Bond markets in Spring 2020 and the response of the Federal Reserve

Annette Vissing-Jorgensen, University of California Berkeley and NBER

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Abstract: This paper studies Treasury market dislocations during the initial phase of the COVID crisis in March of 2020. Distortions were large for long-maturity Treasuries with the 10-year yield increasing by 64 bps from March 3 to 18. This was not due to higher expected inflation nor increased CDS rates for government debt. I study who were selling and document that outflows from bond mutual funds peaked during the weeks of the largest price distortions and were likely contributors to downward price pressure on Treasuries. Funds facing outflows dis-proportionately sold Treasuries. Other large Treasury sellers included foreign central banks and hedge funds. I link the poor performance of Treasuries and investment-grade corporate bonds in mid-March to a disappearing safety-effect. Analysis of Federal Reserve interventions reveal that Treasury yields started falling with large daily Fed purchases of Treasuries in the days after March 18. Investment-grade corporate yields fell sharply after the Fed's March 23 announcement, which included corporate bond purchases. In sharp contrast to the importance of large purchases in the Treasury market, corporate markets stabilized without immediate purchases and purchases made have been delayed and modest. I argue that providing liquidity requires large purchases (the Treasury market) but that one can stabilize a market with few purchases if the announcement itself moves fundamentals (perceived credit risk) enough to stop selling (the corporate market). I compare these lessons with how Treasury yields evolved during fall 2008 and how Treasury QE worked during the financial crisis.

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January 3, 2021 (First version August 26, 2020)

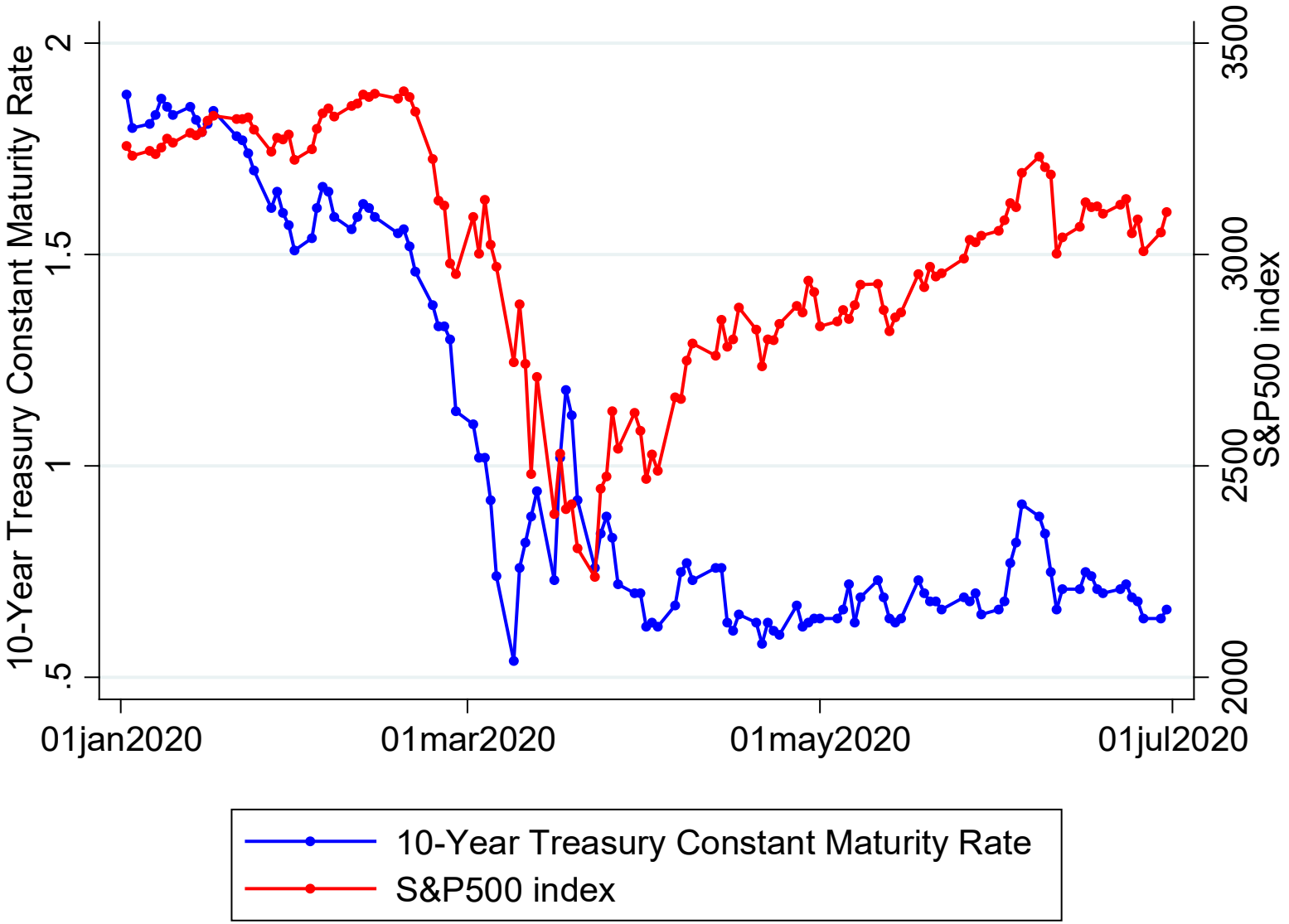
1. Dislocations in Treasury markets in March
2. Who were selling Treasuries? Why?
3. Fed facilities to stabilize bond markets

Throughout: Comparison to 2008

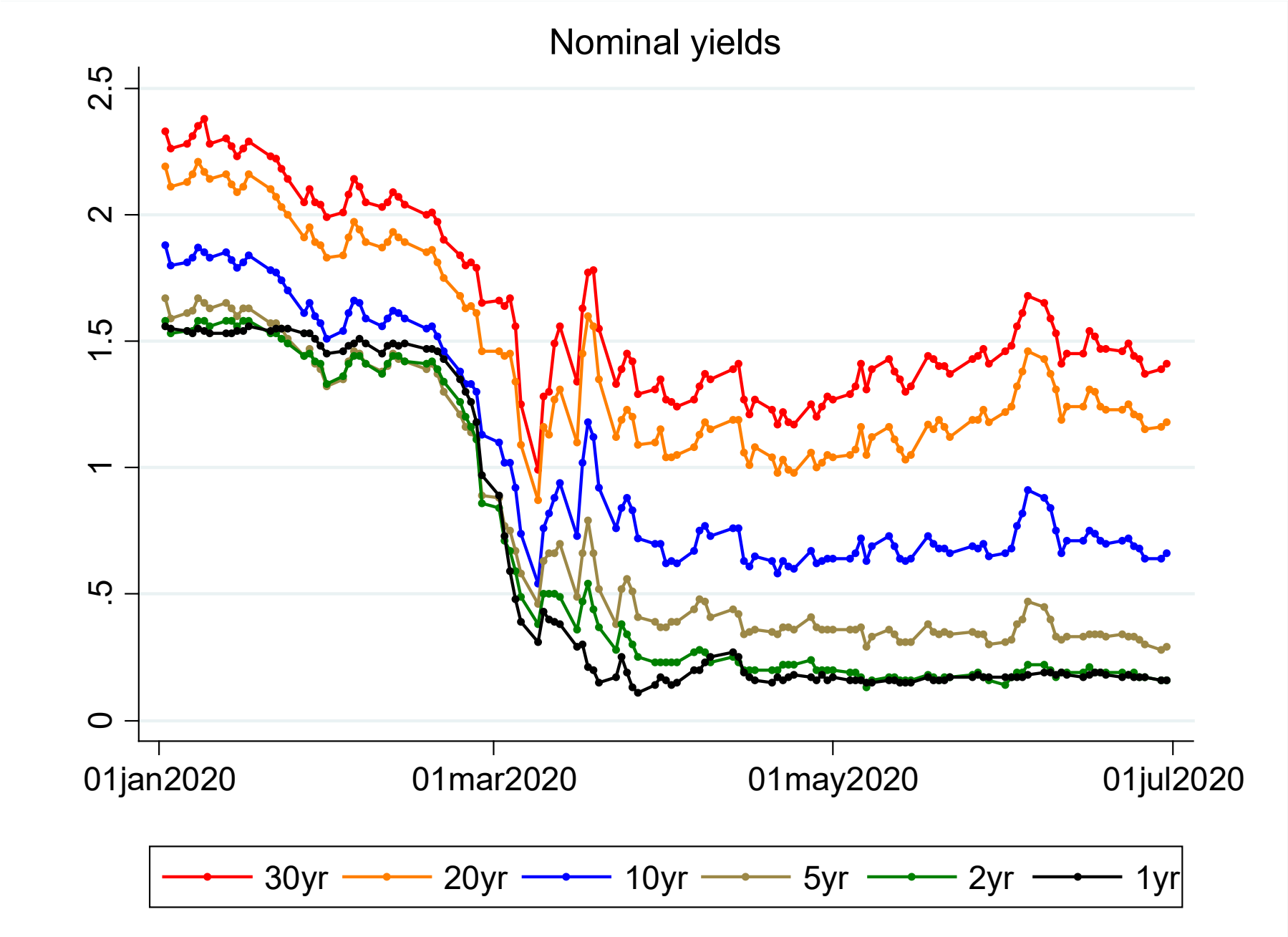
TREASURY MARKET DISLOCATIONS IN MARCH 2020

Treasury yields spiked in mid-March as S&P500 kept falling:

10-year yield +64 bps from 3/9 to 3/18

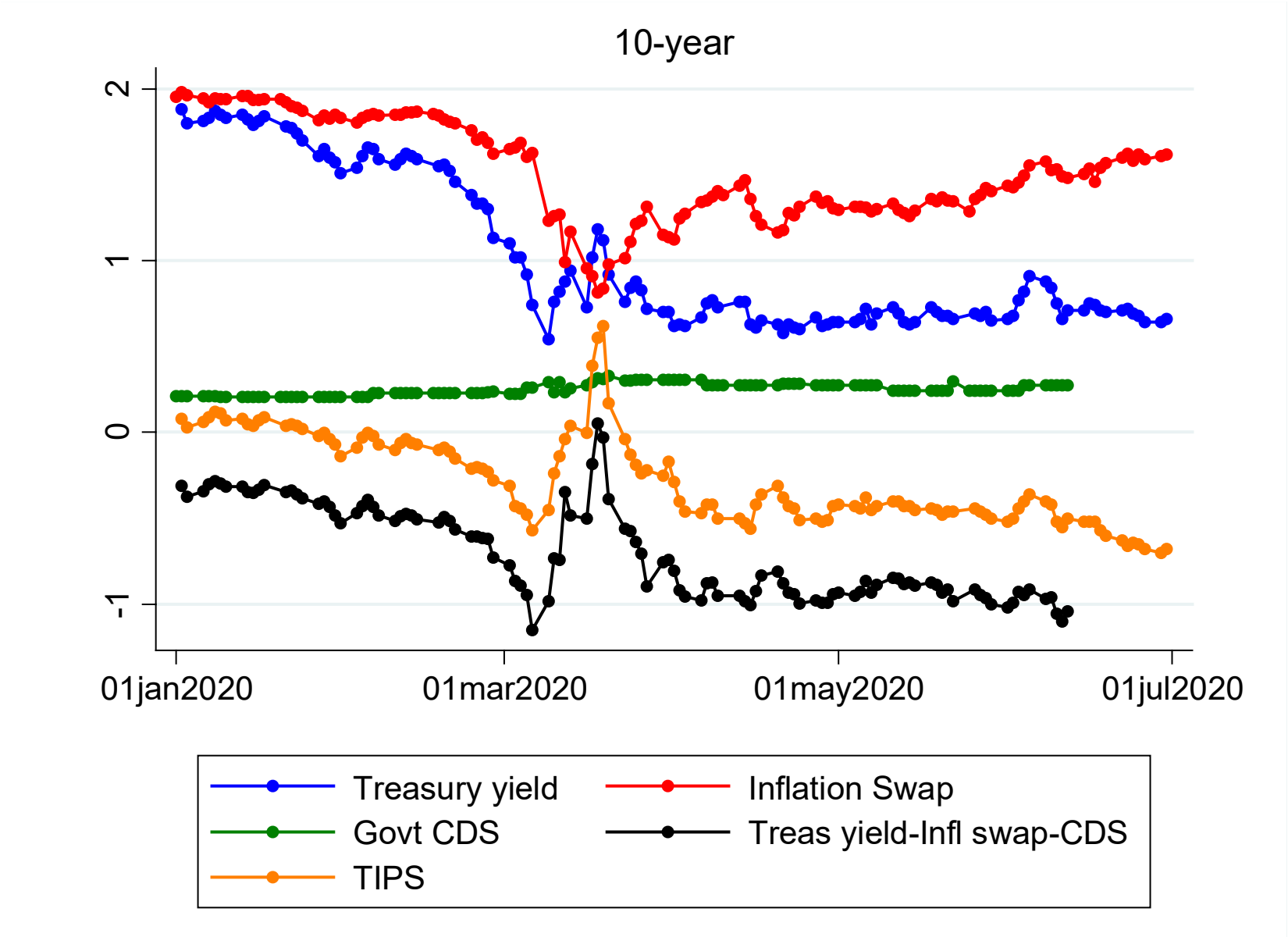


Treasury yields spiked more at longer maturities



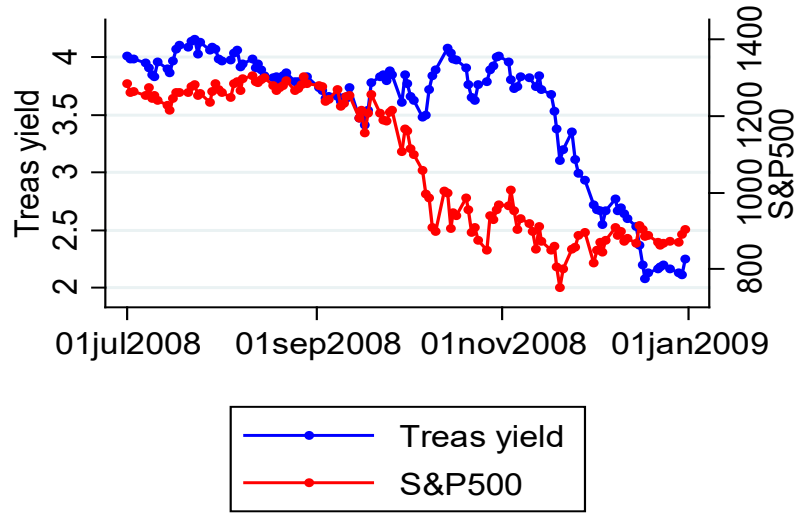
Yield spike driven by higher real yields, not expected inflation or credit risk

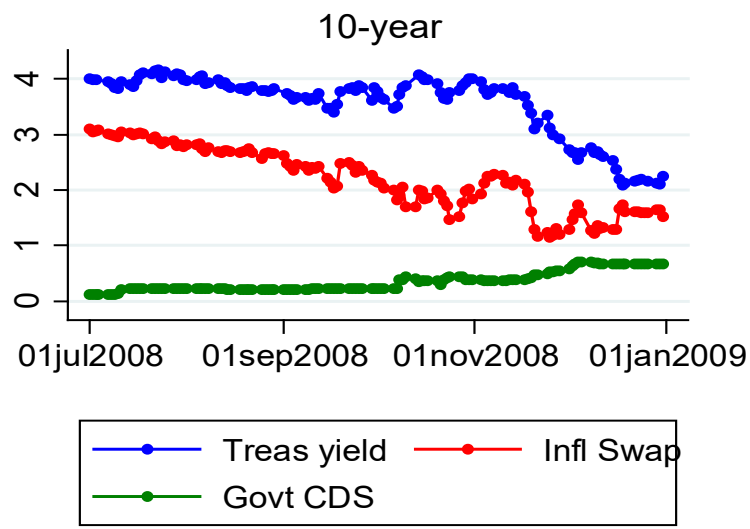
10-year yield, adjusted for inflation and CDS: +103 bps from 3/9 to 3/18

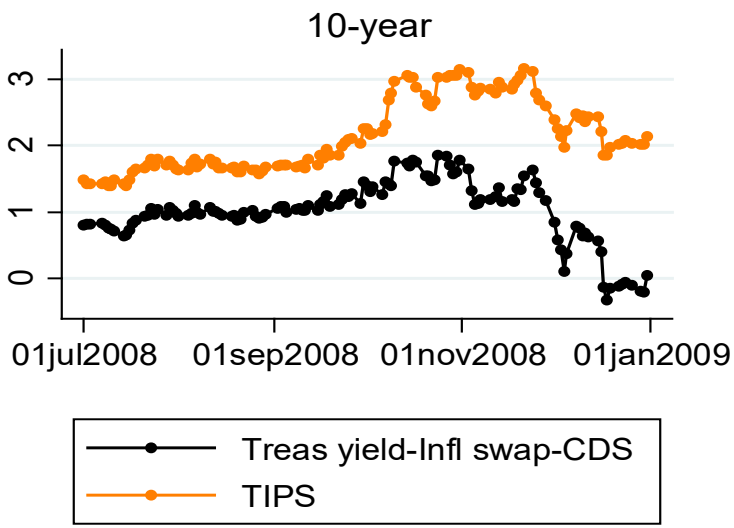


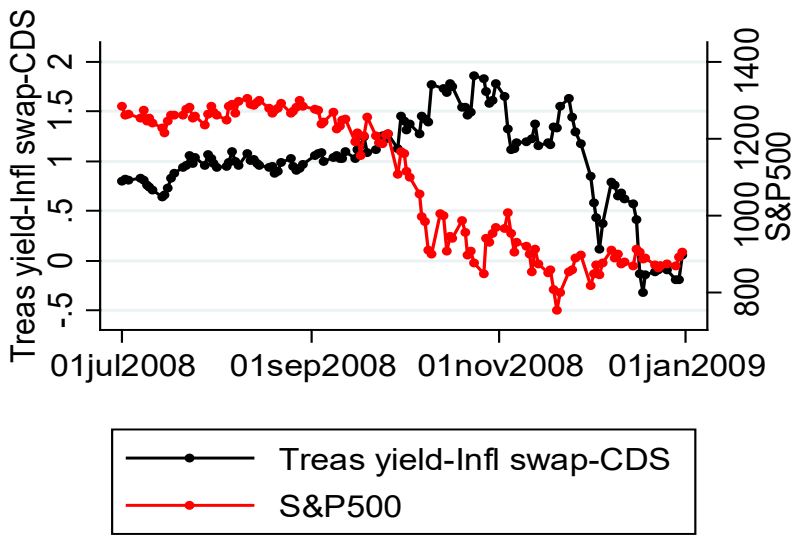
Comparing to 2nd half of 2008: No spike in Treasury yield, but some in real yields

Real rates increase, but less suddenly than in 2020 and spike stops without Fed purchases (QE1 only buys Treasuries after March 18, 2020)









WHAT HAPPENED IN MARCH 2020? WHO WERE SELLING? WHY?

I will show you data on *selling*

Other papers focus on who were *not buying* (enough): Dealers

- Duffie (2020): Proposes central clearing of Treasuries to overcome dealer balance sheet constraints
- He, Nagel and Song (2020): Model link between dealer balance sheet constraints and asset prices

TREASURY SELLING

Treasuries: US Financial Accounts, L.210/FU.210.

Last column accounts for valuation changes.

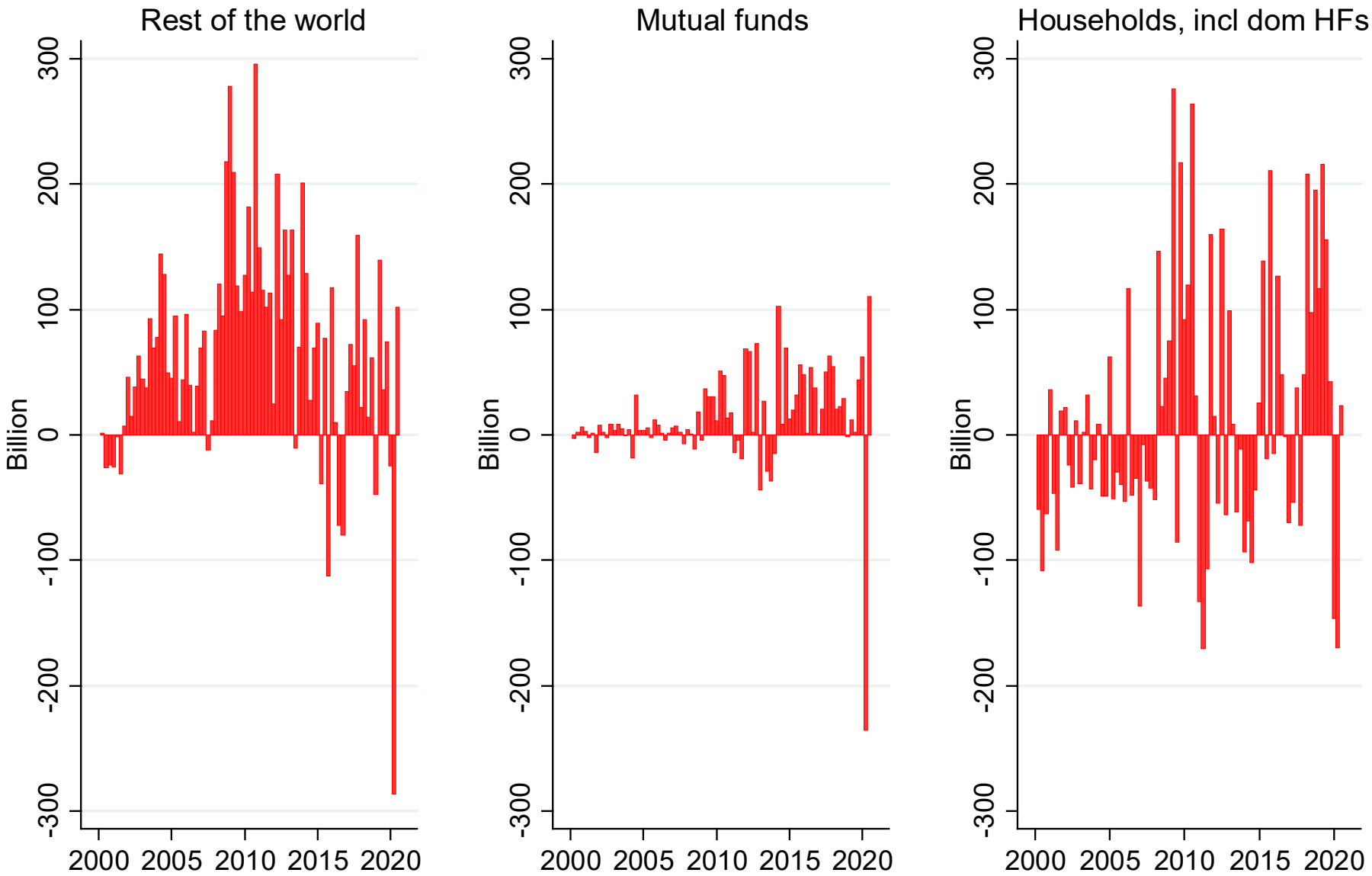
Sellers: Rest of the world, mutual funds, households

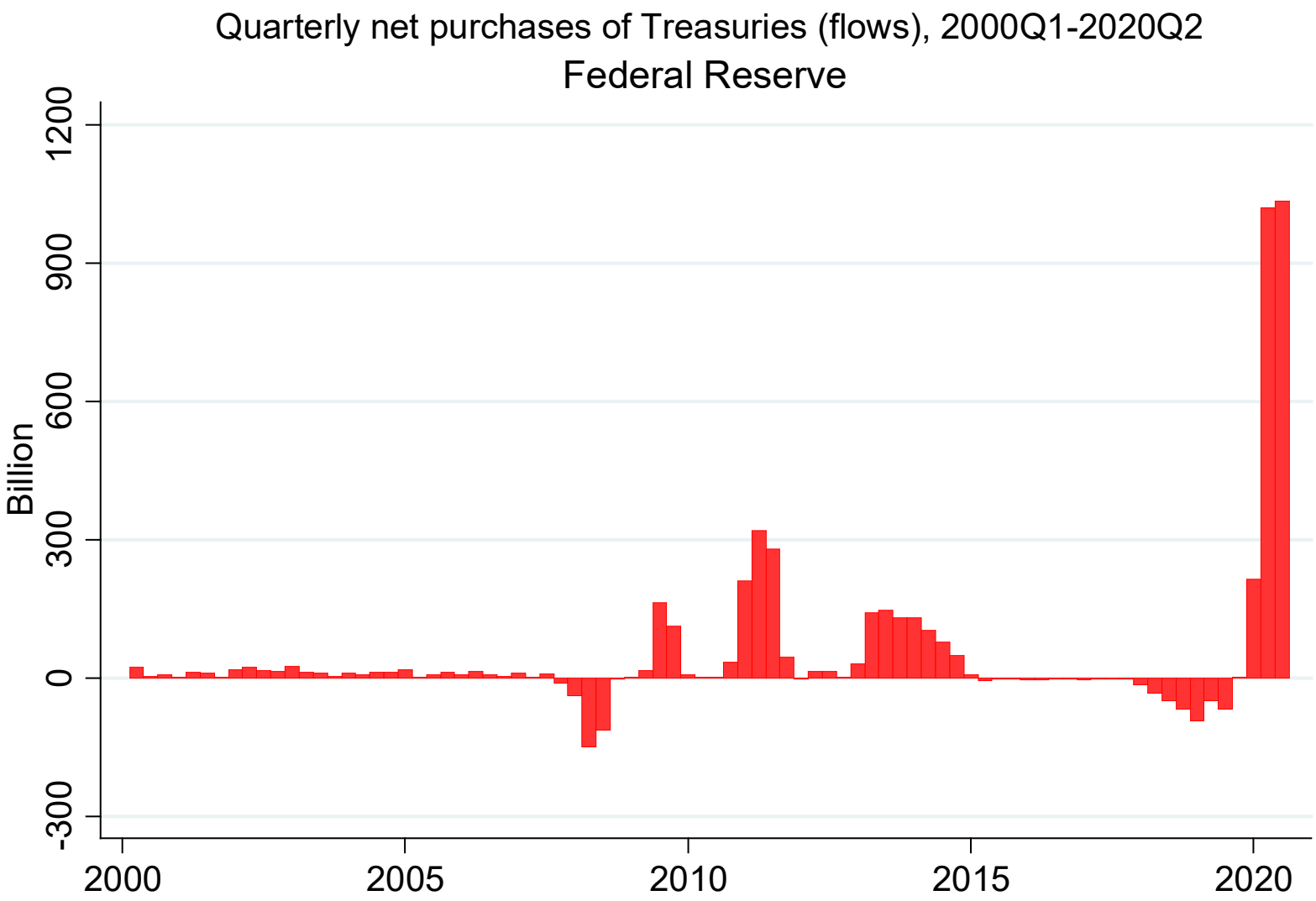
			Holdings change	Traded	
$B	2019Q4	2020Q1	2020Q1-2019Q4	Bought/sold in 2020Q1	
Total liabilities	19,019	19,518	500	500	
Total assets	19,426	20,699	1273	500	
Rest of the world	6,691	6,810	120	-287	Notes/Bonds: -300, Bills: +13
Mutual funds	1,311	1,114	-197	-236	Notes/Bonds: -241, Bills: +5
Household sector, incl. dom hedge funds	2,081	1,792	-289	-170	
State and local governments	740	740	0	-50	
State and local govt retirement funds	353	352	-1	-30	
Brokers and dealers	230	258	29	-20	
Foreign banking offices in U.S.	121	116	-5	-15	
Holding companies	58	54	-4	-9	
Banks in U.S. affiliated areas	17	15	-2	-3	
Private pension funds	421	453	32	-3	
Credit unions	38	39	1	-2	
Nonfinancial noncorporate business	79	84	5	-1	
ABS issuers	33	32	-1	-1	
Closed end funds	3	3	-1	-1	

Buyers: Fed, money market funds

			Holdings change	Traded	
$B	2019Q4	2020Q1	2020Q1-2019Q4	Bought/sold in 2020Q1	
Monetary authority	2,541	3,757	1217	1019	Notes/Bonds: +863, Bills: +156
Money market funds	1,037	1,268	231	231	Notes/Bonds: +36, Bills: +195
Exchange traded funds	232	263	31	20	
Nonfinancial corporate business	48	69	21	17	
Government sponsored enterprises	171	186	14	14	
Life insurance companies	215	244	29	11	
Property casualty insurance companies	153	169	15	6	
Federal government retirement funds	2,150	2,157	6	5	
U.S. chartered desository institutions	704	724	20	3	
Discrepancy	-407	-1181	-773	0	

Quarterly net purchases of Treasuries (flows), 2000Q1-2020Q2




Quarterly net purchases of Treasuries (flows), 2000Q1-2020Q2
Federal Reserve
Billion
1200
900
600
300
0
-300
2000
2005
2010
2015
2020

MUTUAL FUNDS: Drivers of Treasury selling (of notes/bonds)

- Large **outflows from bond funds of all types to money market funds** in March 2020

Type of mutual fund	Total net assets (TNA), end of Feb 2020, $B	Net new cash flow, March 2020	
		$B	% of Feb 2020 TNA
Equity	**10,381**	**-46**	**-0.4**
Hybrid	**1,500**	**-47**	**-3.1**
Bonds	**4,884**	**-255**	**-5.2**
Investment grade (govt, MBS, corp, ABS etc.)	2,258	-89	-3.9
High yield bond	328	-22	-6.6
Government (incl MBS)	364	-16	-4.5
Multisector bond	519	-42	-8.1
World bond	556	-44	-7.9
Municipal	859	-42	-4.9
Money market	**3,647**	**688**	**18.9**
Treasury & Repo Money Market	794	327	41.2
Treasury & Agency Money Market	1,927	507	26.3
Prime Money Market	791	-139	-17.6
Tax-Exempt Money Market	135	-6	-4.8

Source: My calculations based on ICI data.

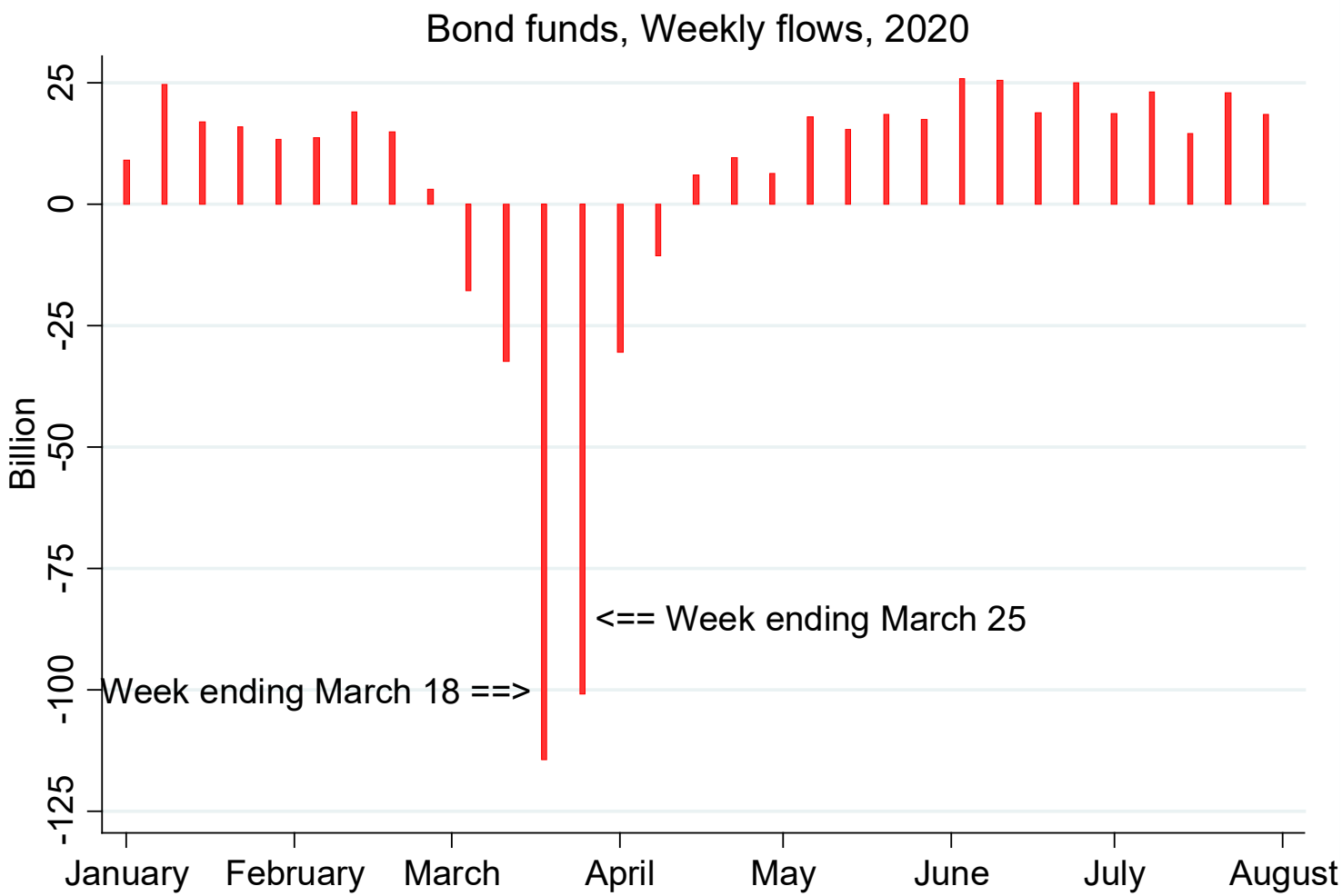
- When funds sold, they **disproportionately sold Treasuries, ``horizontal slicing”**

	(1)	(2)	(3)	(4)	(5)
	End of 2019, $B		Flows in 2020Q1, $B		
	Total net assets (TNA)	Treasury holdings	Net new cash flow	Implied net purchases of Treasuries, if funds sold in proportion to holdings	Actual net purchases of Treasuries
Equity	12,747	47	-110	-2	-11
Hybrid	2,170	91	-56	-3	-24
Bonds, taxable	3,610	856	**-133**	-36	**-95**
Bonds, municipal	800	0	-22	0	0
Other (MBS, currency funds)	392	15	-27	-1	-3
Sum	19,719	1,010	-347	-41	-132

Note: My calculations based on the CRSP mutual fund database. Money market funds not included.

Taxable bonds funds sold 11% of their Treasuries but only 1% of their other bonds.

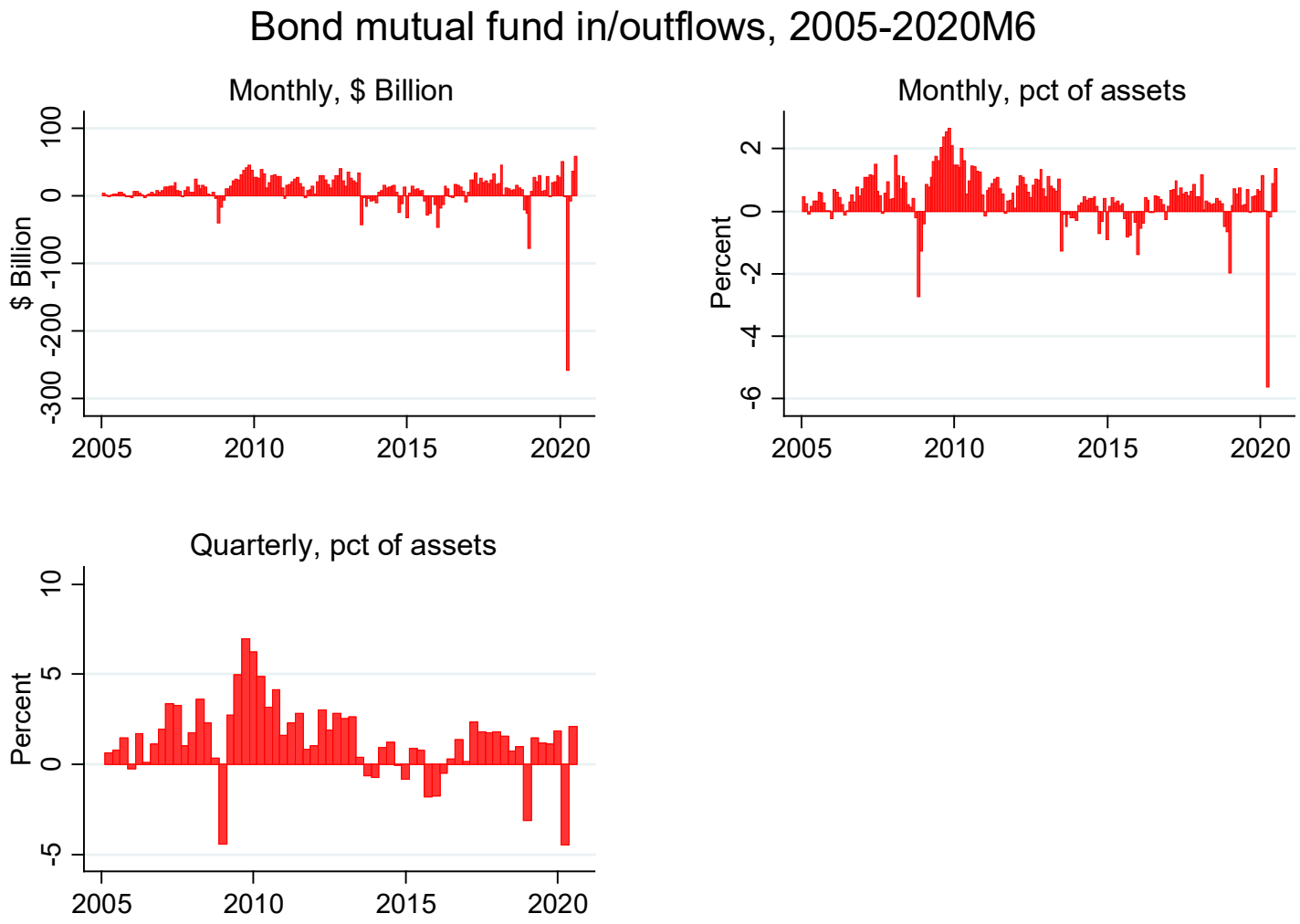
Bond fund outflows peaked in same week as Treasury yields spiked



Source: ICI data

Bond mutual fund flows: Comparing 2008 and 2020

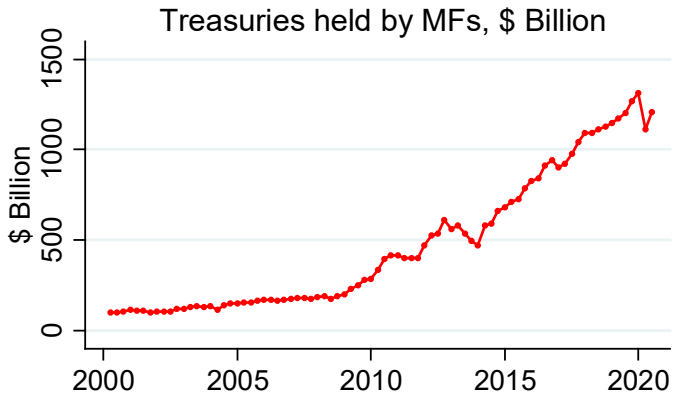
- In $B: March 2020 was a huge outlier.
- Relative to total net assets and using quarterly flows: Similar in 2008Q4 and 2020Q4



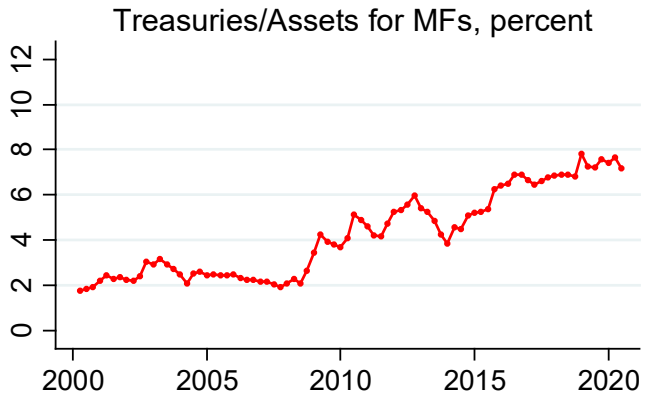
Source: ICI data

So why didn't mututal funds sell many Treasuries in 2008? They had few to sell!

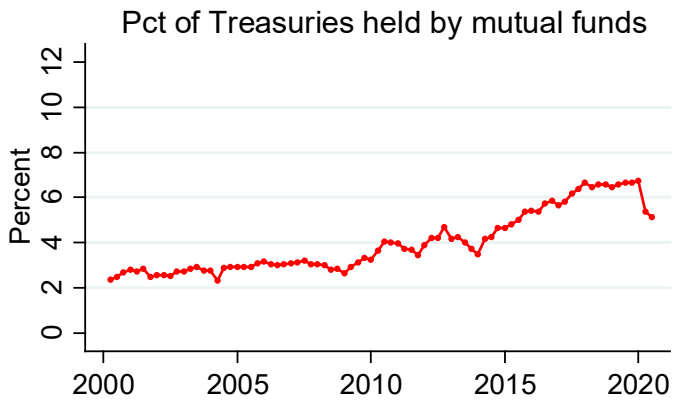
- MF sector is **much more reliant on Treasuries now** (7 times larger holdings)
- In progress: Study changes in mutual fund liquidity risk management



Source: US Financial Accounts, Table L.122



Source: US Financial Accounts, Table L.122



Source: US Financial Accounts, Table L.210

Mechanism behind bond fund outflows: Disappearing safety effect

Krishnamurthy and Vissing-Jorgensen (2011, 2012) safety effect:
Investor willingness to pay extra for ultra-safe/ultra-liquid assets
(for Treasuries, but inherited to some extent by Aaa and other low-risk bonds)

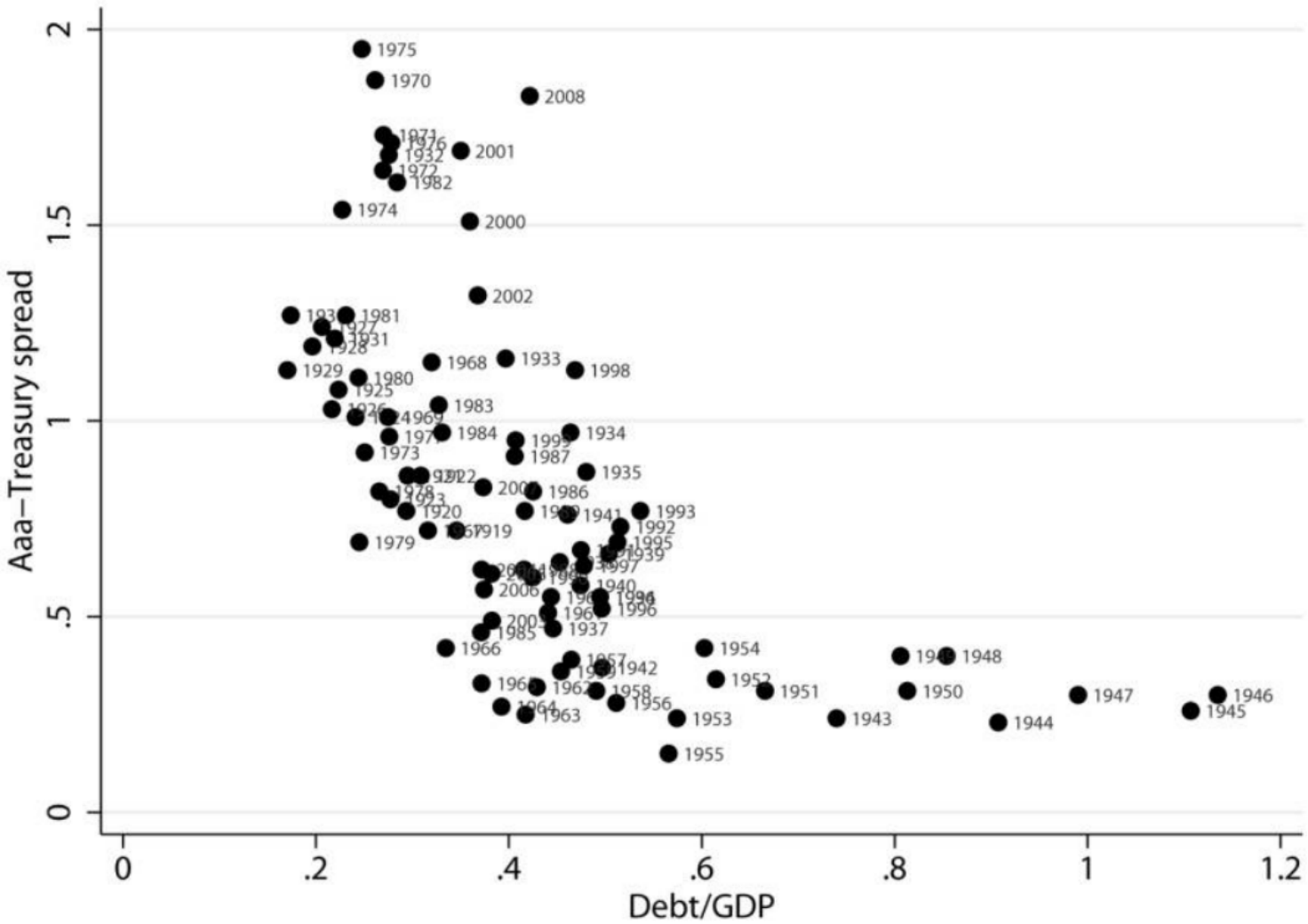
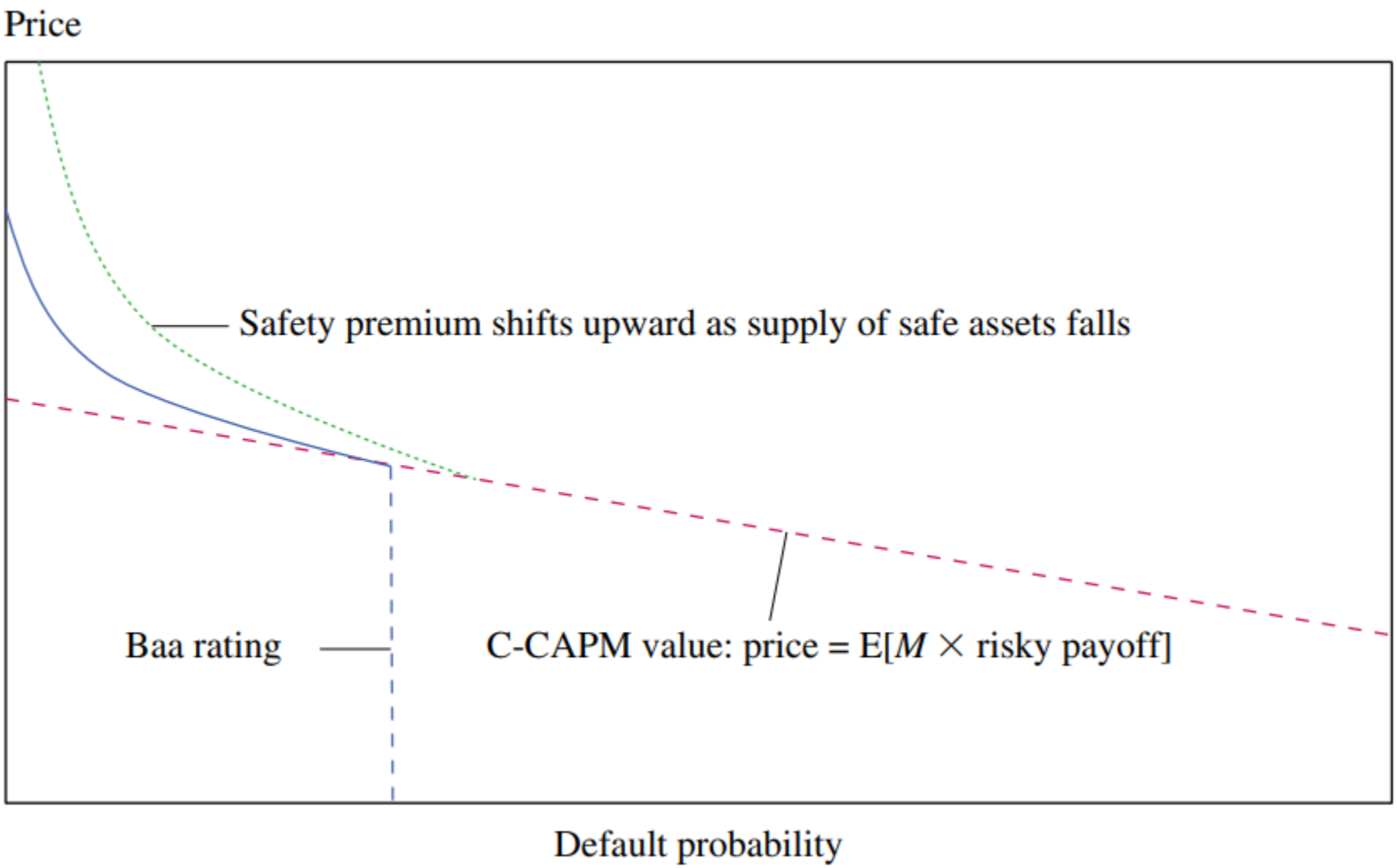


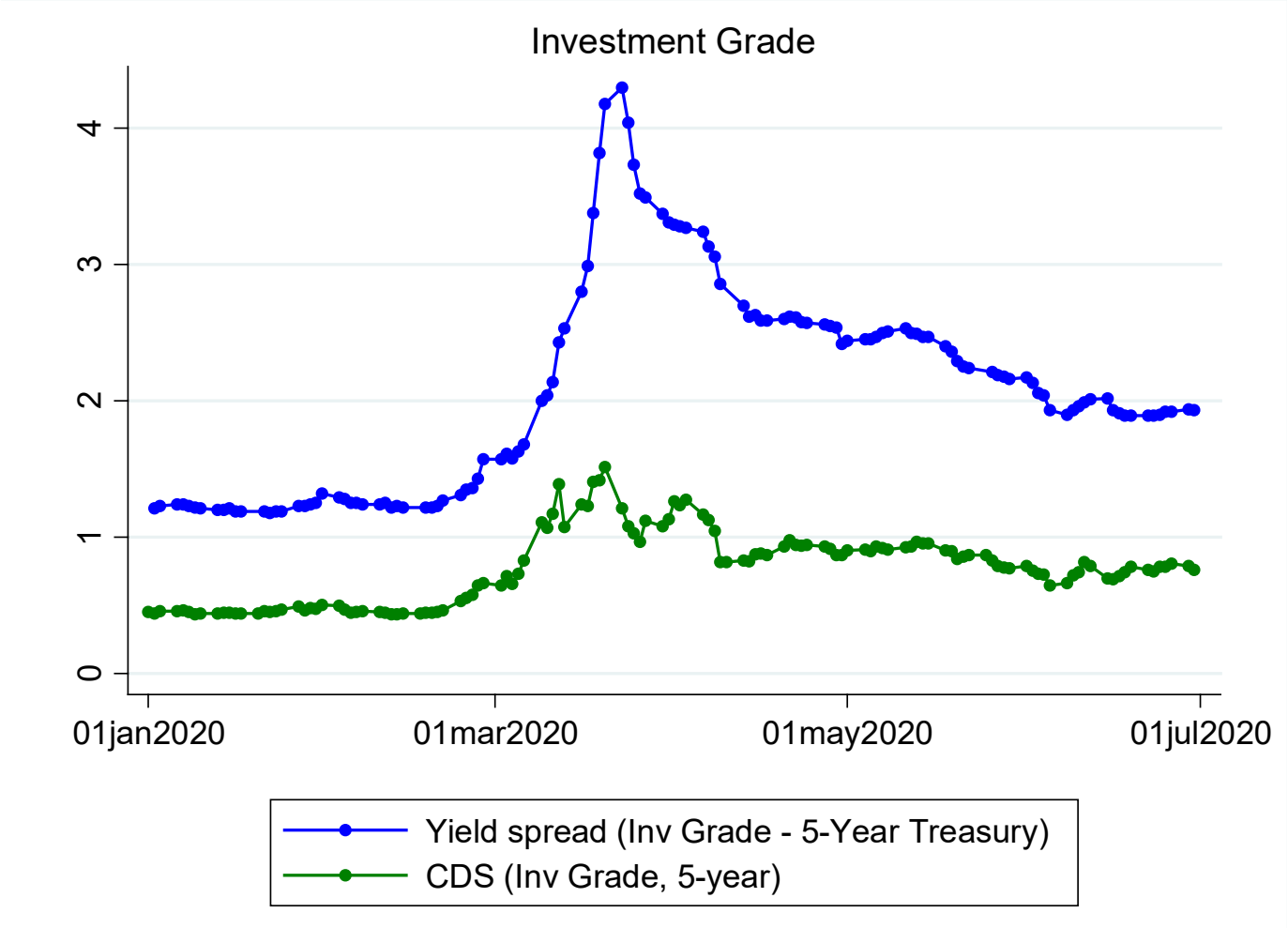
Figure 1. The Safety Premium on Bonds with Near-Zero Default Risk



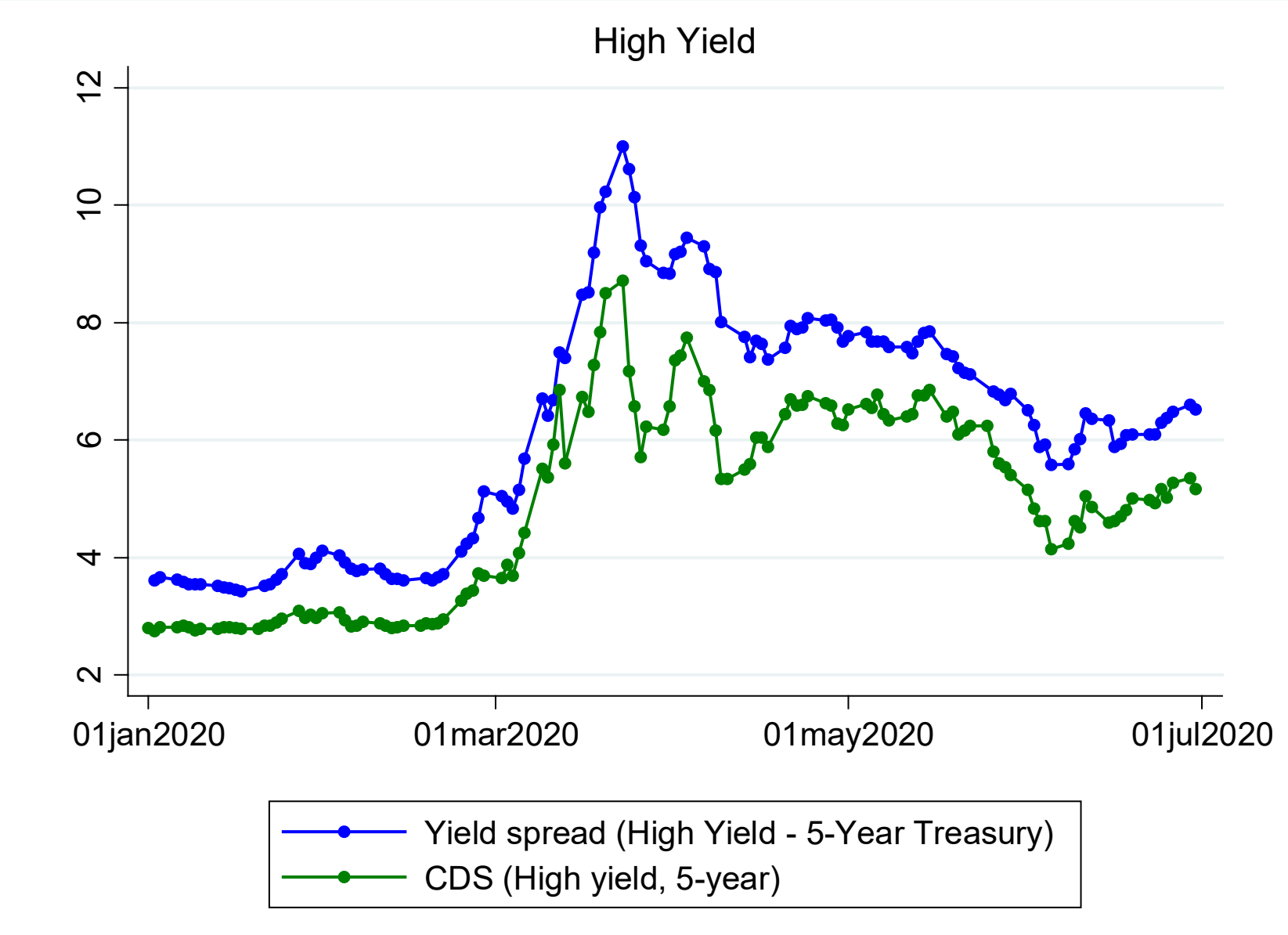
Testable implication: Assets sliding down the curved part (losing convenience feature) should see abnormally large yield changes relative to the change in their default risk (dP/d(Default) is higher).

Consistent with disappearing safety effect, investment grade corporate bond spread spiked, much more than inv grade CDS

Difference increased more than 200 bps from 3/9 to 3/23! Peaks>300 bps on 3/23



High yield corporate bond spread follows its CDS more closely



Testing for safety effect: Larger effect of CDS changes on yields for IG than HY

	Dependent variable: Yield spread				
	2013-2020H1		2020H1		2008
	IG	HY	IG	HY	IG
Inv grade CDS index	2.325***		2.626***		2.845***
	(11.59)		(15.46)		(12.19)
High yield CDS index		1.486***		1.205***	
		(13.78)		(20.14)	
Constant	-0.0101	-0.851*	0.0398	0.281	-0.351
	(-0.08)	(-2.21)	(0.46)	(1.41)	(-1.12)
N (days)	1868	1868	125	125	251
R-squared	0.770	0.819	0.832	0.943	0.813

Note: Yield spreads are corporate yields minus 5-year Treasury yields.

t statistics in parentheses. * p<0.05, **p<0.01, *** p<0.001.

REST OF THE WORLD: Drivers of Treasury selling

1. Official sales: FX intervention
2. Private sales: Unwinding of hedge fund trades

We're particularly interested in sales of notes/bonds since that's where price distortions emerged (plenty of demand for bills from money market funds)

Split into **official vs. private** foreign sales

	HOLDINGS ($B)			NET PURCHASES implied by holdings change and assumed return ($B) (BEA calculation)
	2019Q4	2020Q1	Pct change	2020Q1
All foreigners	**6691**	**6810**	**1.79**	**-287**
Notes/bonds	5985	6091	1.77	-300
Bills	706	720	1.89	13
Foreign Official	**4077**	**4118**	**1.01**	**-182**
Notes/bonds	3808	3835	0.69	-196
Bills	269	283	5.44	15
Foreign Private	**2614**	**2692**	**3.00**	**-105**
Notes/bonds	2176	2256	3.67	-104
Bills	438	436	-0.28	-1

Source: US Financial Accounts L.210, F.210 (all foreign), BEA Table 9.1 (foreign official). Foreign private calculated as all foreign minus foreign official. Based on the last column, BEA assumes a 6.08% return on all Treasuries held by foreigners and a 6.79% return on their holdings of notes/bonds in 2020Q1.

- Foreign official sales of notes/bonds twice as large as private sales: FX intervention

  (Transactions data (TIC) suggest larger private sales but holdings approach more accurate, see Bertaut and Judson, 2014)

Foreign official: Comparing 2008 and 2020

2008: Sell agency debt/MBS, buy T-bills

2020: Sell Treasury notes/bonds, buy cash and reduce overall $ holdings

$B	2008Q4	2020Q1
Net U.S. incurrence of liabilities to foreign official agencies	15	-51
Portfolio investment liabilities	42	-98
Equity and investment fund shares	11	36
Debt securities	31	-134
Short term	115	19
Treasury bills and certificates	194	15
Federally sponsored agency securities	-67	0
Negotiable certificates of deposit	-6	2
Commercial paper and other securities	-6	2
Long term	-84	-153
Treasury bonds and notes	20	-196
Federally sponsored agency securities	-107	31
Corporate bonds and notes	3	11
State and local government securities	0	1
Negotiable certificates of deposit	-1	0
Other investment liabilities	-27	47
Currency and deposits	12	60
Loans	-41	-17
Trade credit and advances	3	4
Special drawing rights allocations	0	0

Source: BEAs, Table 9.1. U.S. Intl Fin Trans's for Liabilities to Foreign Official Agencies

- Foreign official **much more reliant on Treasury notes/bonds** than agency sec's now.

	$B		Pct of total	
	2008Q3	2019Q4	2008Q3	2019Q4
U.S liabilities to foreign official agencies	3872	6763	100	100
Portfolio investment	3610	6173	93.3	91.3
Equity and investment fund shares	346	1216	8.9	18.0
Debt securities	3265	4957	84.3	73.3
Short term	420	301	10.8	4.4
Treasury bills and certificates	277	269	7.2	4.0
Other short-term securities	143	32	3.7	0.5
Long term	2845	4656	73.5	68.8
Treasury bonds and notes	1813	3808	46.8	56.3
Other long-term securities	1032	848	26.7	12.5
Other investment	261	590	6.7	8.7
Currency and deposits	140	391	3.6	5.8
Loans	84	24	2.2	0.4
Trade credit and advances	30	127	0.8	1.9
Special drawing rights allocations	8	49	0.2	0.7

Source: Bureau of Economic Analysis, Table 3.1. U.S. International Investment Position for Liabilities to Foreign Official Agencies at the End of the Period

Foreign private: Hedge funds likely important. Top 20 counties by notes/bond sales:

TIC data. Duration of note/bond holdings is not available at the country level. I assume a 6.79% return on notes/bonds in column 4 (as used by the BEA in table above).

	Notes/bonds					
	(1)	(2)	(3)	(4)	(5)	(6)
	HOLDINGS ($B)			NET PURCHASES implied by holdings change and assumed return ($B) (my calculation)	NET PURCHASES from transactions data ($B)	Change in reserves ($B)
Country	2019Q4	2020Q1	Pct change	2020Q1	2020Q1	2020Q1
1 China, Mainland	1067	1049	-1.7	-91.1	-35.9	-42.4
2 Cayman Islands	142	113	-20.1	-38.2	-138.3	0.0
3 Brazil	278	263	-5.4	-33.8	-10.1	-13.7
4 Ireland	228	216	-5.1	-27.0	-17.7	0.1
5 Saudi Arabia	135	122	-10.1	-22.8	-11.9	-26.2
6 Canada	125	112	-10.9	-22.2	3.7	0.8
7 Belgium	186	180	-3.1	-18.5	-7.1	0.7
8 Korea, South	118	108	-8.7	-18.2	-9.4	-8.7
9 India	158	151	-4.5	-17.8	-10.3	17.9
10 Bermuda	49	39	-20.2	-13.3	-4.3	no data
11 Luxembourg	204	205	0.4	-13.1	-8.0	0.0
12 Sweden	48	39	-19.2	-12.5	-0.2	0.0
13 Mexico	39	30	-22.7	-11.4	-7.5	6.8
14 Indonesia	30	22	-27.9	-10.5	-2.8	-8.2
15 Spain	48	42	-12.6	-9.3	-1.3	-0.2
16 United Arab Emirates	26	19	-26.8	-8.8	-0.2	-1.1
17 Switzerland	205	210	2.6	-8.6	-1.6	-4.1
18 Hong Kong	234	241	3.3	-8.2	-8.8	-3.7
19 Thailand	75	72	-3.2	-7.4	-3.1	2.1
20 Singapore	139	143	2.9	-5.4	-0.1	-0.3

large reduction in reserves | hedge fund hub

Several papers point to the **unwinding of Treasury basis trades by hedge funds** as a key factor behind Treasury market dislocations

- Schrimpf, Shin and Sushko (2020), Hauser (2020), Duffie (2020)
- Barth and Kahn (OFR, 2020) cast some doubt on importance of this for pricing

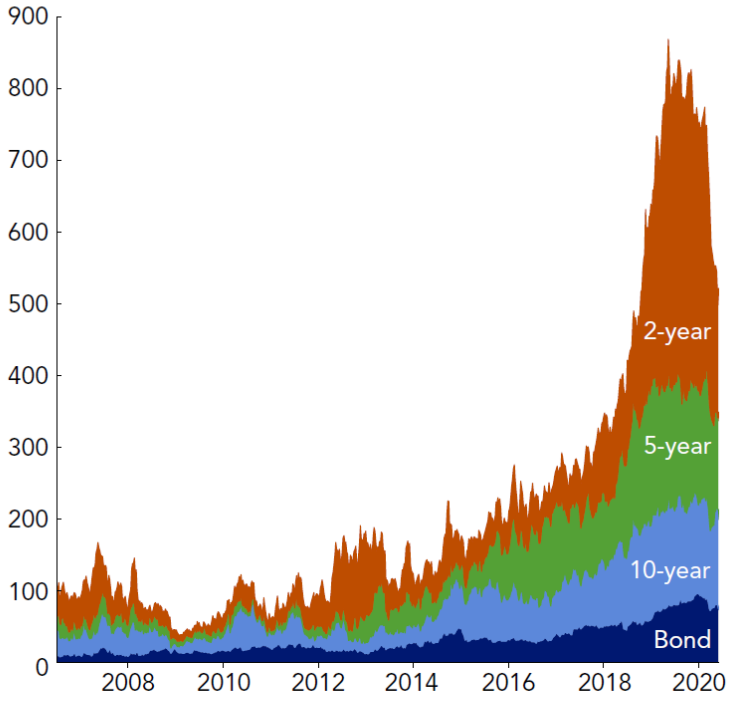
The trade is as follows:

1. Enter **short Treasury futures position** to deliver Treasury, get cash at a future date
2. **Buy Treasury security** (the cheapest to deliver)
3. Fund the Treasury position using **repo**

Profitable if at initiation the CTD Treasury is cheap relative to the future and you manage to roll over the repo financing at a cheap rate and meet margin along the way

- In mid-March, margins increased and volatility increased, leading to trade unwinding

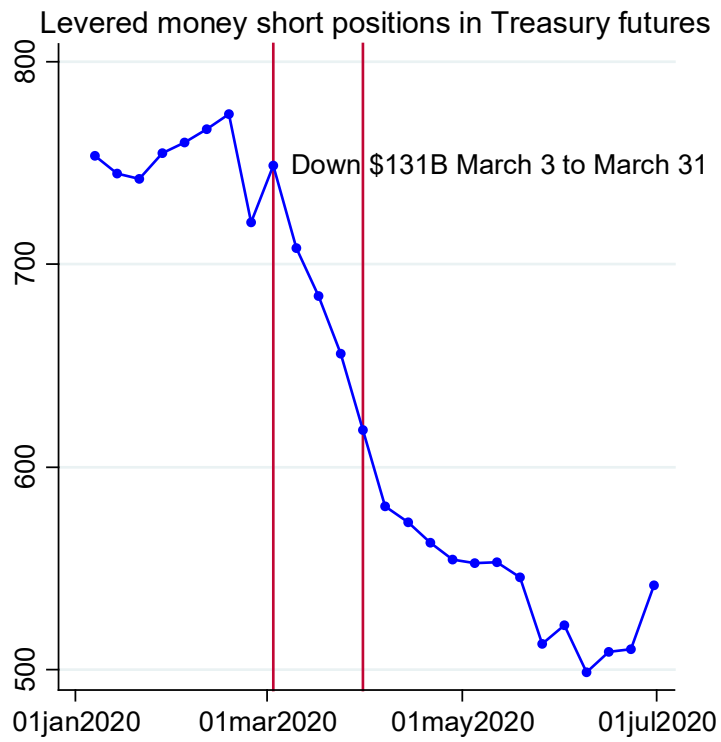
Figure 7. Hedge Fund Treasury Futures Short Positions ($ billions)



Note: Data are aggregate leveraged fund short positions in dollars of face value. Ultra bond futures and 10-year ultra note futures positions are included with bond futures and 10-year note futures respectively.

Sources: Commodity Futures Trading Commission Commitment of Traders, Office of Financial Research

Reduction of $131B from March 3 to March 31, 2020



DID FED ACTIONS HELP STABILIZE MARKETS AND THE ECONOMY?

Fed actions, March-July 2020:

- Reductions in **Fed funds target**
- **USD swap facilities** to provide dollars to foreigners
- Facilities to **stabilize money markets** after outflows from prime funds
- Programs to **stabilize bond markets** (Treasuries, MBS, corporate, munis, ABS)

March 15, 5 pm:

- Fed funds target ↓ 100 bps to 0-0.25 pct
- Primary credit rate ↓ 150 bps to 0.25 pct. Discount window borrowing encouraged.
- Rate on dollar swap lines with BoC/BoE/BoJ/ECB/SNB ↓ 0.25 pct to OIS+0.25 pct. 84-day borrowing introduced.
- At least $500B Treasury purchases, at least $200B MBS purchases

March 23, 8 am:

- Unlimited Treasury, MBS purchases. Agency CMBS now included in MBS purchases
- $300B in lending, backed by $30B credit protection from Treasury, via:
  1. Corporate bond purchases: Investment grade issuers only

     Primary market (PMCCF): Interest rate "informed by market conditions"
     Secondary market (SMCCF): Pricing at "fair market value"

  2. Term Asset-Backed Securities Loan Facility (TALF)

     Fed lending against AAA-rated ABS backed by consumer/small business loans

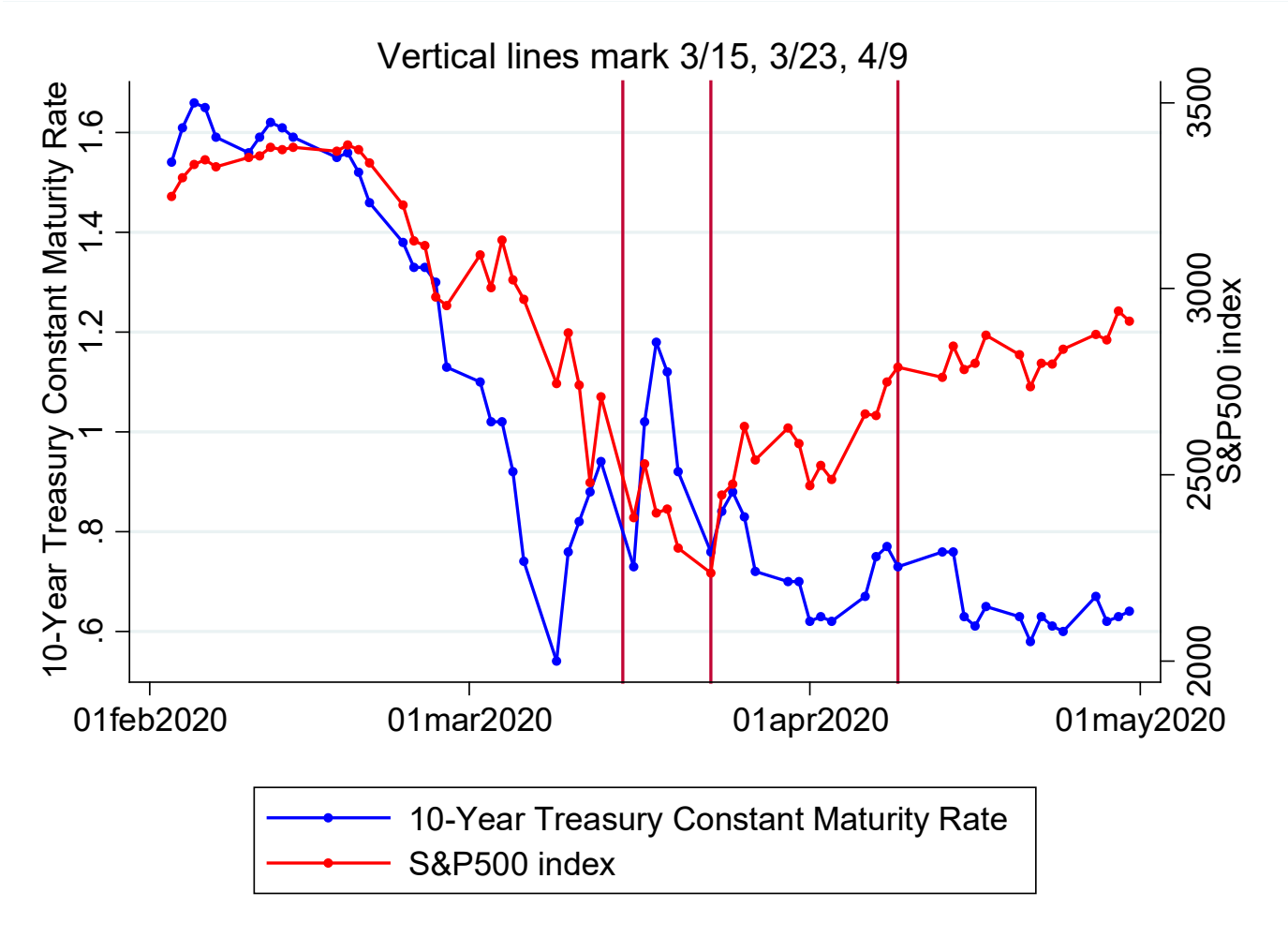
  3. CPFF, MMLF expanded with more muni debt.
  4. Main Street Lending Program (MSLP) will be forthcoming

April 9, 8:30 am:

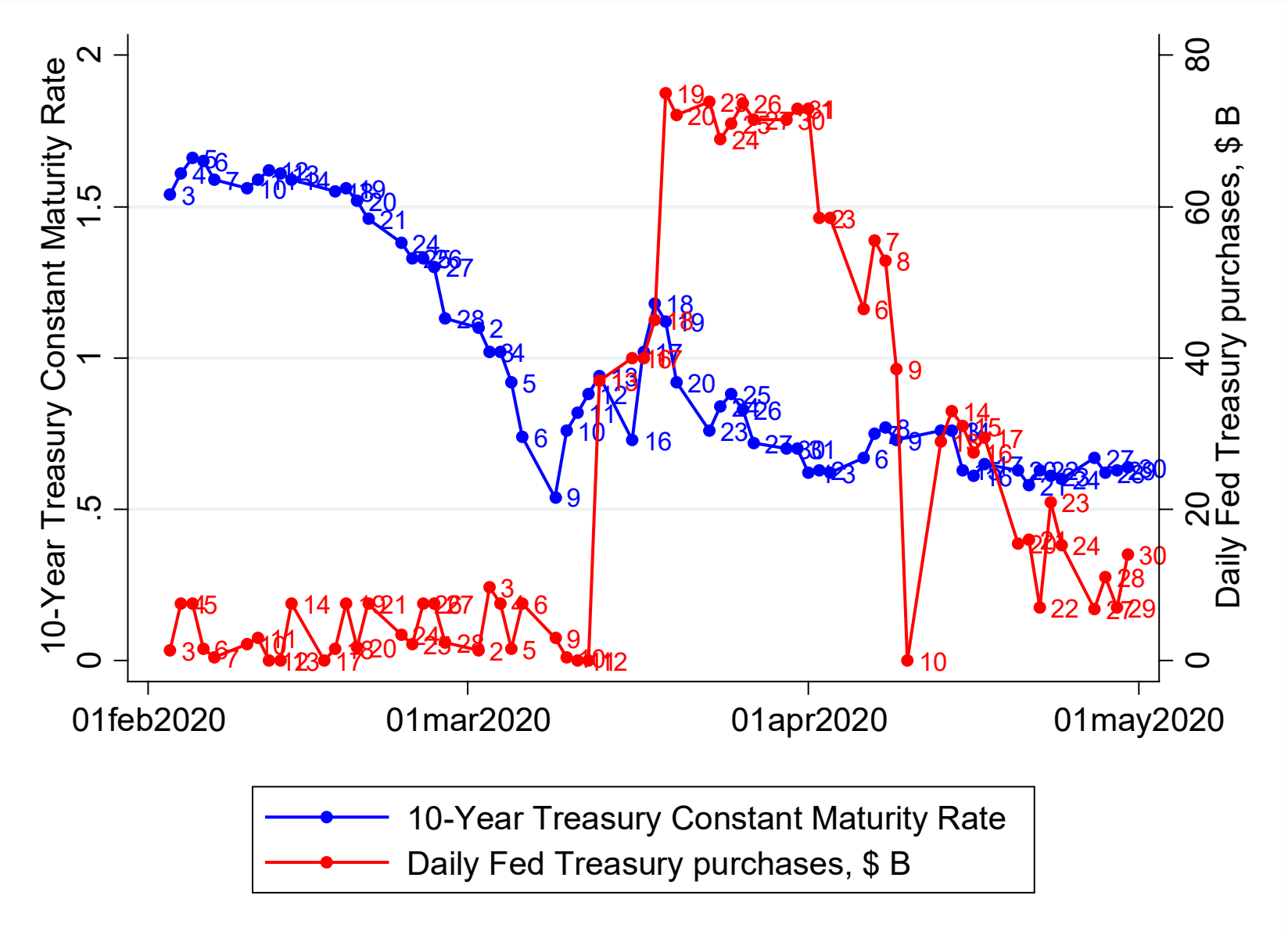
a. Corporate bond purchases (plus TALF) expanded:
   Up to $850B, $85B credit protection. Fallen angels added.
b. Main Street Lending Program:
   Up to $600B, $75B credit protection. SOFR+250 to 400 bps.
c. Municipal Liquidity Facility (MLF): Up to $500B, $35B credit protection

FED IMPACT ON TREASURY MARKETS

- 3/15: Announcement fails to stop yields from increasing on 3/17, 3/18
- 3/23: Yield falls, some of this drop is causal based on intra-day data
  But larger drop on 3/19-3/20. Why? Was policy not crucial for stabilizing markets? Yes!



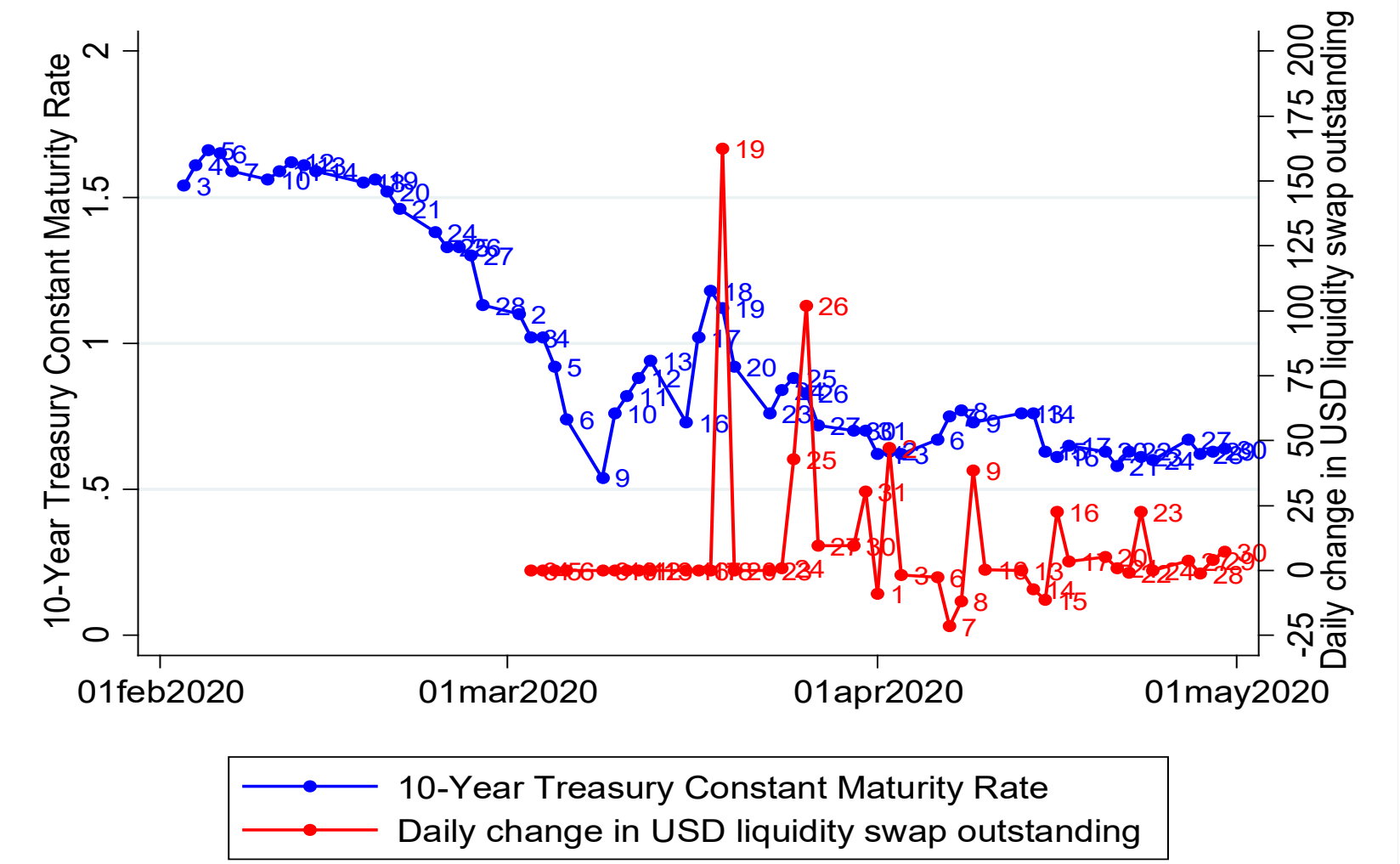
Massive daily Fed purchases from March 19 helped bring Treasury yields down



Confounding factors? Corporate yields went *up* on March 19-20 and stock market fell →
Unlikely that Treasury yield decline on March 19-20 due to stabilizing economic news

Settlement of first USD Swap Lines on March 19, $162B, also lines up with turning point

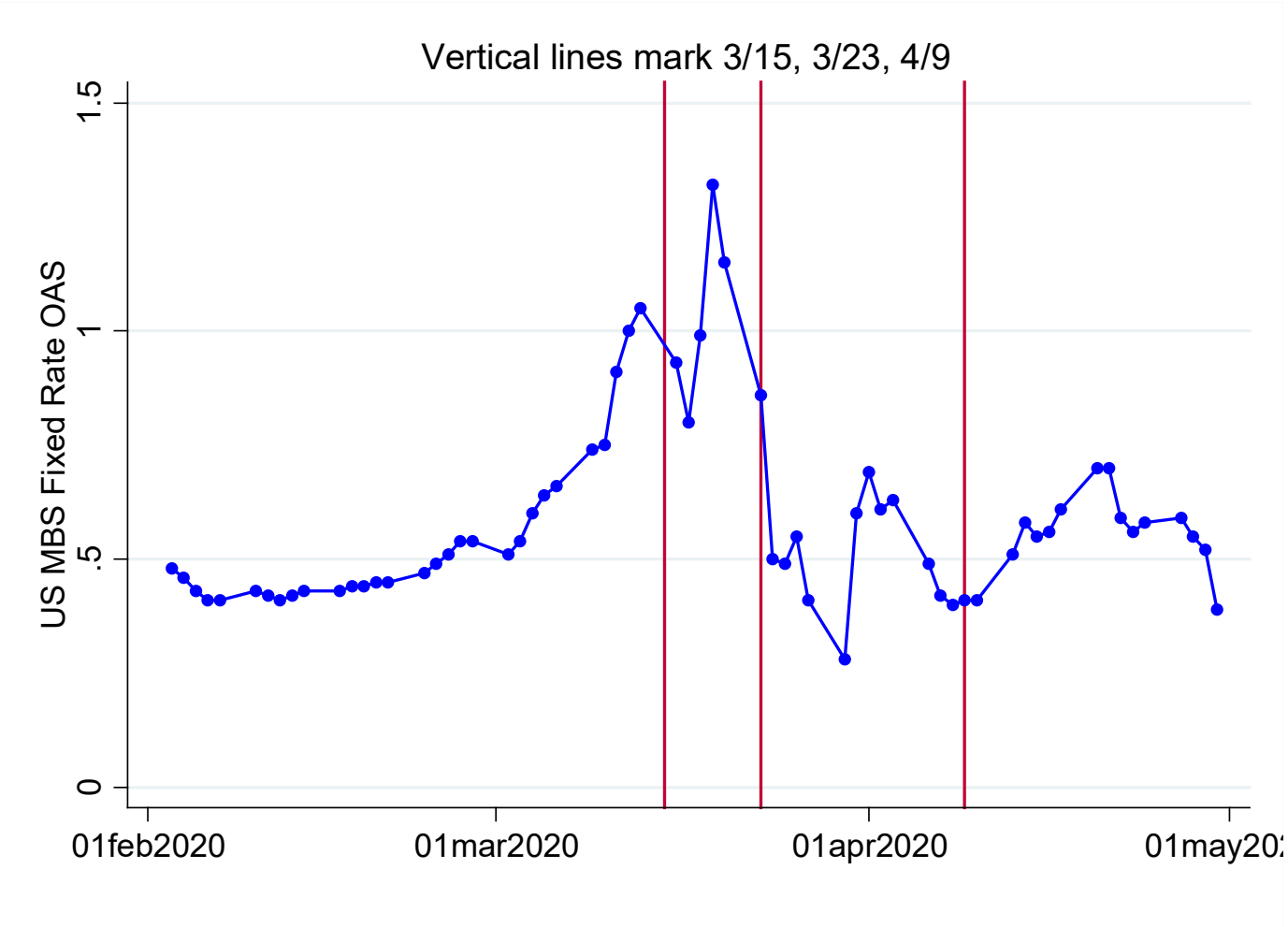
- Reduced need to sell Treasuries to raise $
- We don't know the factor mapping $ availabiliy to Treasury sales
- March 19 settlement amount about the same as Fed purchases on March 19+20



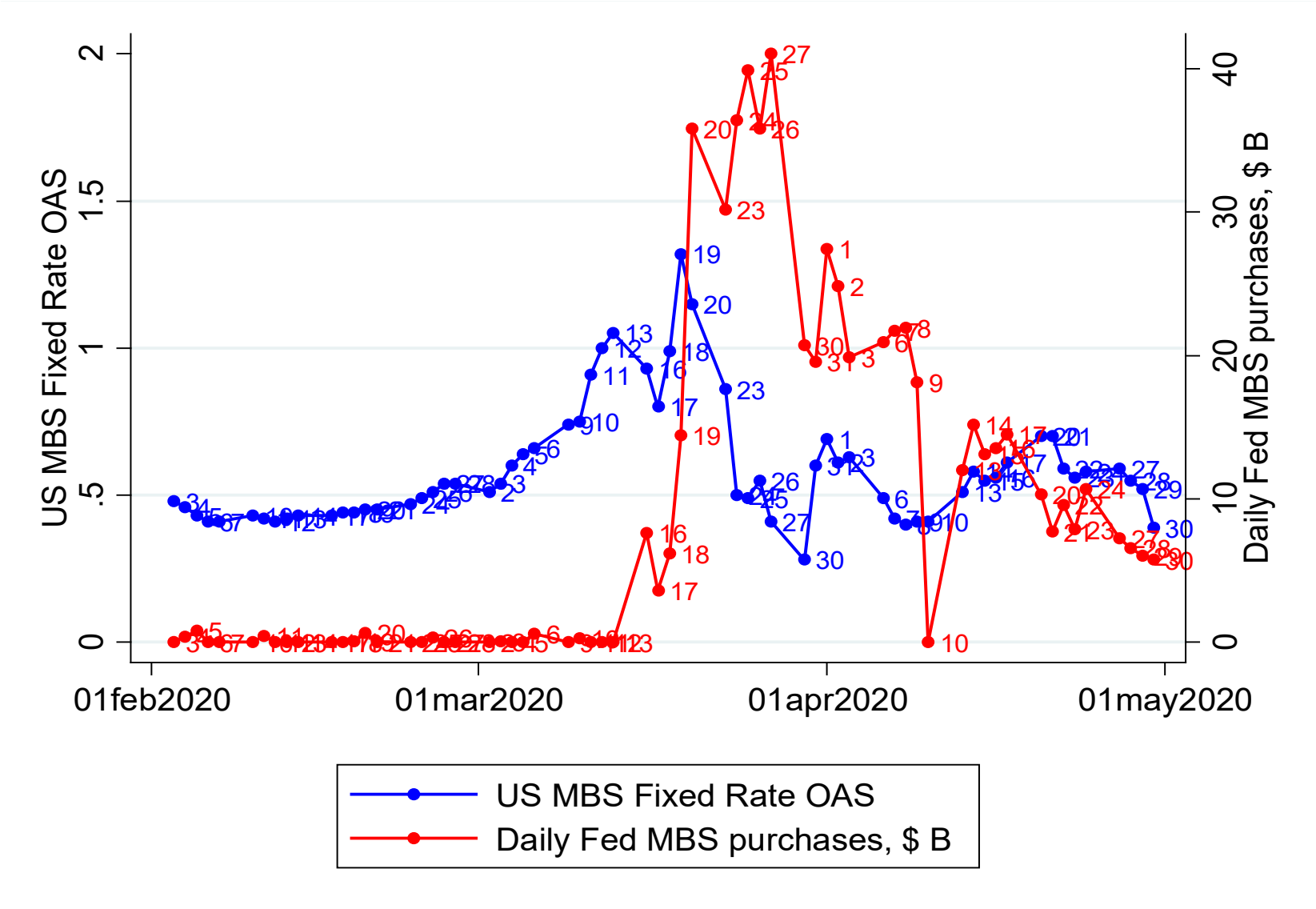
Very useful for identifying causal effects of Fed purchases:

MBS purchases were increased a day later and yields fell a day later:

MBS risk premium spikes on March 19 despite March 15 announcement



Massive daily Fed purchases from March 20 help lower MBS risk premium



- Large Fed purchases a day later than for Treasuries
  And yields turn a day later than for Treasuries

MBS sellers included highly levered REITS:

- Fed announcements on 3/15 apparently not enough to make them stop selling.
- Faced MBS default risk due to COVID, MBS prepayments, repo funding problems
  - Needed liquidity

MBS: US Financial Accounts, L.211/F.211

Sellers:

			Holdings change	Traded
$B	2019Q4	2020Q1	2020Q1-2019Q4	Bought/sold in 2020Q1
Total liabilities	9431	9771	340	377
Total assets	9629	10156	527	377
REITs	335	211	-124	-124
State and local governments	457	479	23	-17
Holding companies	45	42	-3	-5
Private pension funds	259	235	-24	-2
Government-sponsored enterprises	268	266	-2	-2
Property-casualty insurance companies	150	153	3	-2
Banks in U.S.-affiliated areas	8	7	-1	-1
Federal government retirement funds	11	10	0	-1

Lessons about how Treasury QE worked during COVID crisis

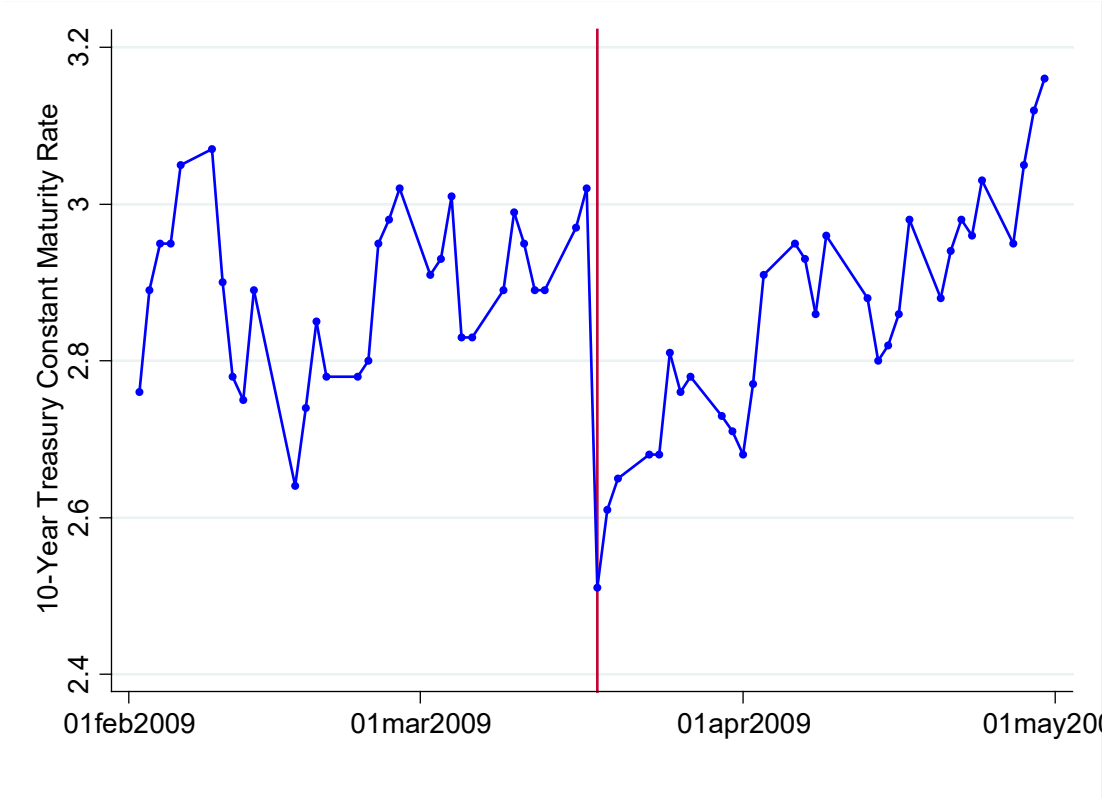
- Treasury selling was driven by liquidity needs, not loss of confidence in Treasuries
  - Bond fund outflows, disproportionate Treasury selling
  - FX intervention
  - Hedge funds unwinding levered trades
  - Perhaps reduced $ hedging by foreign investors

- March 15 announcement wasn't enough to make others provide Treasury liquidity, in expectation of selling to the Fed/getting USD via swap facilities
  - It took large actual purchases+large actual USD swaps to bring yields down
  - For "market functioning QE", flow effects are crucial
  - Policies cannot be evaluated simply based on announcement effects on yields
  - If your announcement doesn't stop the selling, you need to buy a lot!

- This is very different from how Treasury QE worked in 2008/2009 or how corporate QE worked in 2020
  - Both had large announcement effects

Treasury QE in 2008/2009:

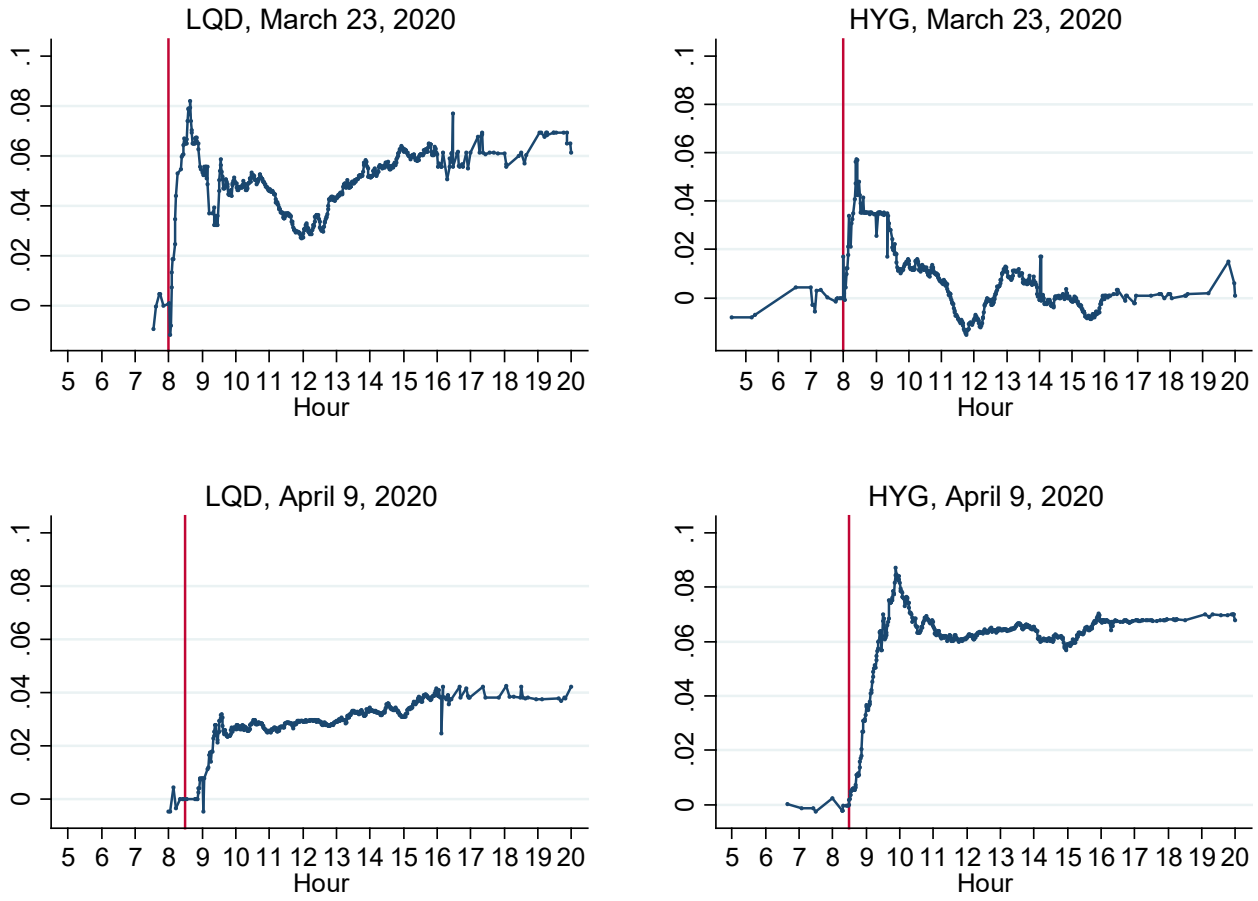
- 50 bps announcement effect on 10-year yield on March 18, 2009



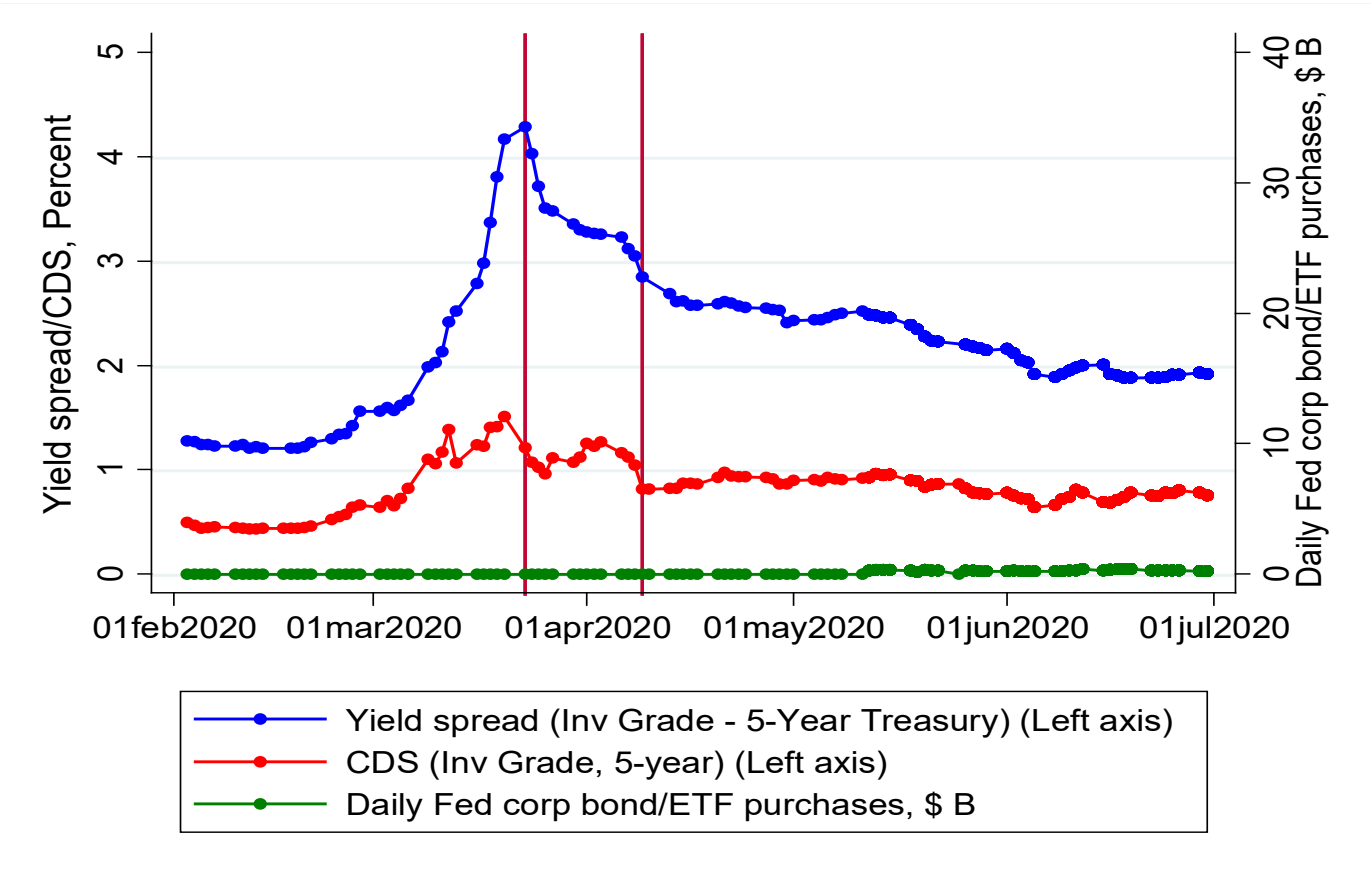
- Treasury QE back then was not about providing Treasury market liquidity -- no large mutual fund outflows, no large rest of the world Treasury selling
- Different channels for affecting yields (signaling, increased Treasury scarcity etc., see Krishnamurthy & Vissing-Jorgensen, 2011)

Corporate QE in 2008/2009:

- 3/23, 4/9 policy announcements involved corporate purchases and had large immediate effects on both IG and HY markets. Causal based on intra-day data.



- Corporate purchases started only on May 12 and have been small (total of $13B by end of Sept, all under the SMCCF)



- Announcements improved fundamentals (credit risk) enough to stop the selling CDS rates fell (intra-day evidence in Haddad, Moreira and Muir (2020)
- Fund flows reversed (Falato, Goldstein and Hortacsu (2020), for corp bond funds)
- ``Tail risk" promise sufficient to calm corporate markets down (along with fiscal policy and better virus news)

Conclusions:

- Large dislocations in Treasury markets in March 2020
  - Not due to loss of confidence in Treasuries

- Instead, Treasury selling was driven by liquidity needs
  - Bond fund outflows, disproportionate Treasury selling
  - FX intervention
  - Hedge funds unwinding levered trades
  - Perhaps reduced $ hedging by foreign investors

- It took large actual Fed purchases (+ USD swaps) to bring Treasury yields down
  - For "market functioning QE", flow effects are crucial
  - If people have to sell now, you have to buy now to stabilize markets!