

- ▶ Bond mutual funds
  - ▶ Liquidity transformation → large redemption in crisis
  - ▶ Pecking order of liquidation → concentrated sale of liquid assets

What caused the reverse flight to liquidity phenomenon?

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  - Pecking order of liquidation $\rightarrow$ concentrated sale of liquid assets

- Implications of the reverse flight to liquidity phenomenon
  - With more liquidity transformation by bond funds
  - Liquid assets may experience more volatility
 - May steer central banks towards providing liquidity backstops to bond funds

Literature

1. Disruptions in liquid asset market during Covid-19
   - Haddad, Moreira, and Muir 20 and Kargar et al. 20: document debt market disruptions
   - Duffie 20, He, Nagel, and Song 20: dealer constraints
   - Falato, Goldstein and Hortacsu 20: fragility in fund flows
   - **A new explanation for heightened selling pressure in liquid assets through mutual fund liquidity transformation**

2. Financial intermediation by banks versus non-banks
   - E.g. Diamond and Dybvig 83, Goldstein and Pozner 05, Hanson, Shleifer, Stein, and Vishny 15, Ma, Xiao, and Zeng 20
   - **Asset-side implications of liquidity provision by mutual funds versus banks**

3. Mutual fund flows and financial stability
   - E.g. Chen, Goldstein, and Jiang 10, Goldstein, Jiang, and Ng 17, Chernenko and Sunderam 17, Jiang, Li, and Wang 20
   - **↑ fund asset illiquidity → ↑ potential for liquid asset market disruptions**

Roadmap

1. Aggregate Trends
2. Empirical Evidence

Bond Fund Growth

▶ Bond mutual funds have become increasingly important...

Total Assets

Fund Shares/Deposits
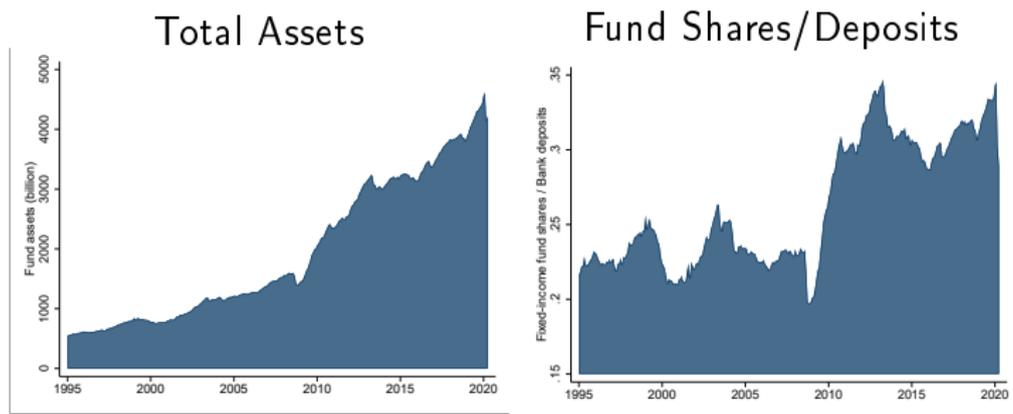
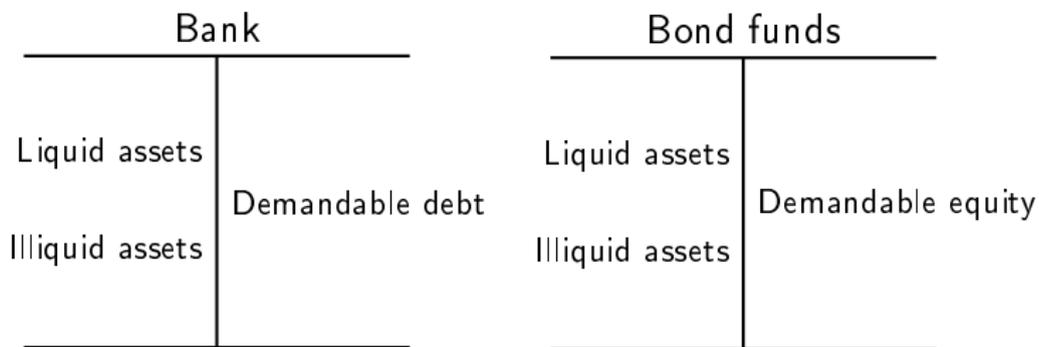▶ AUM: $1 trillion to $4.5 trillion from 2007 to 2019
▶ Shares/Deposits: 0.22 to 0.35 from 2007 to 2019

Mutual Fund Liquidity Transformation
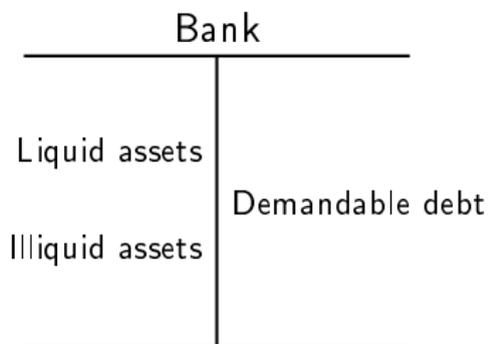
Bank

| Liquid assets | Demandable debt |
| Illiquid assets | |

Mutual Fund Liquidity Transformation

Bank	
Liquid assets	Demandable debt
Illiquid assets	

Bond funds	
Liquid assets	Demandable equity
Illiquid assets	

Mutual Fund Liquidity Transformation

Bank	
Liquid assets	Demandable debt
Illiquid assets	

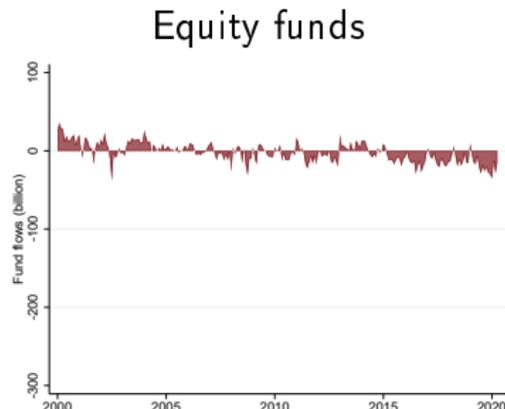| Bond funds	
Liquid assets	Demandable equity
Illiquid assets	
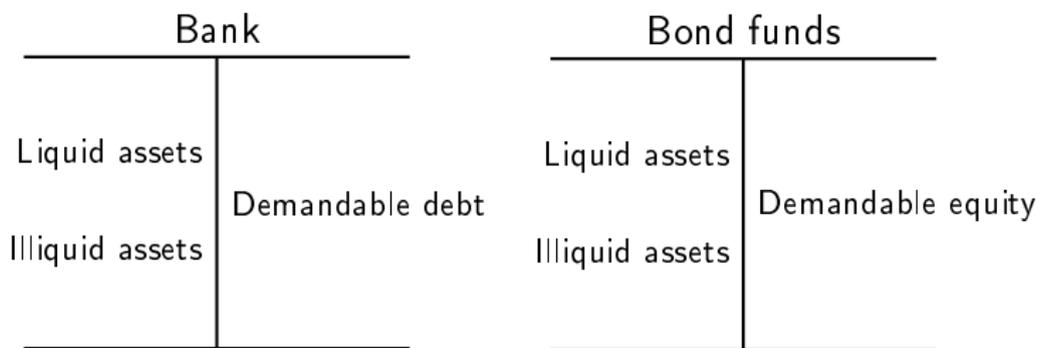
▶ Like banks, bond funds provide liquidity by issuing liquid claims backed by (mostly) illiquid assets

▶ Liquidity transformation may lead to first-mover advantage, e.g. Market value drops from 100 to 80 but NAV is still at 90

Pronounced Outflows at Bond Funds

▶ Bond funds suffered an unprecedented $264 billion outflows in March, 2020

Bond funds   Equity funds
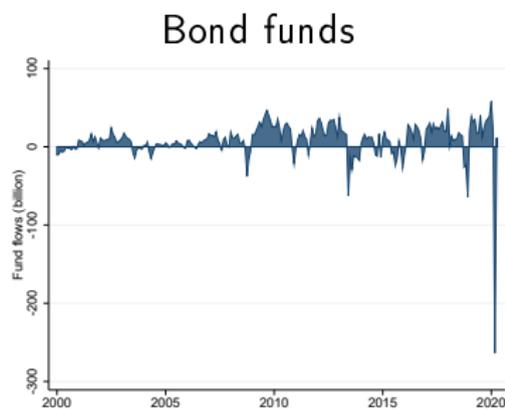
▶ Equity funds suffered much smaller outflows → liquidity transformation must matter...

Higher Asset Illiquidity, Larger Outflows

▶ ...also evident from more pronounced outflows at more illiquid
bond funds
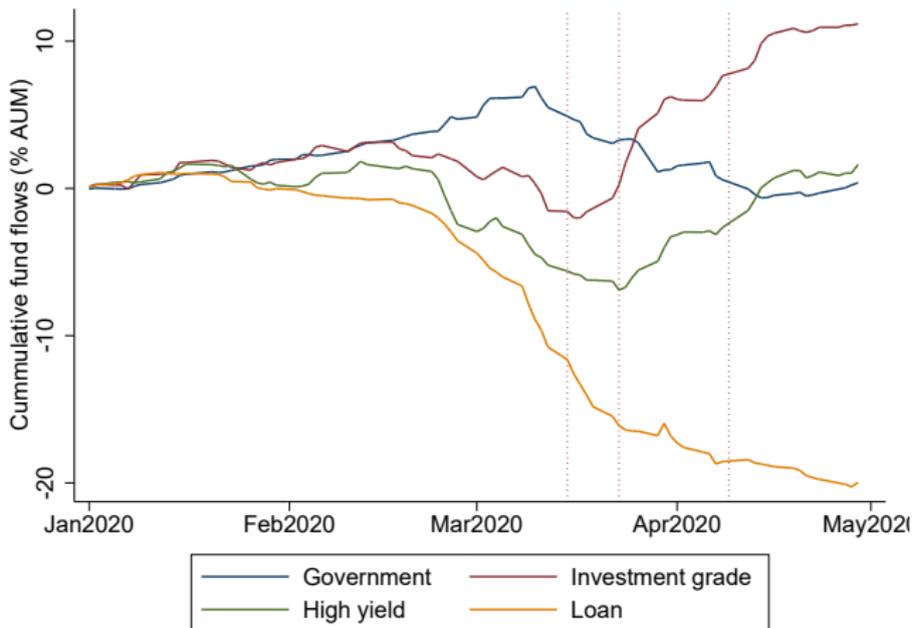
Concentrated Sales of Liquid Assets

▶ Liquid assets were disproportionately liquidated
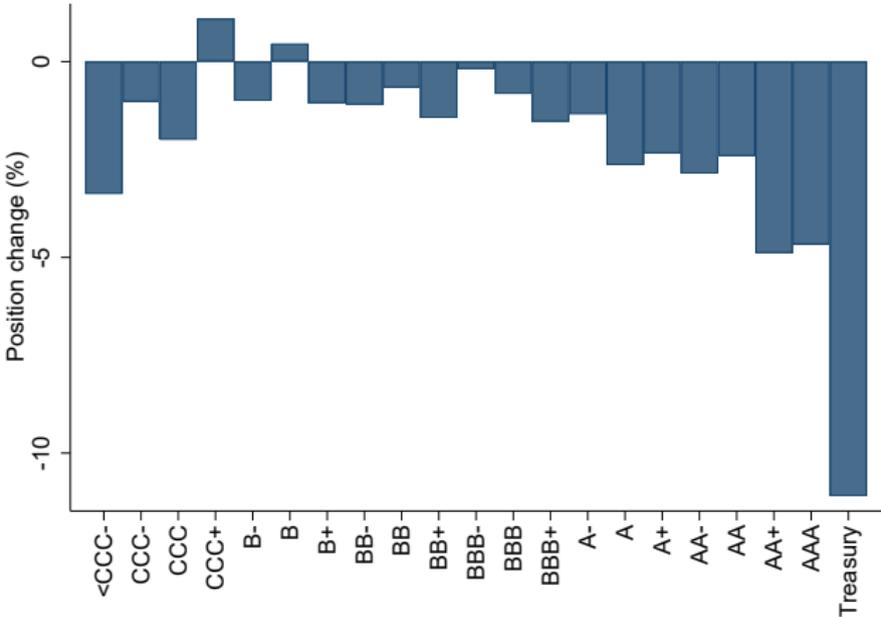
Large Aggregate Liquidations

▶ Aggregate Treasury liquidations by open-end funds amounted to $236 billion in 2020Q1
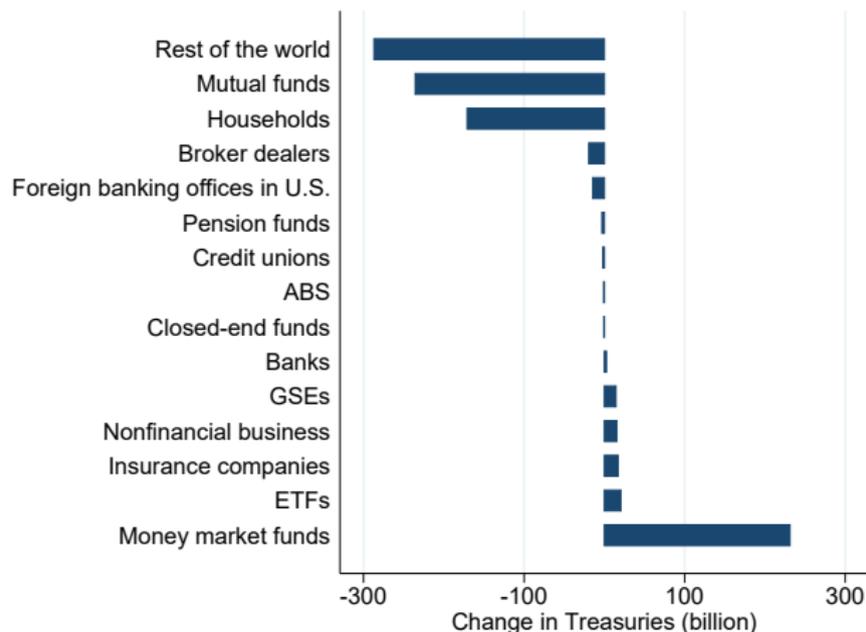
Empirical Evidence

Liquidity Transformation and Outflows: Fund-level Evidence

Figure: Fund Outflows versus Fund Liquidity Provision Index (LPI)
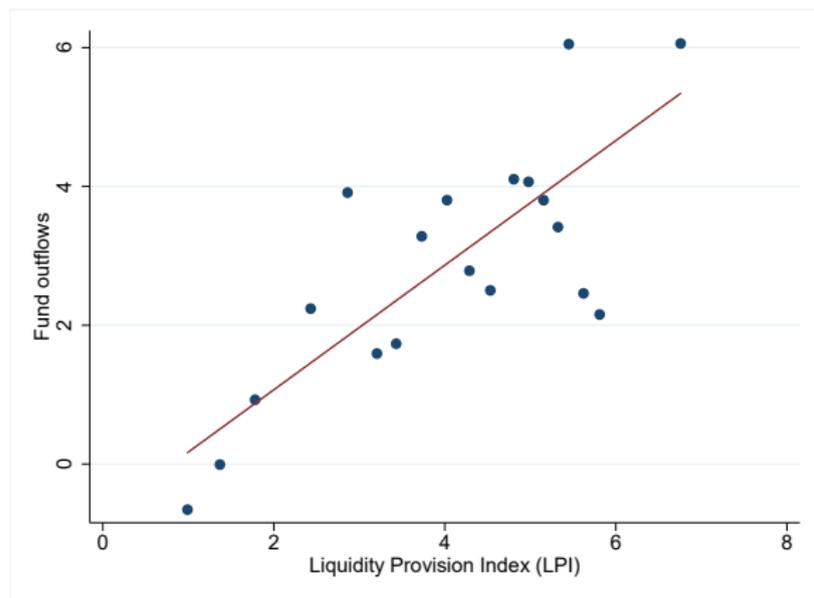
▶ LPI = per dollar expected contract payment - direct
liquidation value assets (Ma, Xiao and Zeng 19)

Cross-section Determinants of Outflows

▶ High asset illiquidity → more outflows

	(1) Outflow	(2) Outflow	(3) Outflow	(4) Outflow
Fund illiquidity	0.546***	0.545***	0.537***	0.564***
	[0.092]	[0.092]	[0.094]	[0.096]
Institutional		0.137	0.135	0.283
		[0.203]	[0.203]	[0.204]
Index fund			-0.259	-0.614
			[0.595]	[0.602]
Fund objective F.E.	No	No	No	Yes
Observations	6,355	6,355	6,355	6,355
Adj. R-squared	0.005	0.005	0.005	0.021

▶ Other controls: yield, return volatility, expense ratio, turnover ratio

What did funds sell when they face redemption?

Reverse Flight to Liquidity: Pecking Order

$$\text{Liquidations}_{i,j} = \beta\text{Fund Outflow}_j + \gamma X_i + \theta X_j + \epsilon_{i,j}$$

Figure: Liquidation to Redemption Sensitivity by Bond Rating
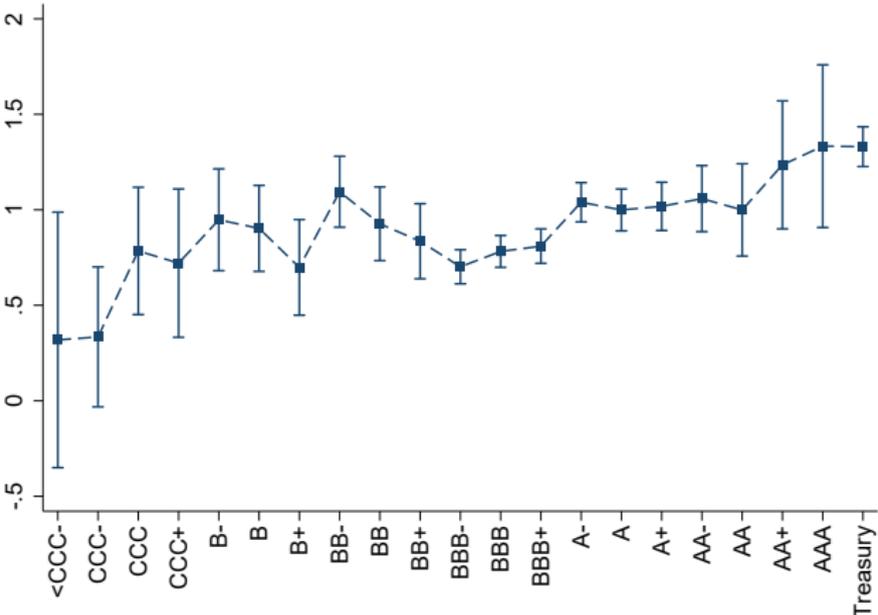
Pecking Order based on Relative Liquidity: Measure

$$\text{Rank}_{i,j} = \sum_{i'} \text{Share}_{i',j} \times \mathbb{1}\left[\text{Liquidity}_i > \text{Liquidity}_{i'}\right]$$

▶ $\text{Rank}_{i,j}$ is defined as the sum of shares of assets held by fund j that are less liquid than bond i

Pecking Order based on Relative Liquidity: An Example

- ▶ Compare two identical Treasury bonds held by (1) a Treasury fund and (2) a corporate bond fund
- ▶ Treasury bond fund has more liquid assets → ranked lower in the pecking order
- ▶ Corporate bond fund has more illiquid assets → ranked higher in the pecking order
- ▶ Corporate bond fund is more likely to sell the Treasury bond for the same redemption

Reverse Flight to Liquidity: Pecking Order

$$\text{Liquidation}_{i,j} = \beta \text{Outflows}_j \times \text{Rank}_{i,j} + \gamma X_{i,j} + \epsilon_{i,j}$$

	(1) Open-end All	(2) Open-end Active	(3) Open-end Passive
Outflows	0.268***	0.208***	0.224***
	[0.016]	[0.024]	[0.035]
Outflows*Rank	0.198***	0.386***	0.082
	[0.047]	[0.060]	[0.151]
Bond F.E.	Yes	Yes	Yes
Fund objective F.E.	Yes	Yes	Yes
Observations	79,050	37,945	39,410
Adj. R-squared	0.067	0.071	0.050

Did funds' selling pressure affect prices of liquid assets?

Bond yields by liquidation rank

Figure: Pecking order of liquidation and bond yield
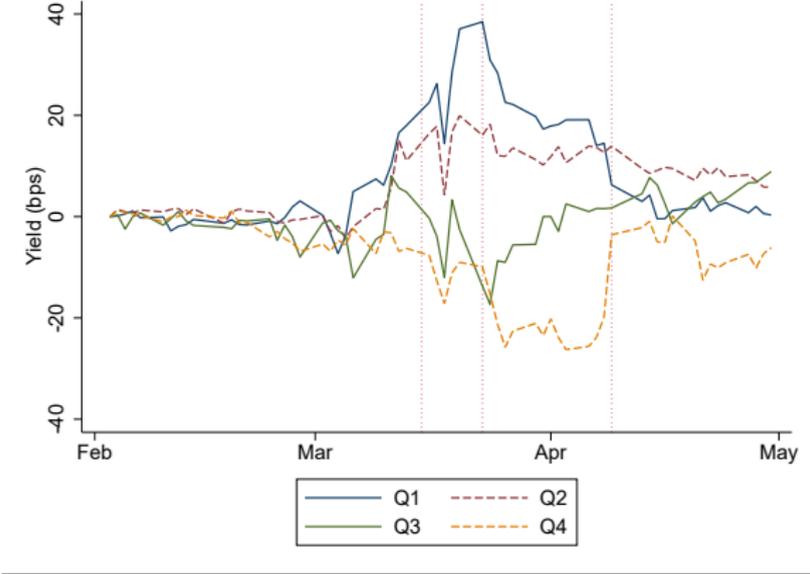
Impact on Asset Prices

$$\text{Imputed Outflow}_{i,t} = \sum_j \text{Fund outflow}_{j,t} \times \frac{\text{Holding}_{i,j,2019Q4}}{\sum_k \text{Holding}_{i,k,2019Q4}}$$

$$\text{Return}_{i,t} = \beta \text{Imputed Outflow}_{i,t} \times \text{High rank}_i + \gamma X_{i,t} + \epsilon_{i,t}$$

	(1) Return	(2) Return	(3) Return
Outflows	-1.646	-1.741	-1.856
	[1.167]	[1.174]	[1.194]
Outflows*High rank	-3.443**	-3.550**	-3.506**
	[1.426]	[1.433]	[1.459]
Rating-Time F.E.	Yes	No	No
Maturity-Time F.E.	Yes	No	No
Issuer F.E.	No	Yes	Yes
Bond F.E.	No	No	Yes
Observations	398,678	398,678	398,677
Adj. R-squared	0.174	0.175	0.166

What were the effects of Fed interventions ?

Fed Intervention

Unprecedented intervention by the Fed in fixed income markets:

- March 15: Announced purchase of Treasuries
- March 23: Announced purchase of IG corporate bonds
- April 9: Announced extension of corporate bond purchase
  - Larger volume
  - Include "fallen angels"

Effect of Fed Interventions on Fund Flows

$$Outflows_{i,t} = \beta FedIntervention_t + \gamma X_{i,t} + \epsilon_{i,t}$$

	(1) Govt	(2) IG	(3) HY	(4) BL
Treasury bond purchase	0.014	0.043	0.093***	0.093***
	[0.032]	[0.039]	[0.026]	[0.033]
Corp bond purchase	0.217***	0.366***	-0.057	0.161***
	[0.040]	[0.063]	[0.035]	[0.051]
Corp bond purchase expansion	0.057***	-0.039**	-0.069***	-0.073***
	[0.017]	[0.019]	[0.008]	[0.010]
Control	Yes	Yes	Yes	Yes
Fund fixed effects	Yes	Yes	Yes	Yes
Month fixed effects	Yes	Yes	Yes	Yes
Observations	13,573	6,452	17,819	9,364
Adj. R-squared	0.058	0.071	0.067	0.096

▶ Announcements of corp bond purchase stopped outflows, but Treasury bond purchase did not

Effect of Fed Interventions on Fund NAV

$$\Delta NAV_{i,t} = \beta FedIntervention_t + \gamma X_{i,t} + \epsilon_{i,t}$$

	(1) Govt	(2) IG	(3) HY	(4) BL
Treasury bond purchase	0.241**	0.188	-2.336***	-2.618***
	[0.119]	[0.236]	[0.274]	[0.290]
Corp bond purchase	0.901***	0.866**	-1.261**	-1.941***
	[0.178]	[0.400]	[0.486]	[0.487]
Corp bond purchase expansion	0.399***	1.616***	1.621***	1.114***
	[0.039]	[0.066]	[0.111]	[0.095]
Control	Yes	Yes	Yes	Yes
Fund fixed effects	Yes	Yes	Yes	Yes
Month fixed effects	Yes	Yes	Yes	Yes
Observations	13,565	6,451	17,816	9,357
Adj. R-squared	0.180	0.427	0.323	0.377

▶ Announcements of corp bond purchase increased NAVs, but Treasury bond purchase did not

Why did reverse flight to liquidity emerge this time?

- Increased liquidity transformation by funds since last crisis
- Bond fund AUM: $1 trillion to $4.5 trillion from 2007 to 2019

- With increased mutual fund liquidity transformation, going forward:
  - Increased volatility in traditionally liquid assets
  - "Are US Treasury Bonds Still a Safe Haven?" (He and Krishnamurthy, 2020)
  - Mutual funds conduct liquidity transformation outside public liquidity backstops
  - More reliance on unconventional central bank asset purchases

Conclusion

1. What caused the reverse flight to liquidity phenomenon?

   Mutual funds transform liquidity by issuing demandable equity shares + using pecking order of liquidations

2. What are the policy effects?

   The purchase of illiquid assets directly alleviates fund outflows and is more effective than the purchase of liquid assets

3. What was special about the Covid-19 crisis? Could everything happen again in the future?

   Migration of liquidity transformation to mutual funds