

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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1. Graphing bond market dislocations

2. What happened?

- **Who were selling?** Why?
- Relevant for understanding **possible need for regulatory reforms**
- Also interacts with how policy works: **You can stop a run buying nothing!**
Providing liquidity requires much larger purchases

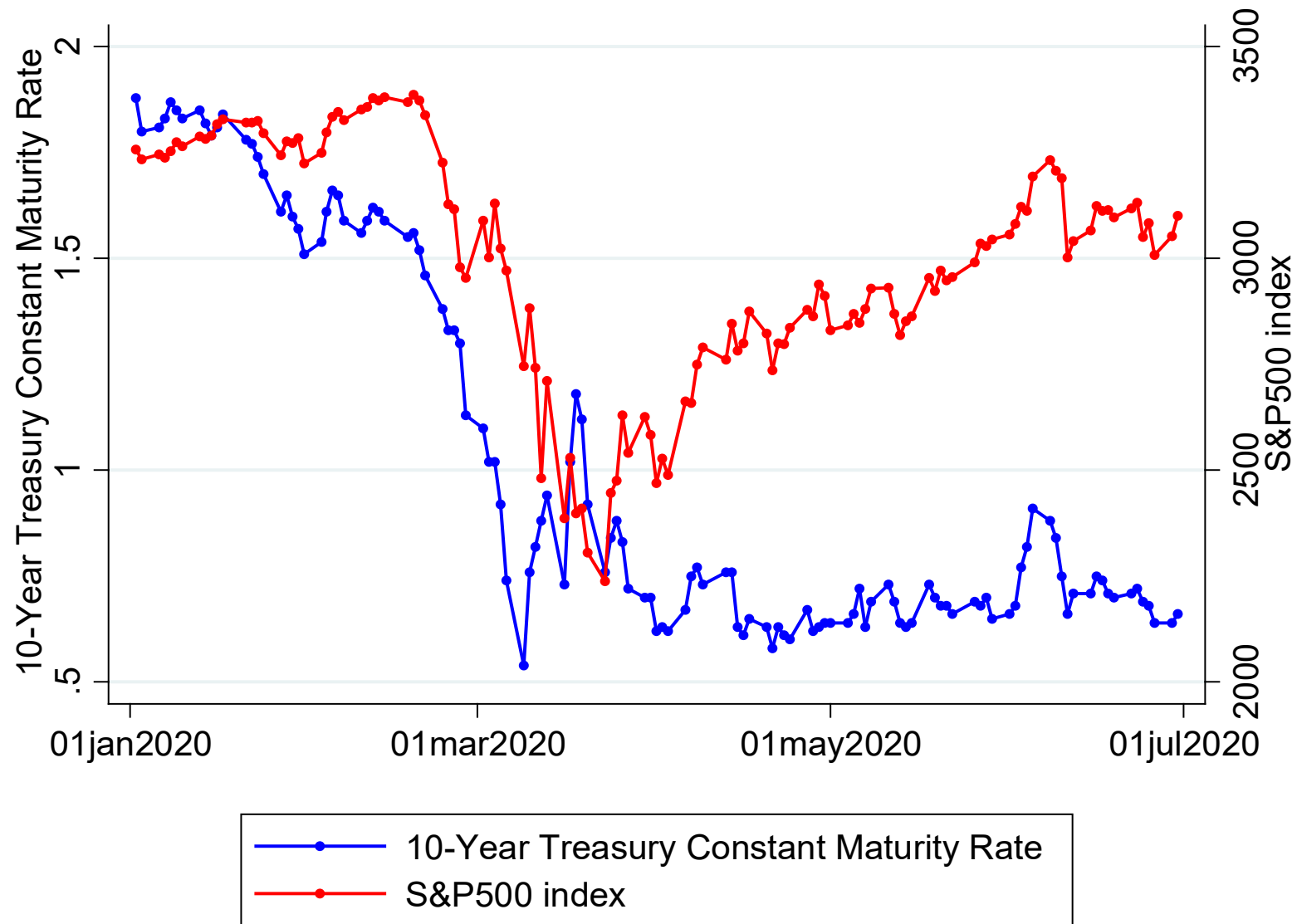
3. Fed actions, March-July 2020

- Reductions in **Fed funds target**
- **USD swap facilities** to provide dollars to foreigners/foreign banks in the US
- Facilities to **stabilize money markets** after outflows from prime funds
- Facilities to **stabilize bond markets** (Treasuries, MBS, munis, ABS, corporate) and **stimulate the economy**

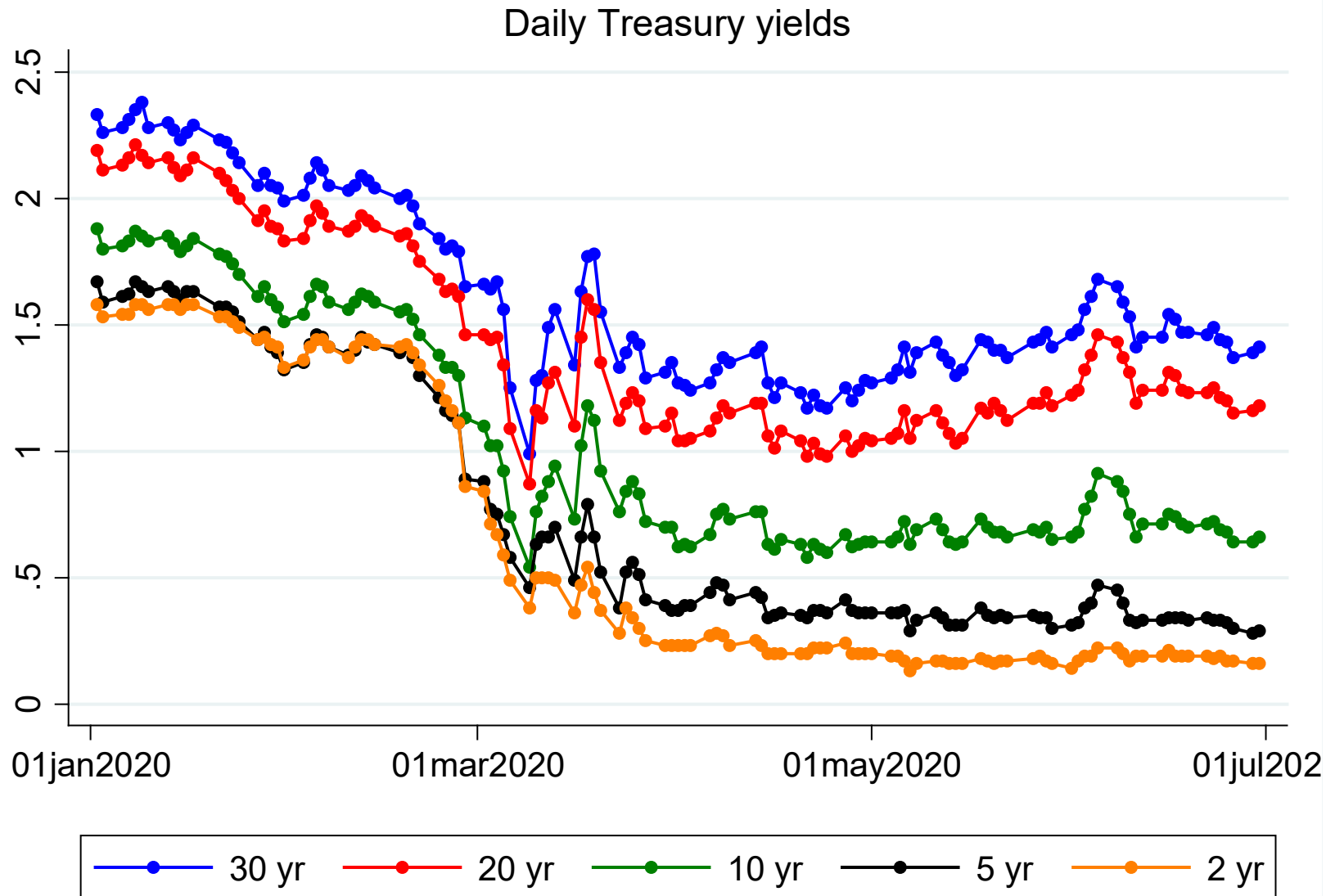
BOND MARKET DISLOCATIONS IN MARCH 2020

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

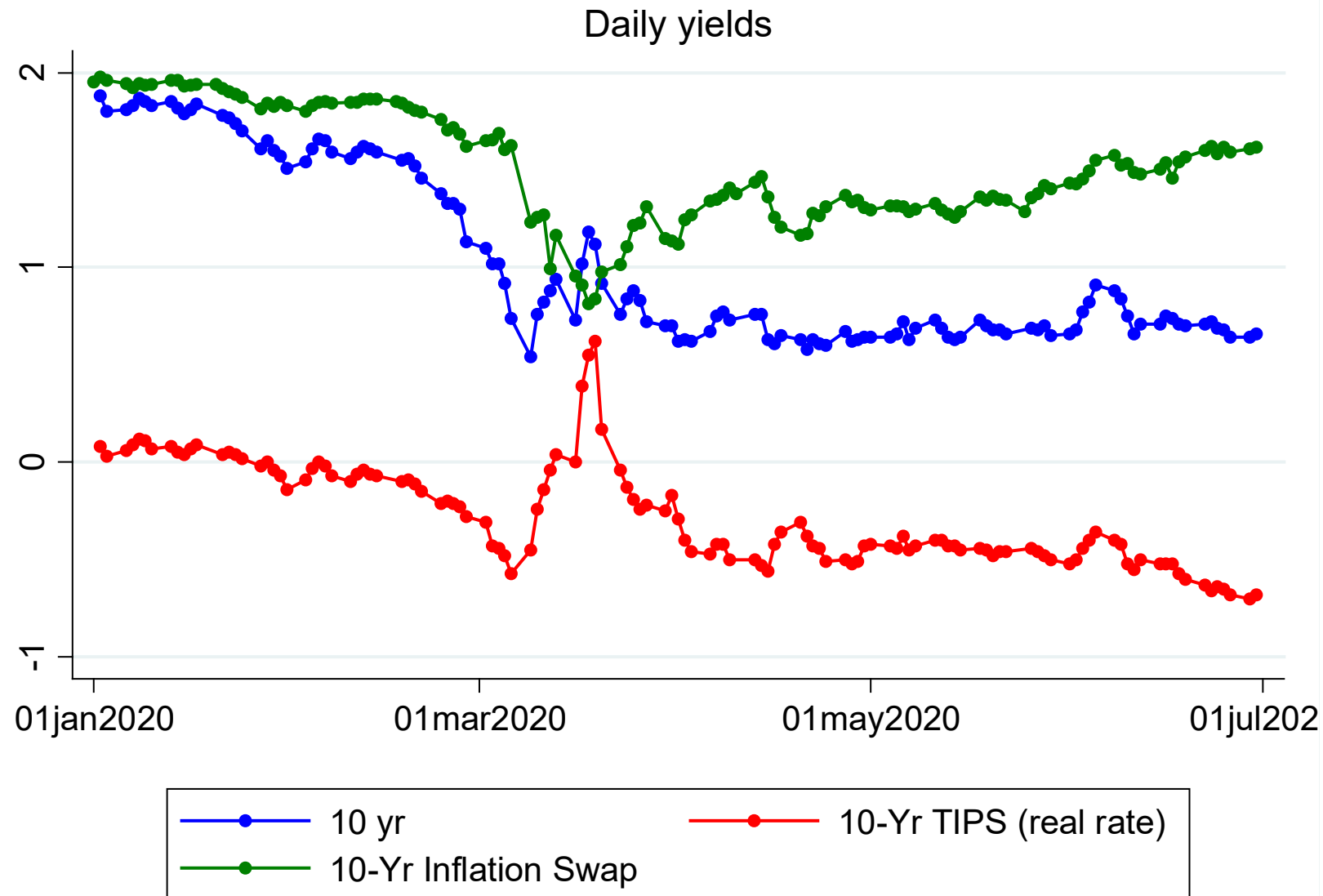
10-year yield +64 bps from 3/9 to 3/18



Treasury dislocations were mostly in longer yields



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

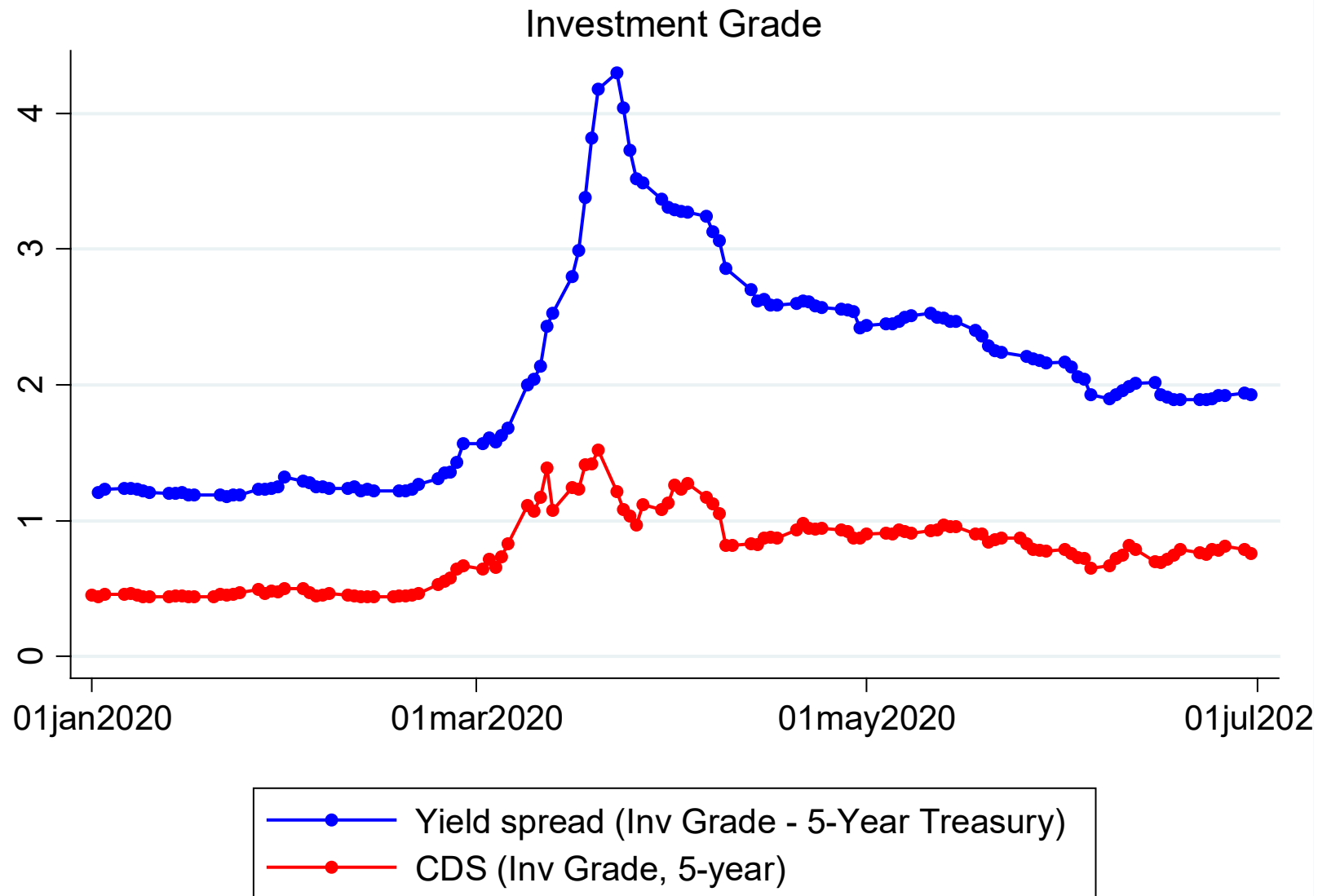


Treasury CDS, 5 yr:

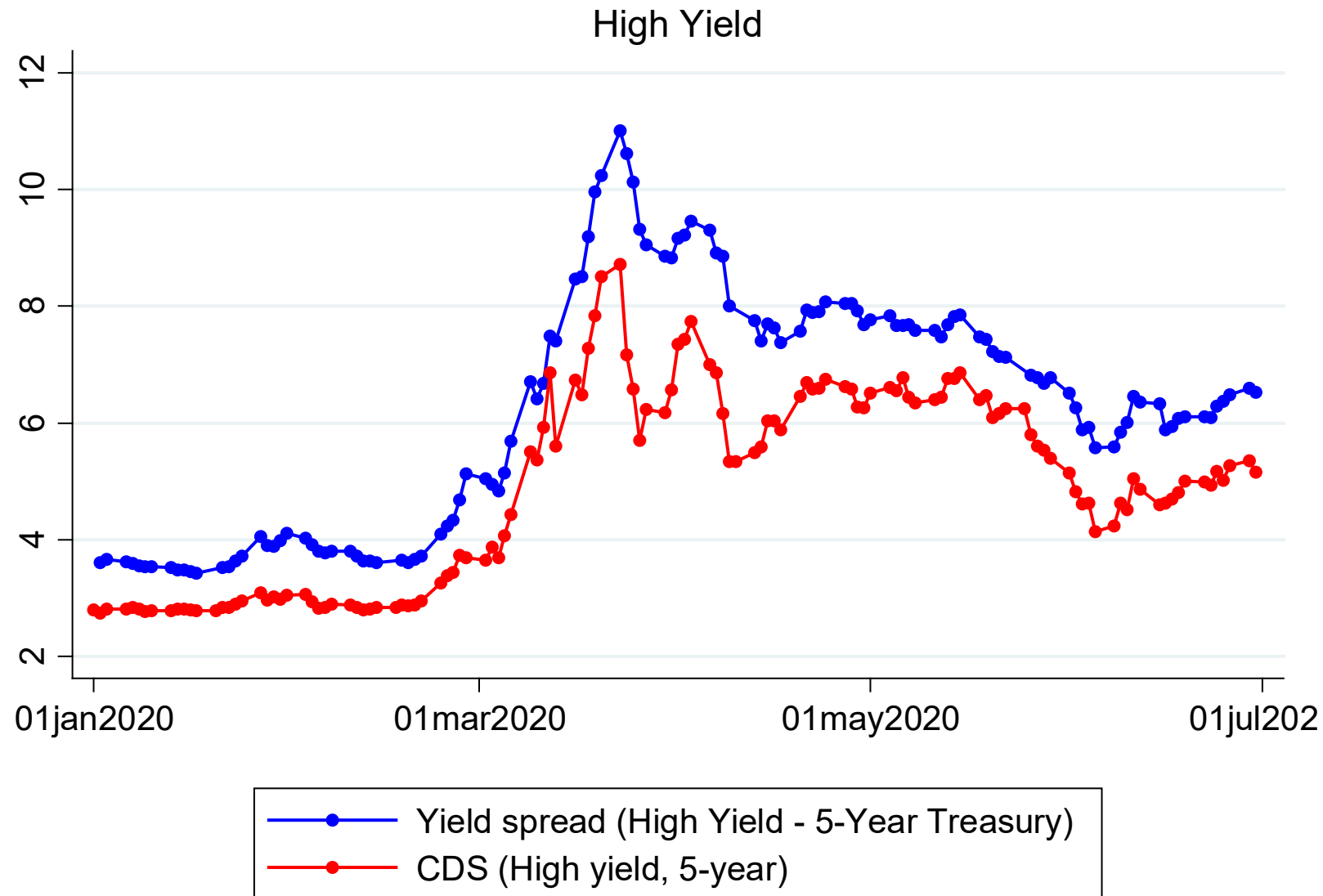


Investment grade corporate bond spreads spiked, much more than their CDS

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

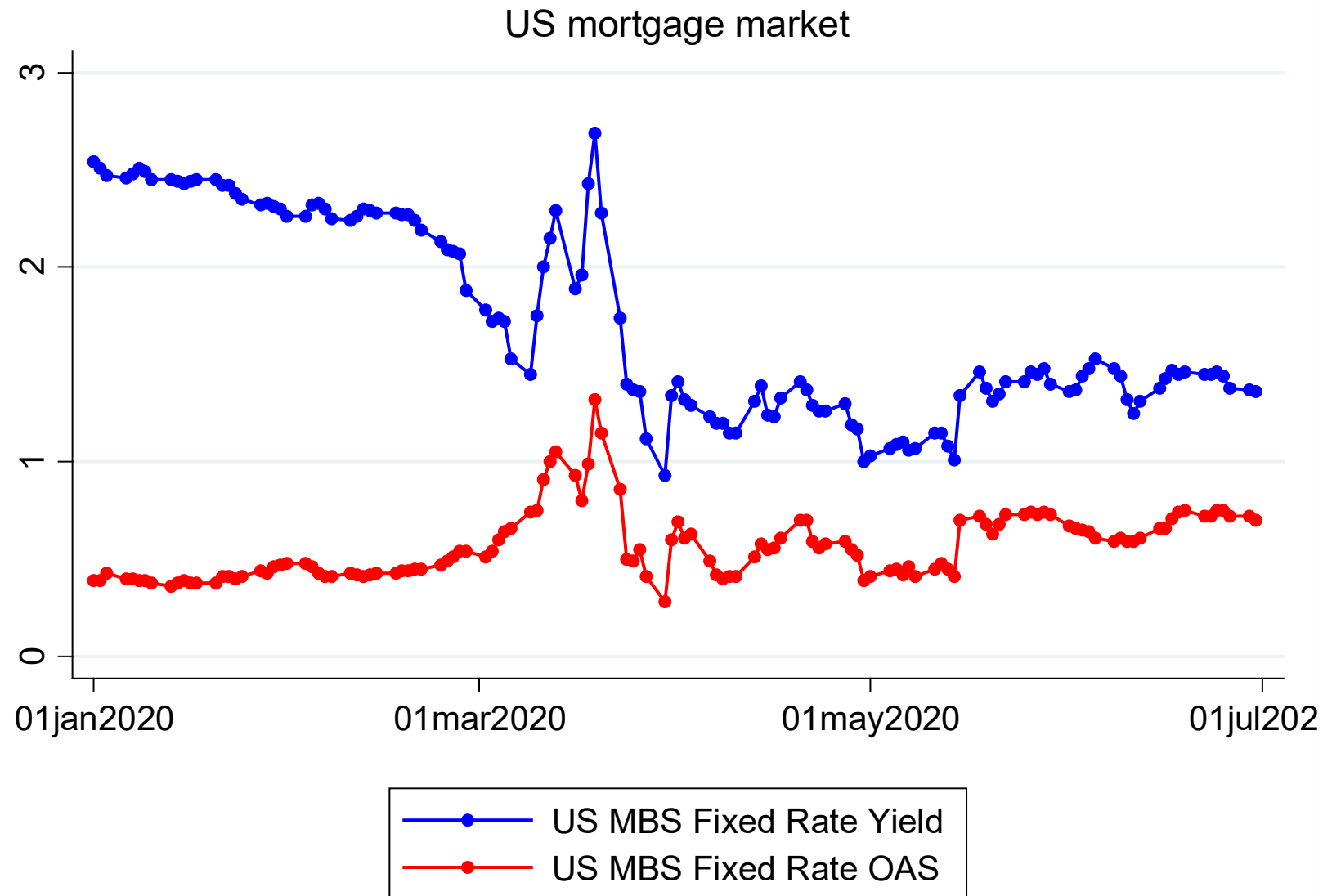


For comparison, high-yield corporate bond spreads followed their CDS more closely



See Haddad, Moreira and Muir (2020) for more on corporate market dislocations

MBS yields and MBS risk premia also spiked in mid-March



WHAT HAPPENED? WHO WERE SELLING? WHY?

I will show you data on *selling*:

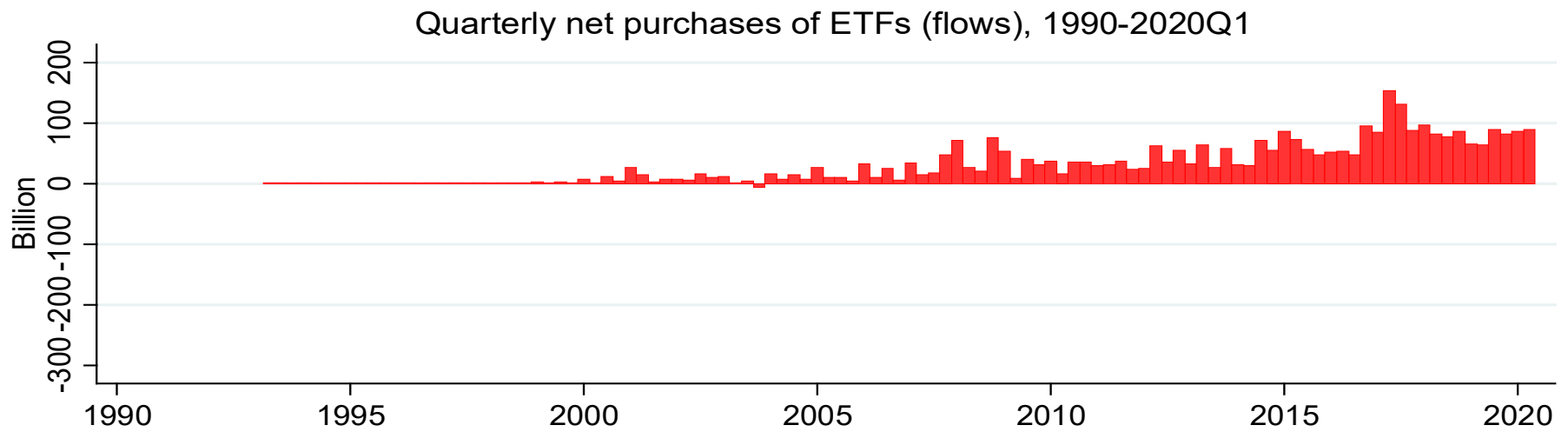
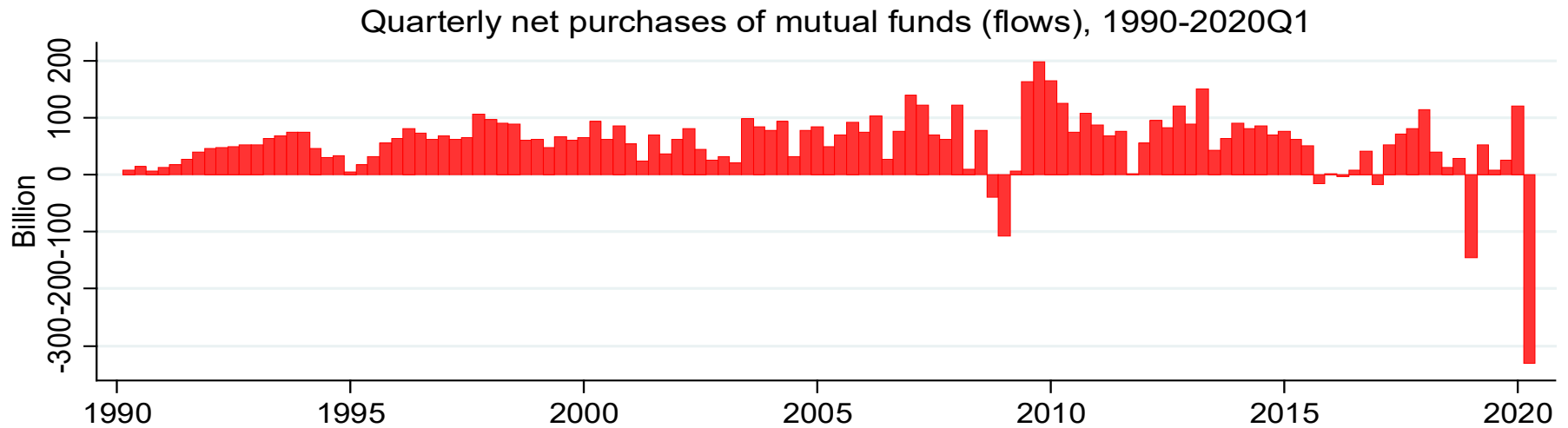
- Massive outflows from bond mutual funds:
Likely affected both Treasury and corporate yields
- Debate about role of hedge fund selling of Treasuries to unwind basis trades

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

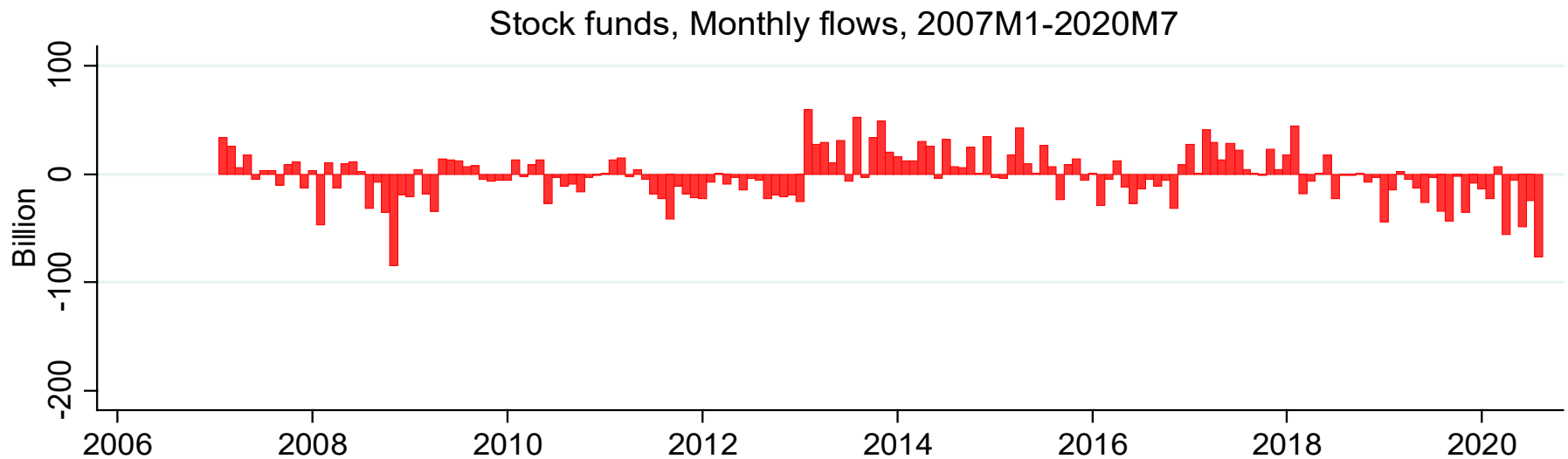
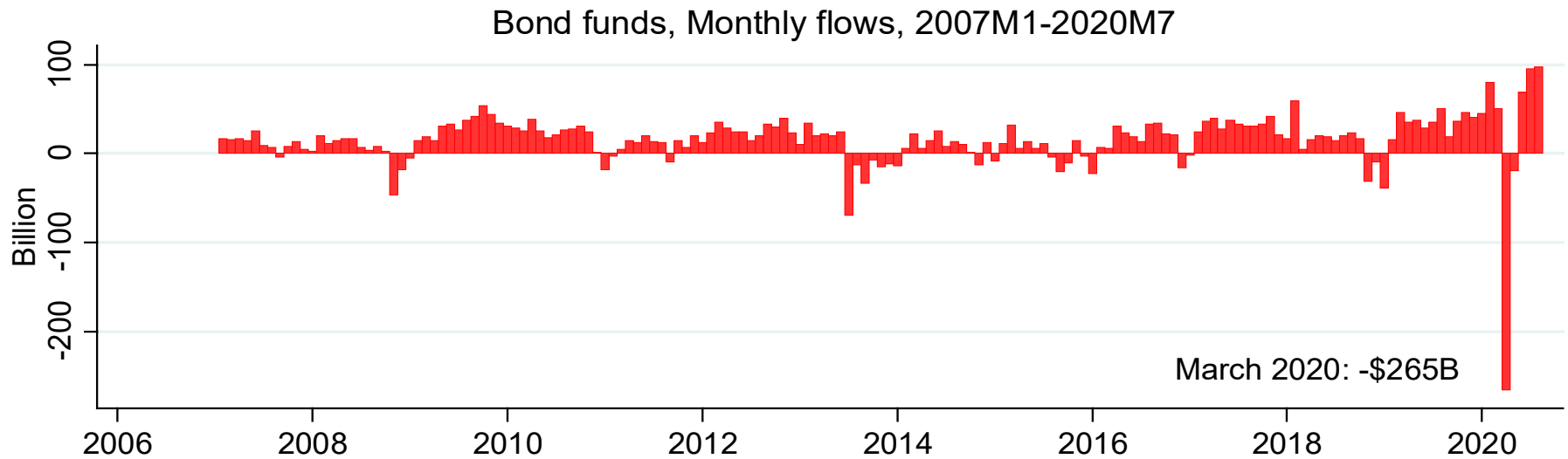
- Duffie (2020): Proposes central clearing of Treasuries to overcome dealer balance sheet constraints
- He, Nagel and Song (2020): Model link between dealer balance sheet constraints and asset prices

MUTUAL FUND OUTFLOWS

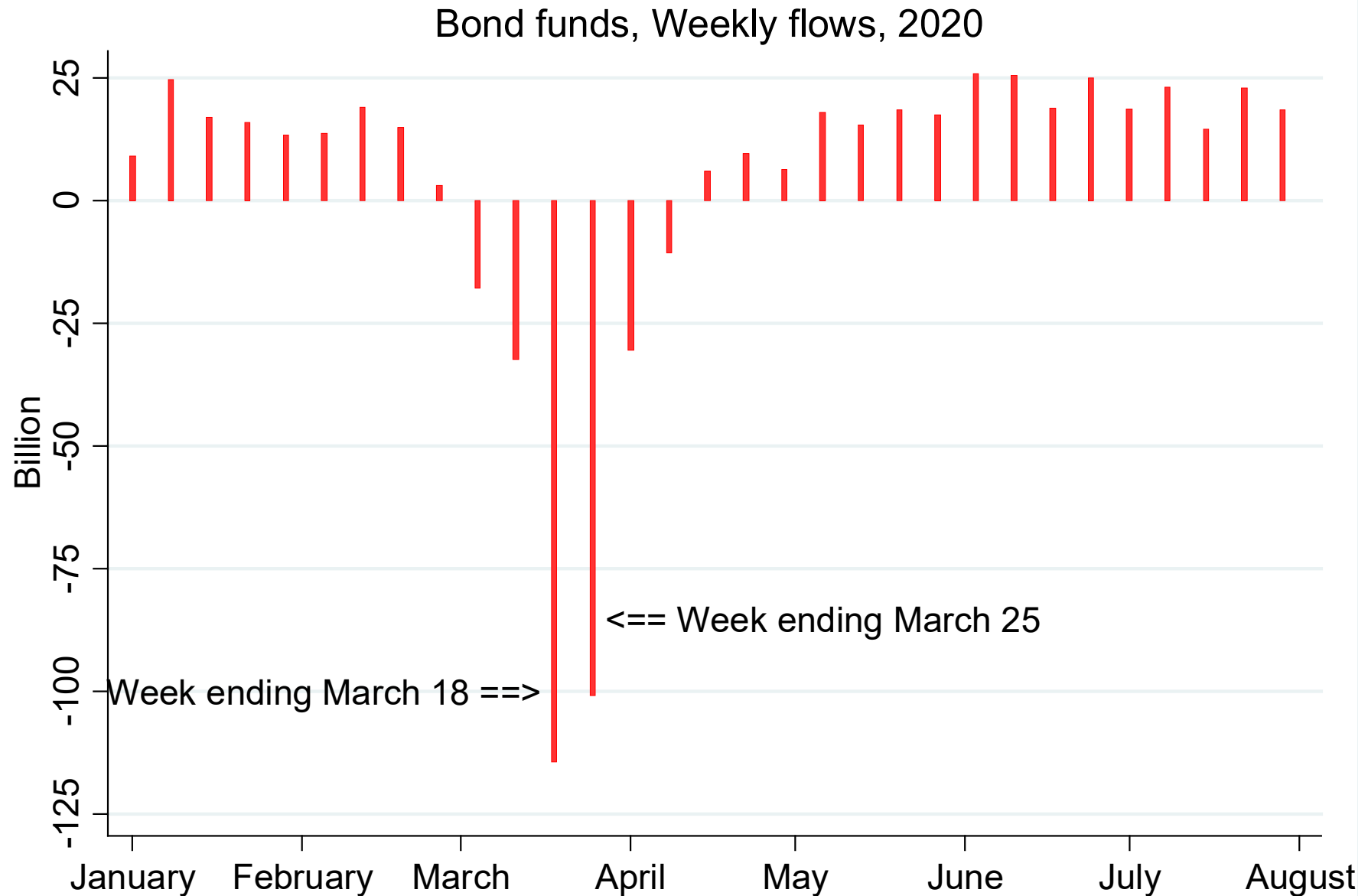
Massive outflows from mutual funds: US Financial Accounts, F.122, F.124



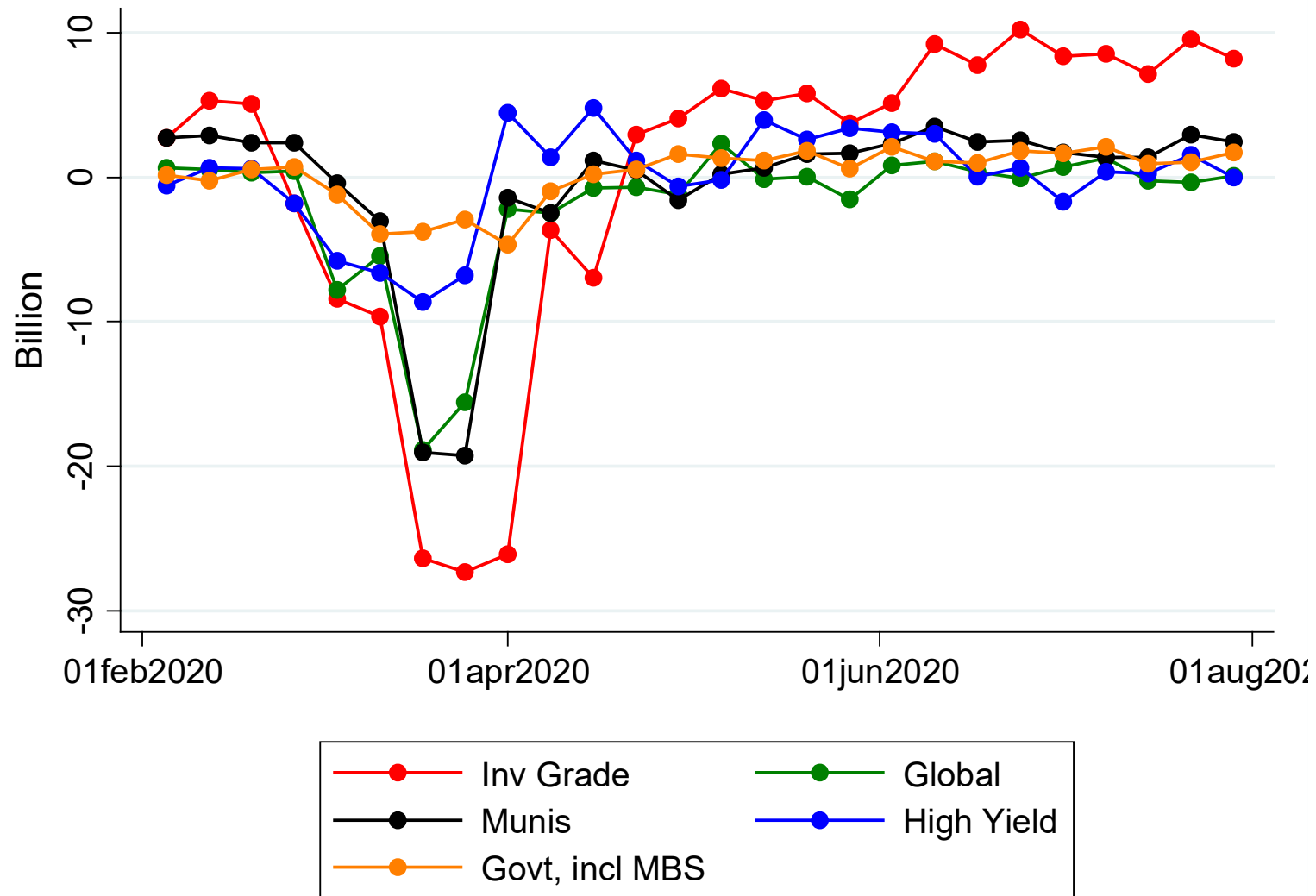
Dramatic (8 sigma) outflows from bond funds: ICI data (includes ETFs from 2013 on)



Bond fund outflows peaked in same week as Treasury yields spiked: ICI data



Small outflows for government funds, larger for all riskier bond funds: ICI data



Possible interpretation:

- Funds facing outflows **sold Treasuries and other liquid assets to meet outflows**
 - Contributed to **Treasury yield spike**
- But, they ran out of liquid assets and **had to also sell illiquid assets** like inv grade corporate
 - Contributed to **investment grade yield spike**

Ma, Xiao and Zeng (2020):

- Corporate bond fund outflows in March 2020: **12%** of AUM
- Corporate bond fund cash holdings pre-covid: **<4%** of AUM for both IG and HY funds
- “when investors redeem their fund shares en masse, funds' **pecking order of liquidation** generates pronounced selling pressure for liquid assets, effectively turning investors' flight to liquidity into the observed reverse flight to liquidity in financial markets.”

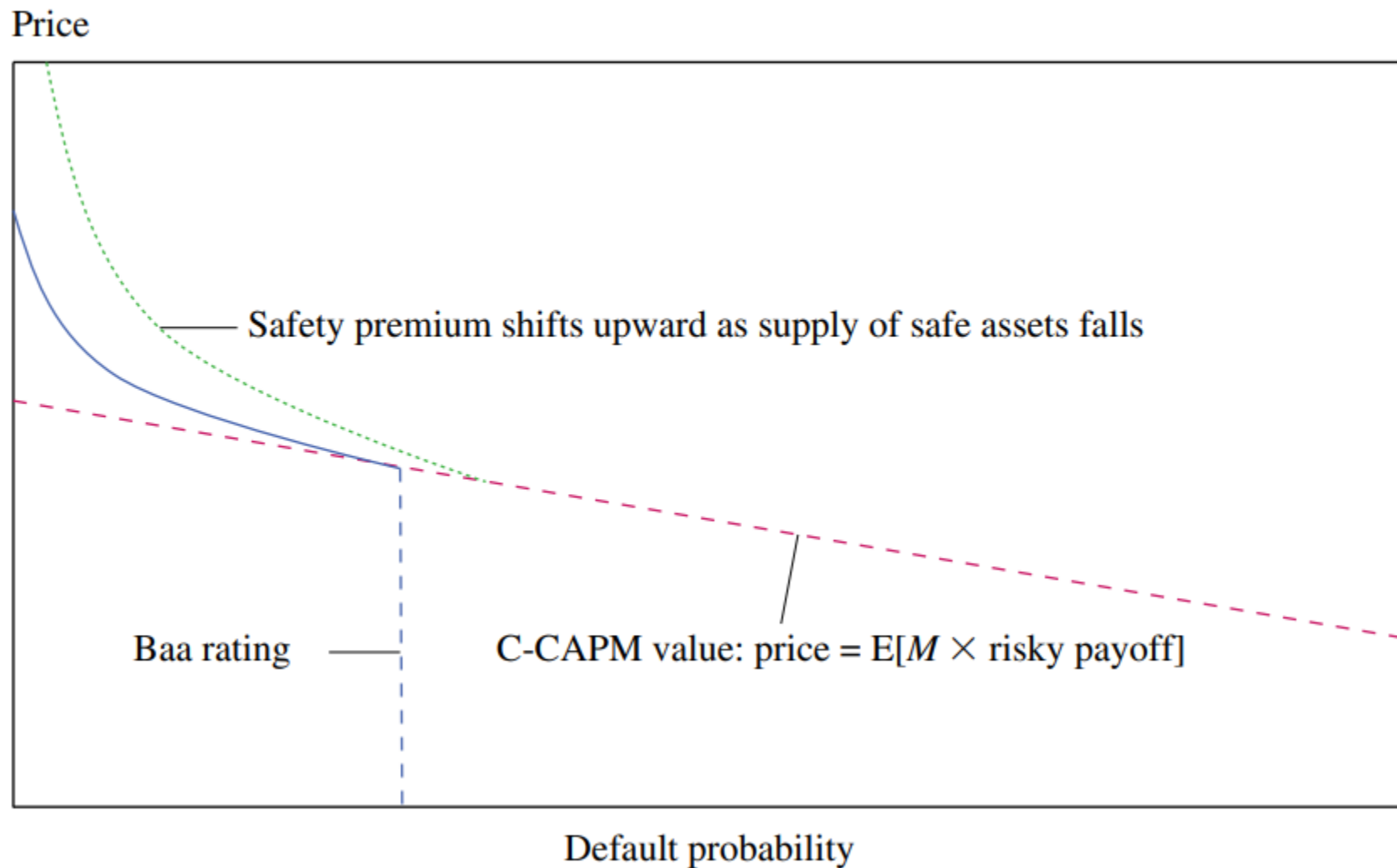
Falato, Goldstein and Hortacsu (2020):

- Share of corporate bonds owned by mutual funds & ETFs up:
From about 20% to 40% in a decade
- **Fragile structure:**
Funds promise daily (or better) liquidity while holding illiquid assets
- **Document reasons for redemptions:**
 - Fundamentals: More selling of funds exposed to COVID-affected sectors
 - Run dynamics: More selling of funds with more illiquid assets
 - Vulnerability: More selling of funds with assets similar to other funds
- **POLICY:** “Swing-pricing” (penalty for withdrawing when many others withdraw)
Introduced in the US in Nov 2018 but not yet implemented

Why so large distortions for IG compared to HY? Disappearing safety effect

Krishnamurthy and Vissing-Jorgensen (2011, 2012) safety effect

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



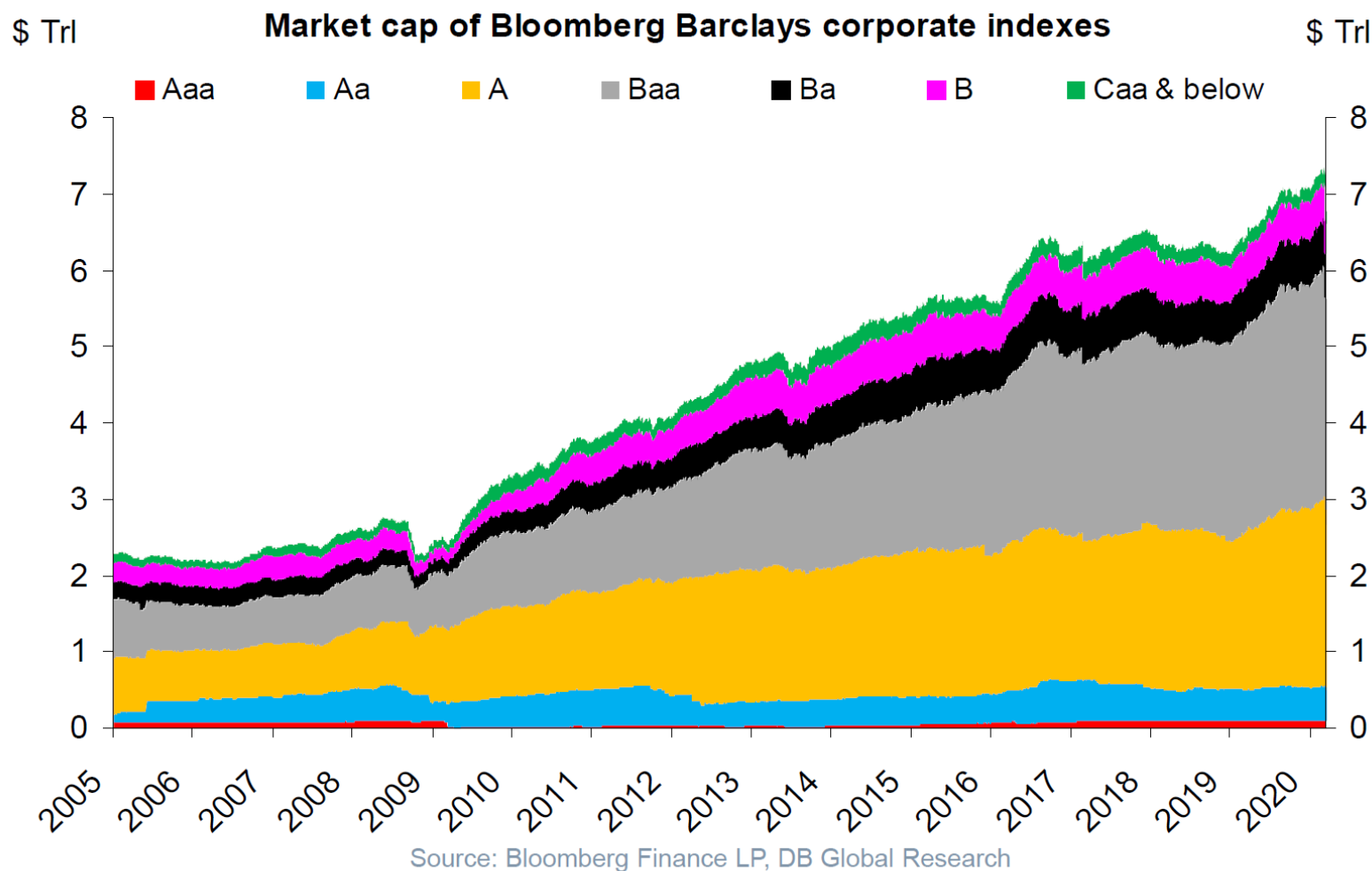
[Vissing-Jorgensen \(March 22, 2020\)](#), “The Case for Federal Reserve Corporate Bond Purchases” laid out **the case for corporate bond purchases** at the time

Why buy corporate bonds now if not in 2008/9?

- (a) The current crisis is much **more severe**.
- (b) This is a **corporate crisis**, not a banking crisis.
- (c) The amount of corporate bonds **outstanding is much larger than in 2008**, implying worse real consequences if rollovers are not possible
- (d) **Half** of corporate bonds are **rated just above junk**
 - Downgrades could lead to large sales by insurance companies & IG funds
- (e) Corporate bond funds have seen **record outflows** in recent days
 - There is a **risk of a full-scale run** on corporate bond funds

“Given large outflows last week, it is **likely that many funds have already sold all their liquid assets to cover outflows**. Further withdrawals will make them **sell into a falling market for an already illiquid asset class**. A large-scale run on bond funds is possible.”

US credit markets have grown from \$2trn in 2008 to \$7trn today.
All driven by much more BBB and single-A paper outstanding



THE POSSIBLE ROLE OF HEDGE FUND TREASURY SELLING

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

**Use flows tables of the US Financial Accounts to track ownership changes
(as opposed to valuation changes)**

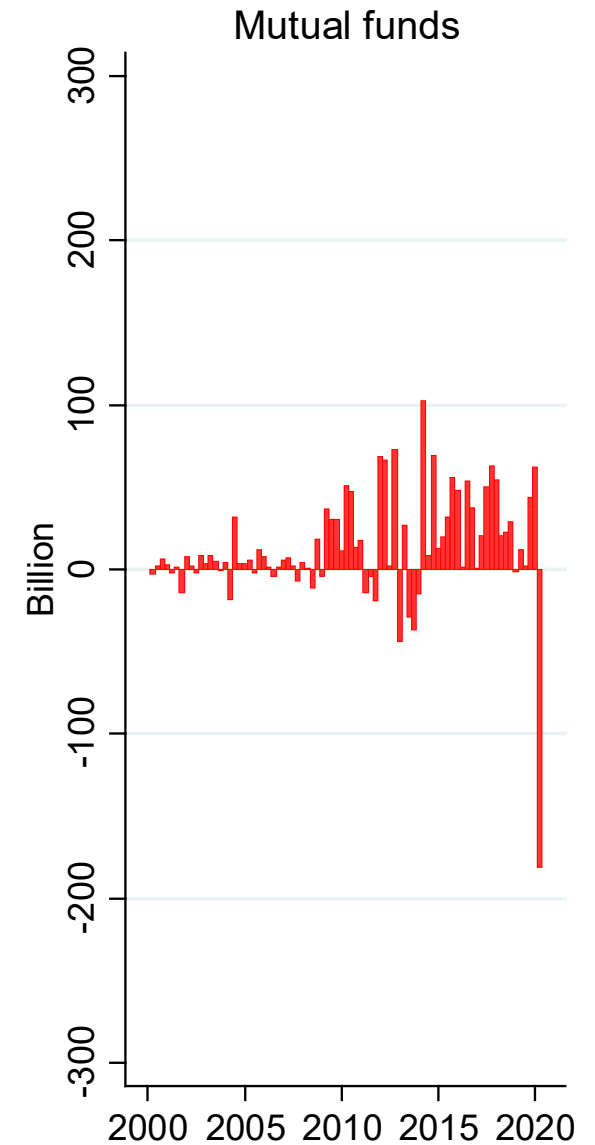
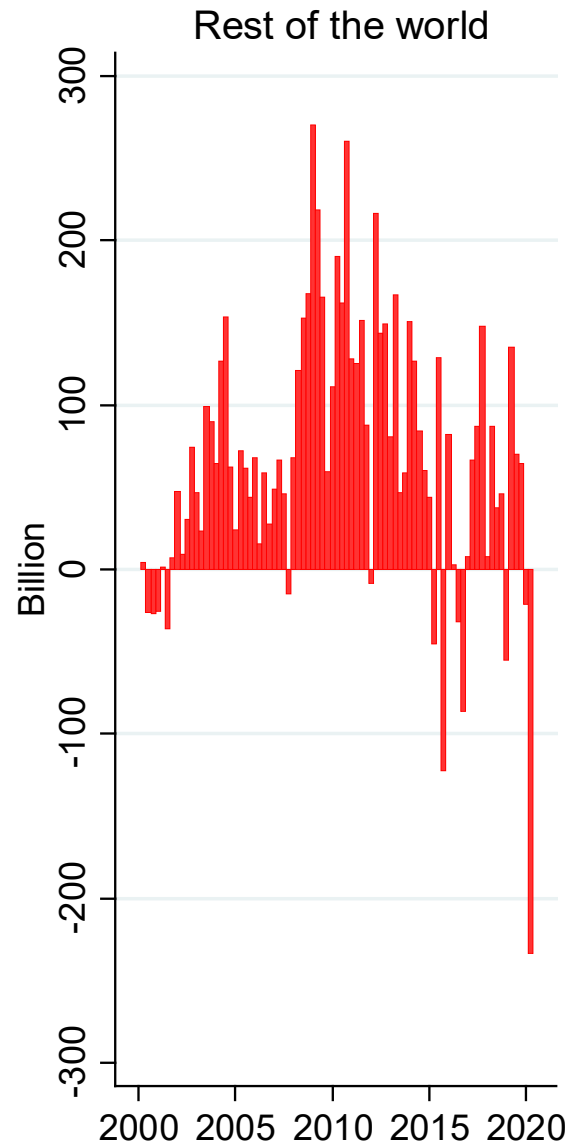
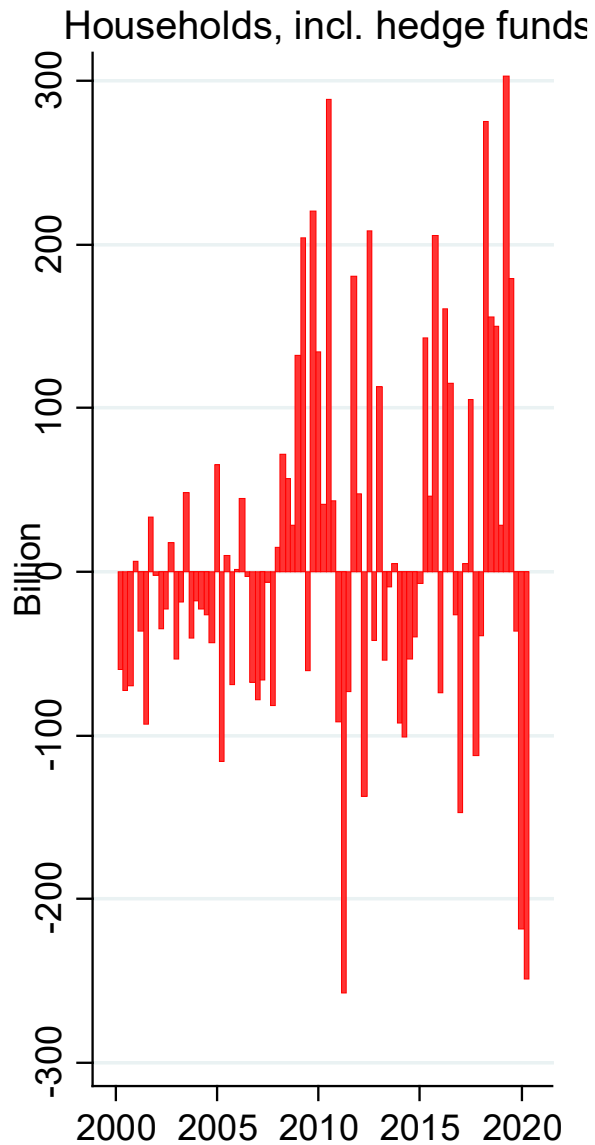
Sellers: Hedge funds, foreigners, mutual funds

\$B	Holdings change		Traded	
	2019Q4	2020Q1	2020Q1- 2019Q4	Bought/sold in 2020Q1
Total liabilities	19,019	19,518	500	684
Total assets	19,292	20,619	1327	684
Household sector, incl. hedge funds	1,896	1,463	-433	-249
Rest of the world	6,695	6,813	118	-233 Notes/Bonds: -250, Bills: +17
Mutual funds	1,311	1,233	-78	-182 Notes/Bonds: -187, Bills: +5
State and local governments	712	724	13	-39
Brokers and dealers	230	258	29	-23
Foreign banking offices in U.S.	121	116	-5	-15
Holding companies	58	54	-4	-9
Nonfinancial noncorporate business	79	81	1	-5
Banks in U.S. affiliated areas	17	15	-2	-3
Credit unions	38	39	1	-2
ABS issuers	33	32	-1	-1
Closed end funds	3	3	-1	-1

Buyers: Fed, money market funds

\$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	265	Notes/Bonds: +42, Bills: +223
Federal government retirement funds	2,150	2,157	6	43	
Private pension funds	468	538	70	31	
Exchange traded funds	232	263	31	20	
Nonfinancial corporate business	45	66	21	17	
U.S. chartered depository institutions	704	725	21	16	
Government sponsored enterprises	171	186	14	14	
Life insurance companies	215	244	28	11	
Property casualty insurance companies	153	168	15	5	
State and local govt retirement funds	383	417	34	2	
Discrepancy	274	1,101	827	0	

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

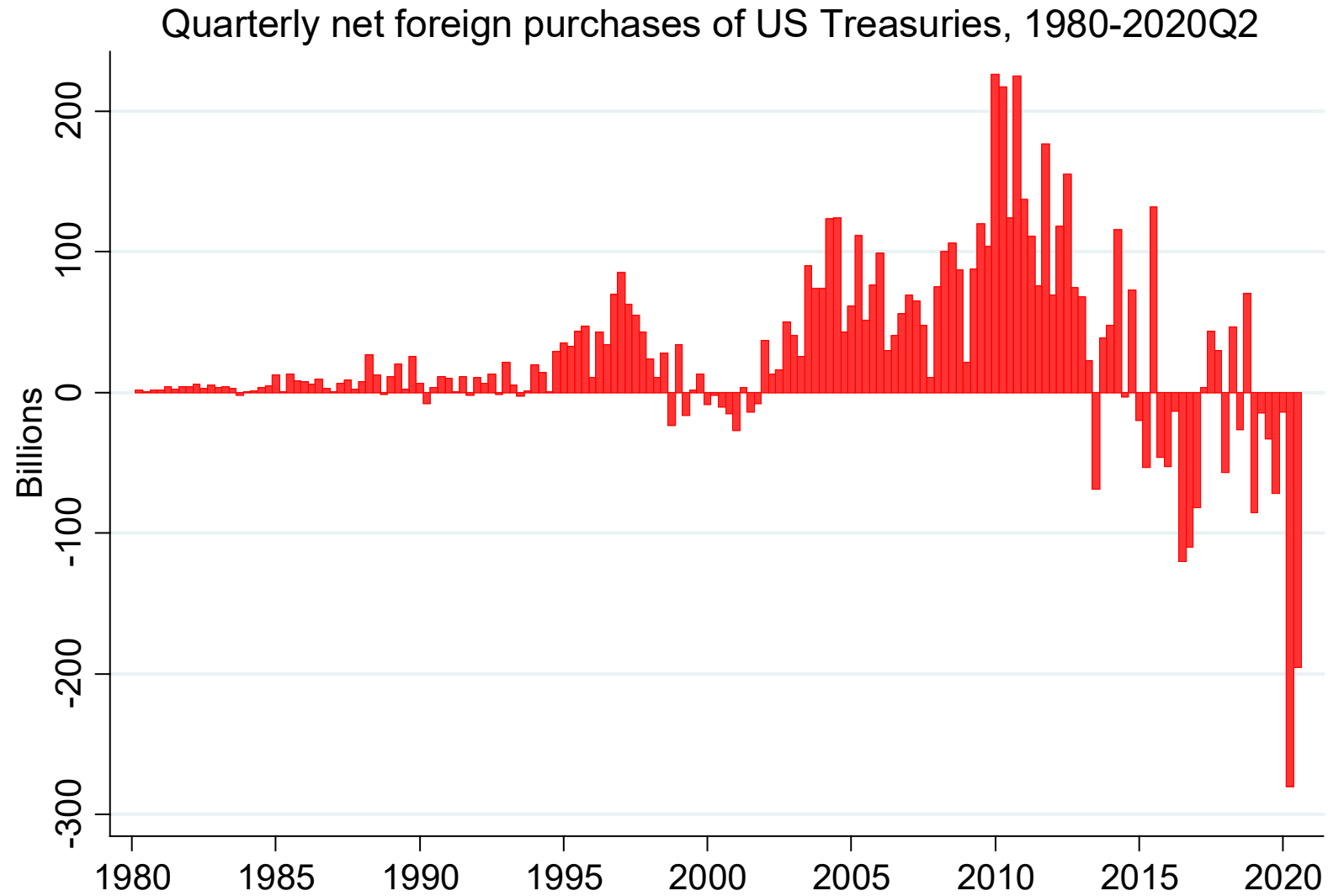


Household sales likely mainly from **hedge funds**.

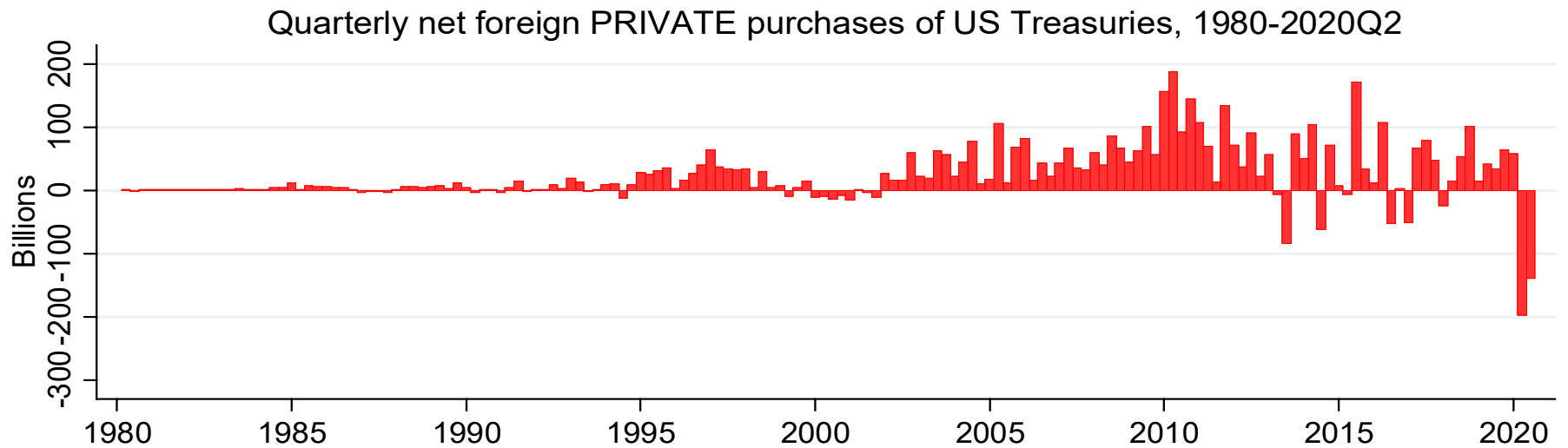
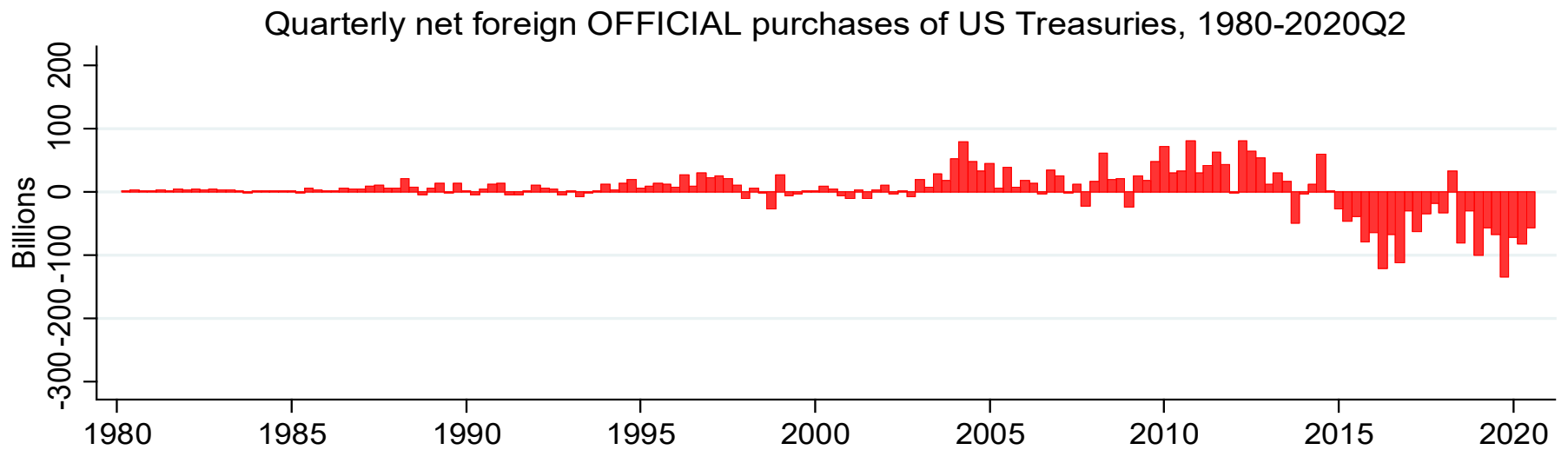
Rest of the world sales also likely mainly from **foreign hedge funds**:

- Driven by private foreign sales more than official sales
- Large sales from Cayman Islands, a huge hedge fund hub

All foreigners, TIC data



Foreign official vs. foreign private, TIC data



Main seller (official plus private) is Cayman Islands

Country	Net Treasury sales, 2020Q1
Cayman Islands	-118
United Kingdom	-32
Hong Kong	-23
Ireland	-16
Japan	-11
India	-11
Saudi Arabia	-11
Brazil	-10
France	-8
China	-8
Canada	-8
Mexico	-8
South Korea	-7
Germany	-6

From this, it looks like hedge funds (US and foreign) did massive selling of Treasuries

- Several papers point to the **unwinding of huge Treasury basis trades by hedge funds** as a key factor behind Treasury market dislocations
- Schrimpf, Shin and Sushko (2020), Hauser (2020), Duffie (2020)

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**

The trade is 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, margin and repo rates increased, leading to trade unwinding

Schrimpf, Shin and Sushko (2020):

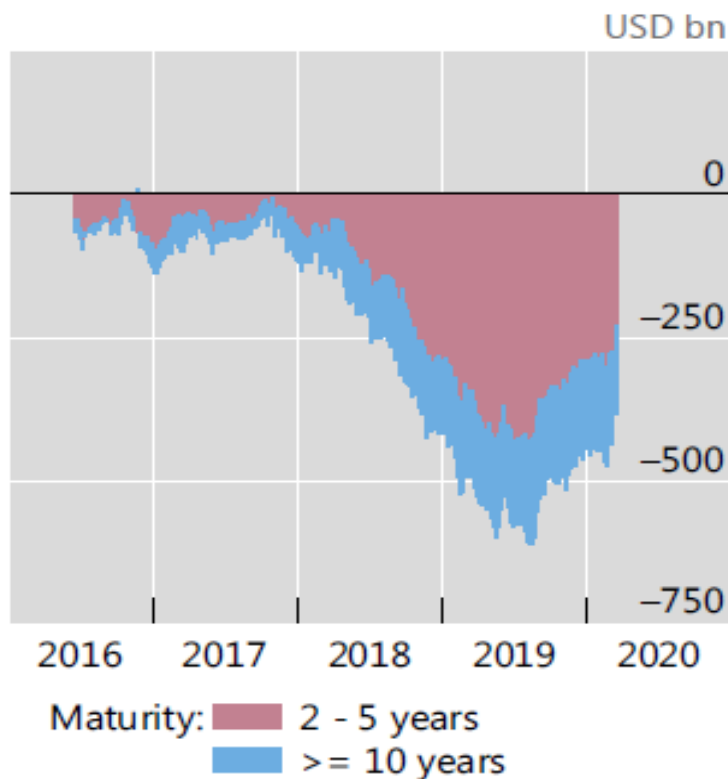
- Argue that the unwinding of these positions led to large Treasury selling, with dealers struggling to absorb this

Graph the **reduction in leveraged fund futures positions**

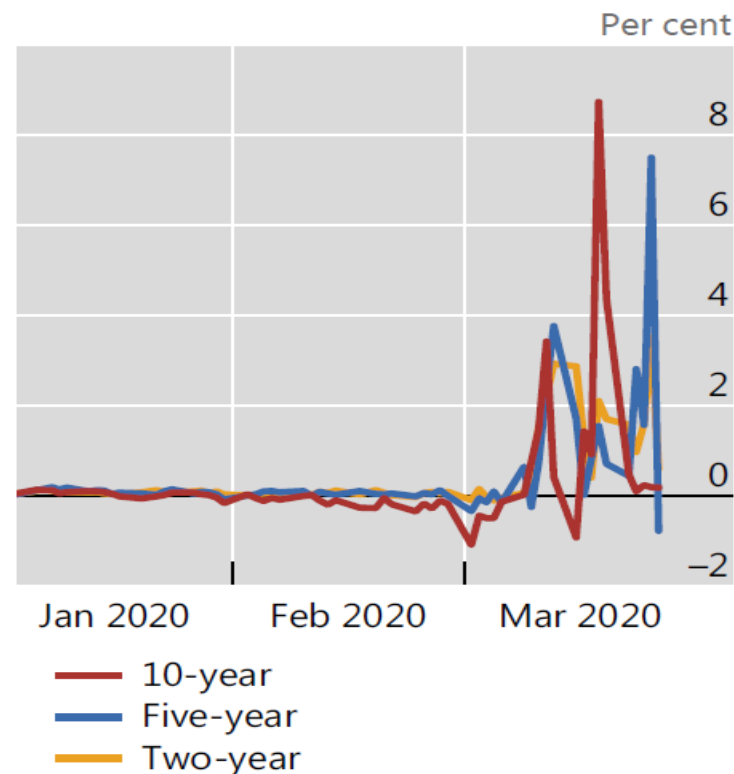
- Argue that CTD Treasury got mispriced by selling to unwind positions

Graph the difference between the **return on legs 1, 2 (implied repo rate, for new positions)** and the **cost of borrowing in leg 3 (actual repo rate)**

Leveraged fund futures positions³



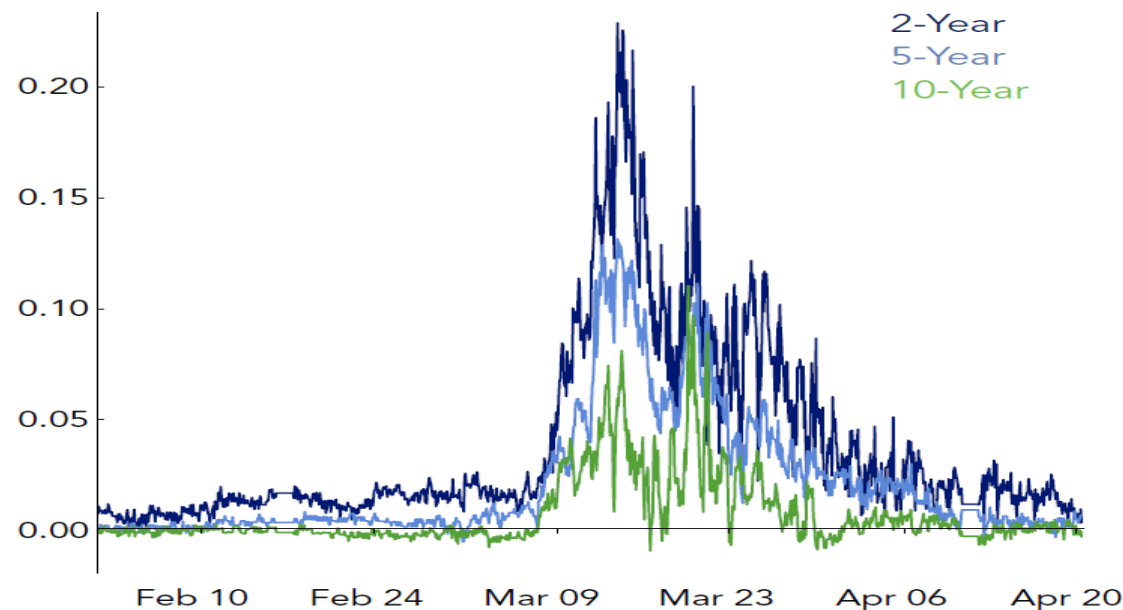
Cash treasury-futures dislocations¹



Barth and Kahn (OFR, 2020) cast some doubt on importance of hedge fund unwinding

- “While funds appear to have **partially exited these trades based on sales of the cheapest-to-deliver notes**, it is **not clear that these sales actually impaired Treasury market liquidity**. Instead, the basis trade appears to have continued to provide net liquidity to underlying Treasuries”. Show that **CTD Treasury was expensive** relative to similar but non-deliverable Treasuries. Argue that this may be due to it still being more liquid.

Figure 20. Spread on the Cheapest-to-Deliver Treasury (percentage points)



Note: Spread is the yield on a similar maturity nondeliverable Treasury minus the yield on the cheapest-to-deliver. Cheapest-to-deliver is for June futures contracts.

Sources: Bloomberg Finance L.P., Office of Financial Research

Also furthering argument that hedge fund selling did not cause the Treasury dislocations:

- Their trades and **trade unwinding were mostly in in 2-year Treasuries**
But **dislocations were mostly in longer maturities**

So, perhaps unwinding of basis trades was not as big a culprit as some have said.

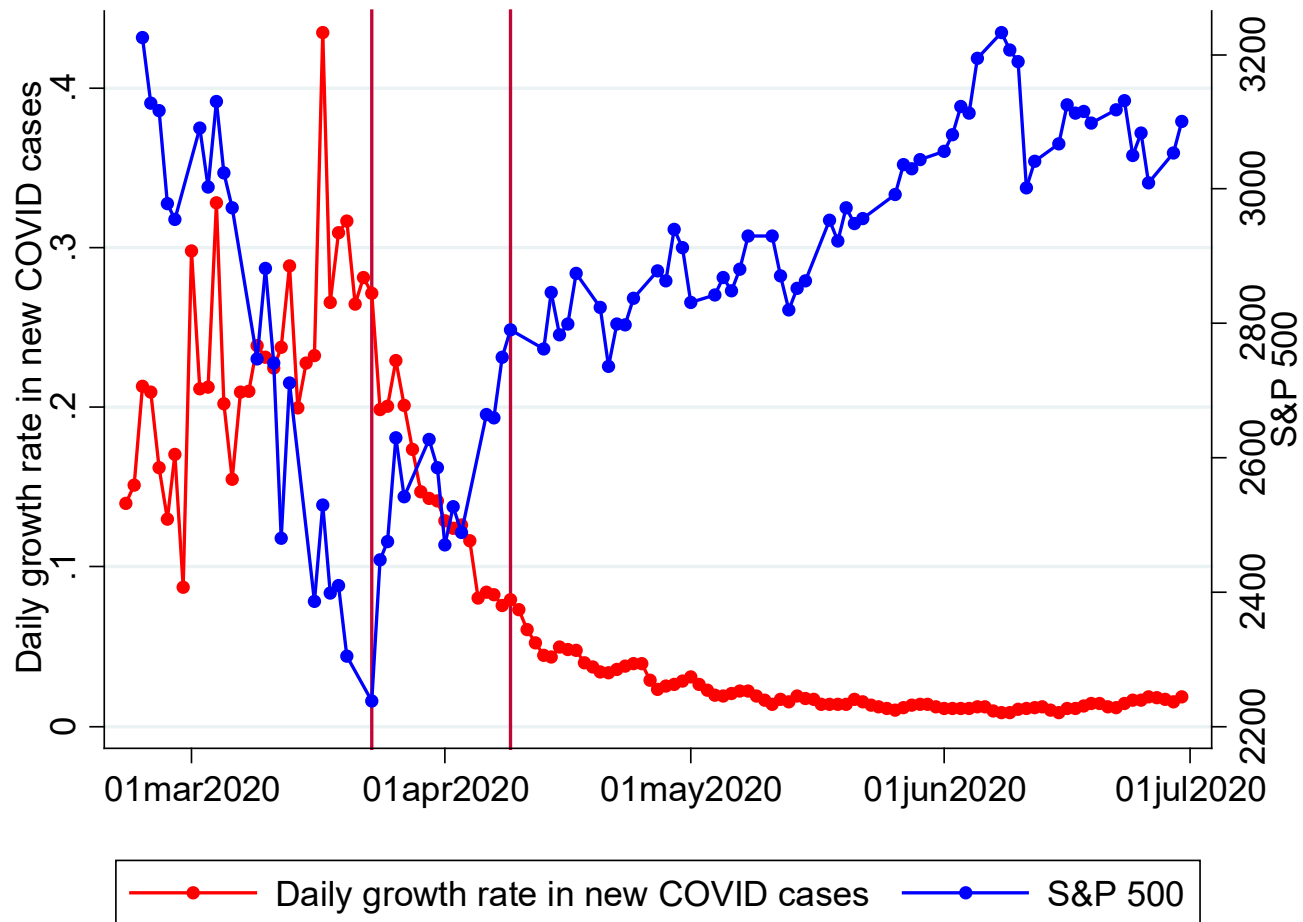
However, we still need to understand the rest of the change in household ownership:

- 2020Q1:
 - Household's Treasury net flow in US Financial Accounts: \$ -249B
 - Reduction in hedge fund short Treasury futures positions: \$ -127B

DID FED ACTIONS HELP IMPROVE MARKETS AND THE ECONOMY?

Possibilities:

1. Fed facilities helped (3/23, 4/9 announcements marked in graph below)
2. Cares Act fiscal stimulus mattered (3/24)
3. Growth rate of virus spread fell



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, munis, ABS, corporate) and **stimulate the economy**

March 3, 10 am:

- **Fed funds target** ↓ 50 bps to 1-1.25%

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.
- \$500B **Treasury purchases**, \$200B **MBS purchases**

March 17, 10:45 am: [Commercial Paper Funding Facility \(CPFF\)](#) restarted

- Buying A1/P1 CP, 90-day, OIS+110 bps (and some A2/P2). \$10B credit protection from Treasury.

March 17, 6 pm: [Primary Dealer Credit Facility \(PDCF\)](#) restarted

- Up to 90 day at primary credit rate

March 18, 11:30 pm: [Money Market Mutual Fund Liquidity Facility \(MMLF\)](#)

- Lends funds to banks to buy assets from prime money market funds
- Up to 1-year at primary credit rate if backed by Treasuries/Agencies, otherwise add 100 bps. \$10B credit protection from Treasury.

March 19, 9 am: [Temporary dollar liquidity arrangements](#) with other central banks

March 20, 10 am: [Dollar swap lines](#) with BoC etc.: Goes from weekly to daily operations

March 20, 11 am: MMLF expanded to munis

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

March 31, 8:30 am: **Repo facility for foreign and international monetary authorities**

- Objective to support Treasury (and other) markets. IOER+25 bps

April 6, 2 pm: Fed will provide **term financing backed by PPP loans**

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

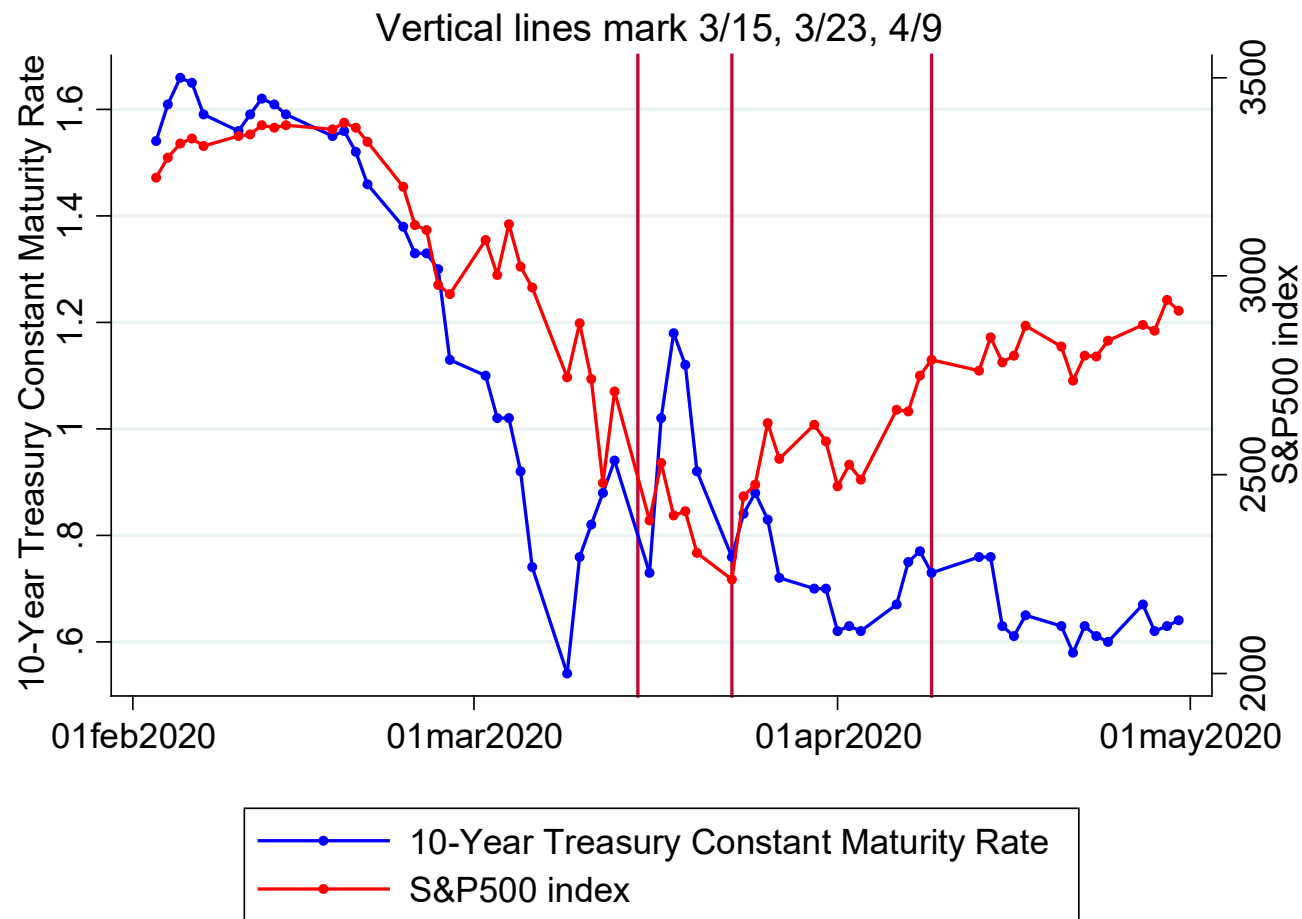
April 27-July 23: **Term sheets updated for MLF, MSLP, PPPLF, TALF, SMCCF, PMCCF**

Identification:

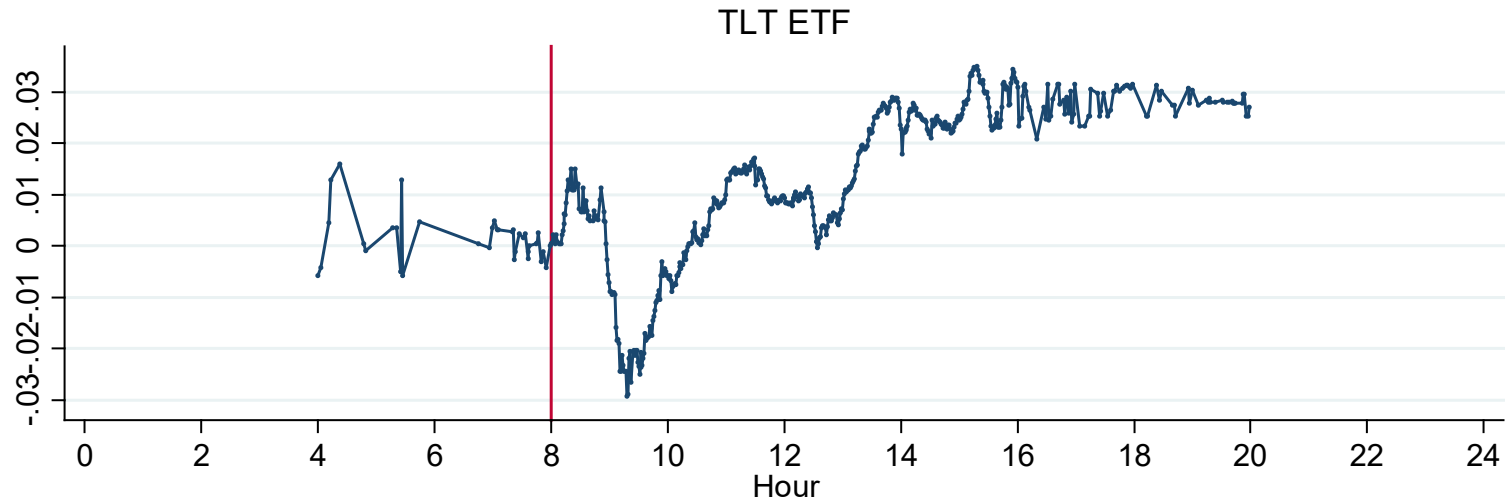
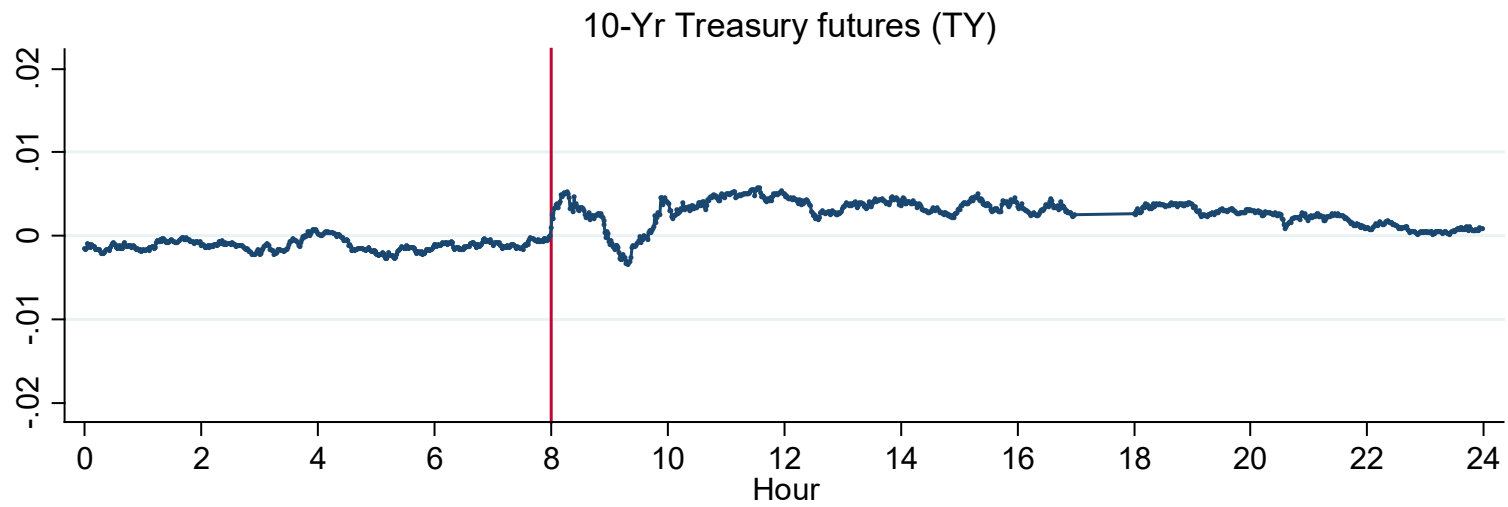
- Timing of Fed **announcements** and **purchases** + cross-section of securities
- Focus on 3/15, 3/23, 4/9 (no large effects of the others on bond markets)

FED IMPACT ON TREASURY MARKETS

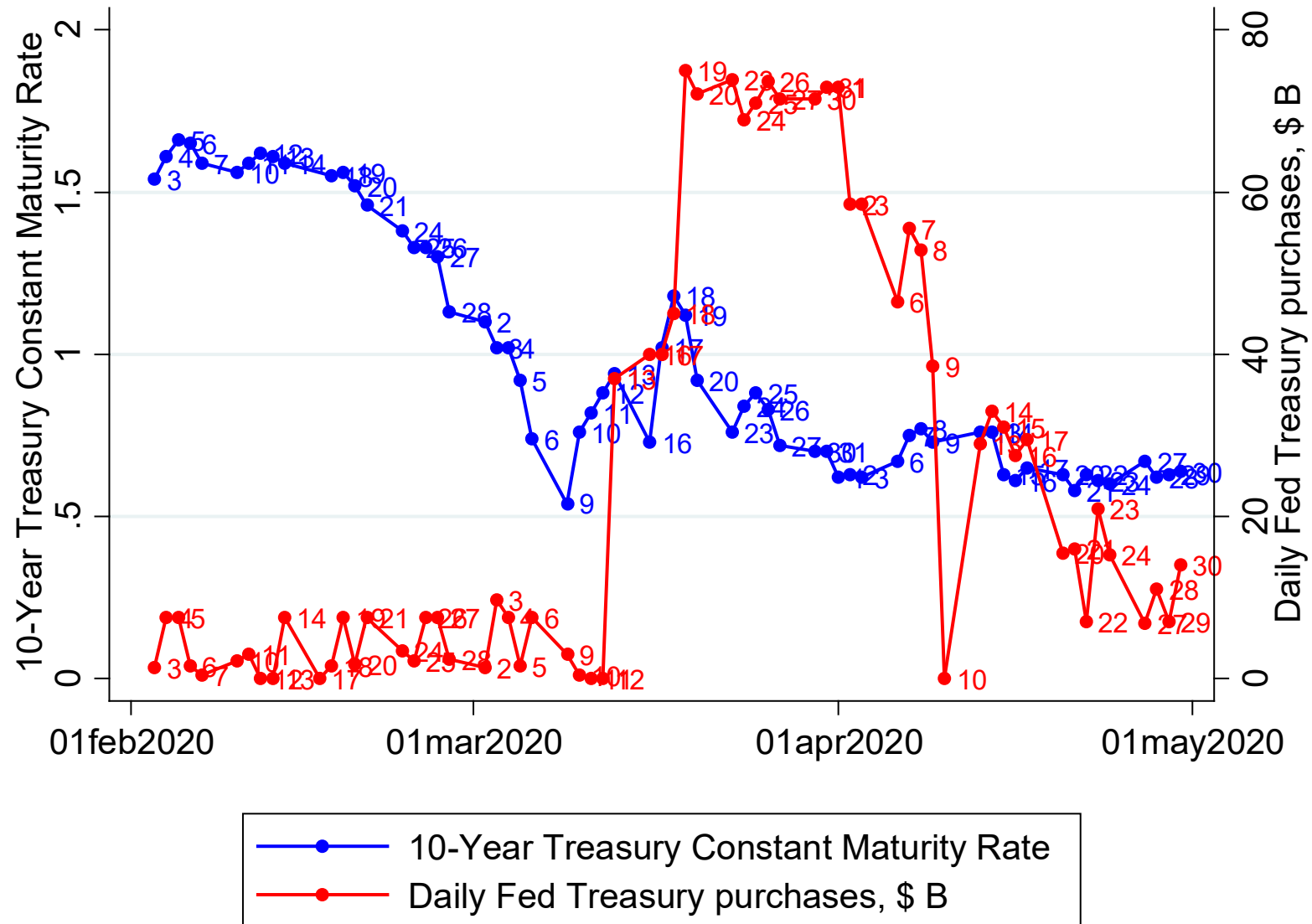
- 3/15: Yield falls but so do stocks. May not be policy related (intra-day infeasible).
Announcement fails to stop yields from increasing on 3/17, 3/18
- 3/23: Yield falls, some of this drop is causal based on intra-day data
But larger drop on 3/20. Why? Was policy not crucial for stabilizing markets?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



Intra-day Treasury returns, March 23, 2020

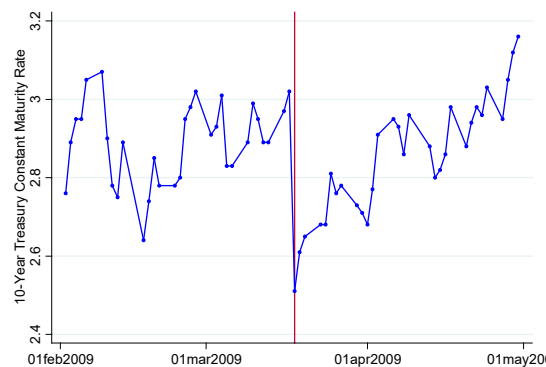


Massive daily Fed purchases from March 19 helped bring Treasury yields down



Lessons about how policy to purchase Treasuries worked during COVID crisis

- Treasury selling driven by liquidity needs, not loss of confidence in Treasuries
 - Corporate funds and other funds seeing outflows
 - Foreigners, facing dollar shortages due to flight to dollars, defending currencies
 - Perhaps hedge fund selling (domestic/foreign)
 - March 15 announcement wasn't enough to make others provide Treasury liquidity, in expectation of selling to the Fed
 - It took large actual purchases to bring yields down
 - For “market functioning QE”, flow effects are crucial
 - This is very different from how Treasury QE worked in 2008/2009
 - Then we saw large announcement effect
- Remember the 50 bps drop in the 10-year on March 18, 2009



- Not about providing Treasury market liquidity -- no large mutual fund outflows
- Different channels for affecting yields (Krishnamurthy & Vissing-Jorgensen)

FED IMPACT ON CORPORATE MARKETS

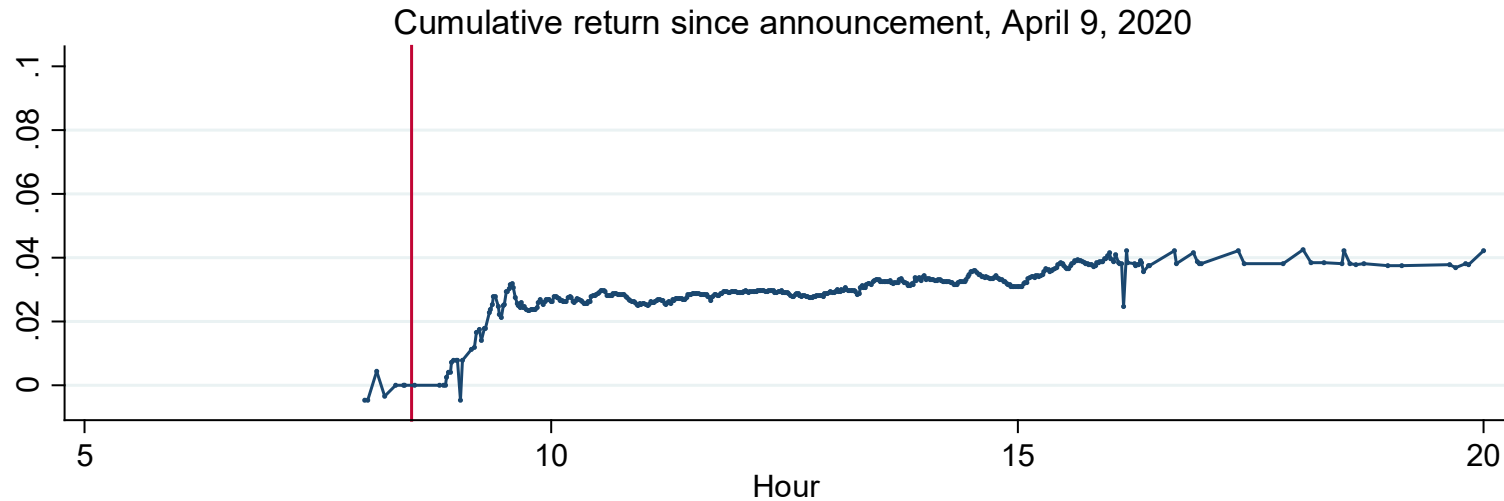
Investment-grade:

- Yields and CDS fall sharply around both 3/23, 4/9 policy announcements
Causal effect of policy based on intra-day data

High-yield:

- Yields and CDS fall sharply around both 3/23, 4/9 policy announcements
Causal effect of policy based on intra-day data
- HY benefits even from the 3/23 announcement which didn't involve HY purchases
VIX plummets suggesting broad effects on risk-premia

Investment-grade corporate bond returns (LQD ETF), intra-day:



High yield corporate bond returns (HYG ETF), intra-day



Intra-day CDS data from Haddad, Moreira and Muir (2020):

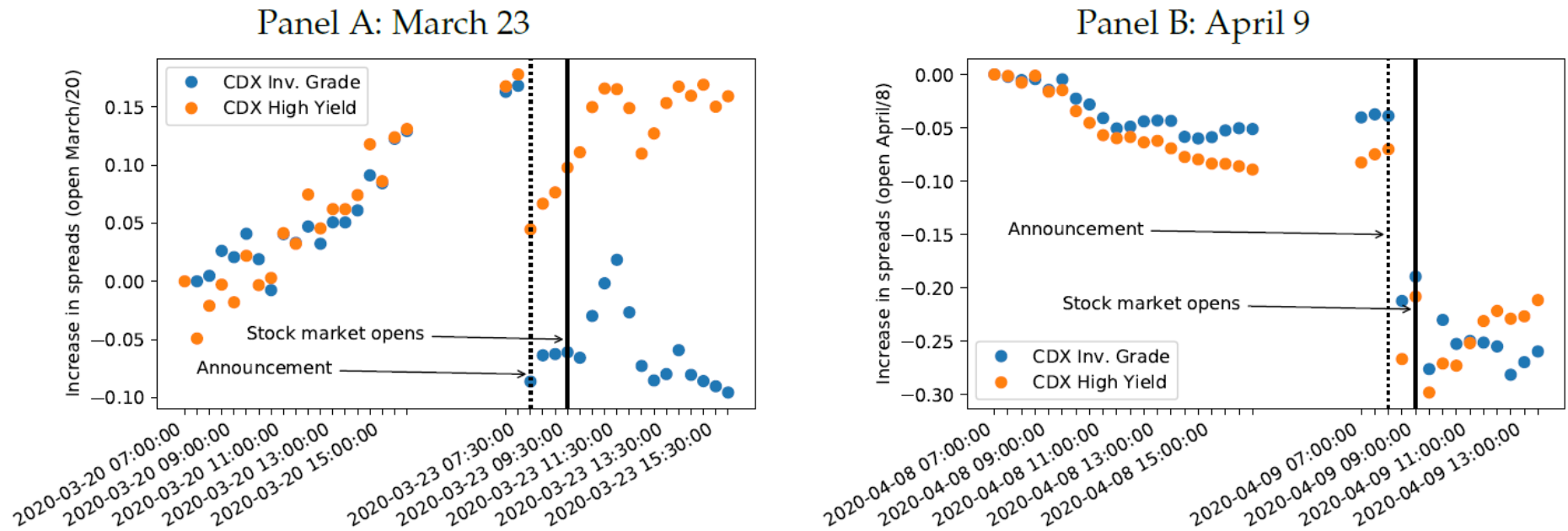
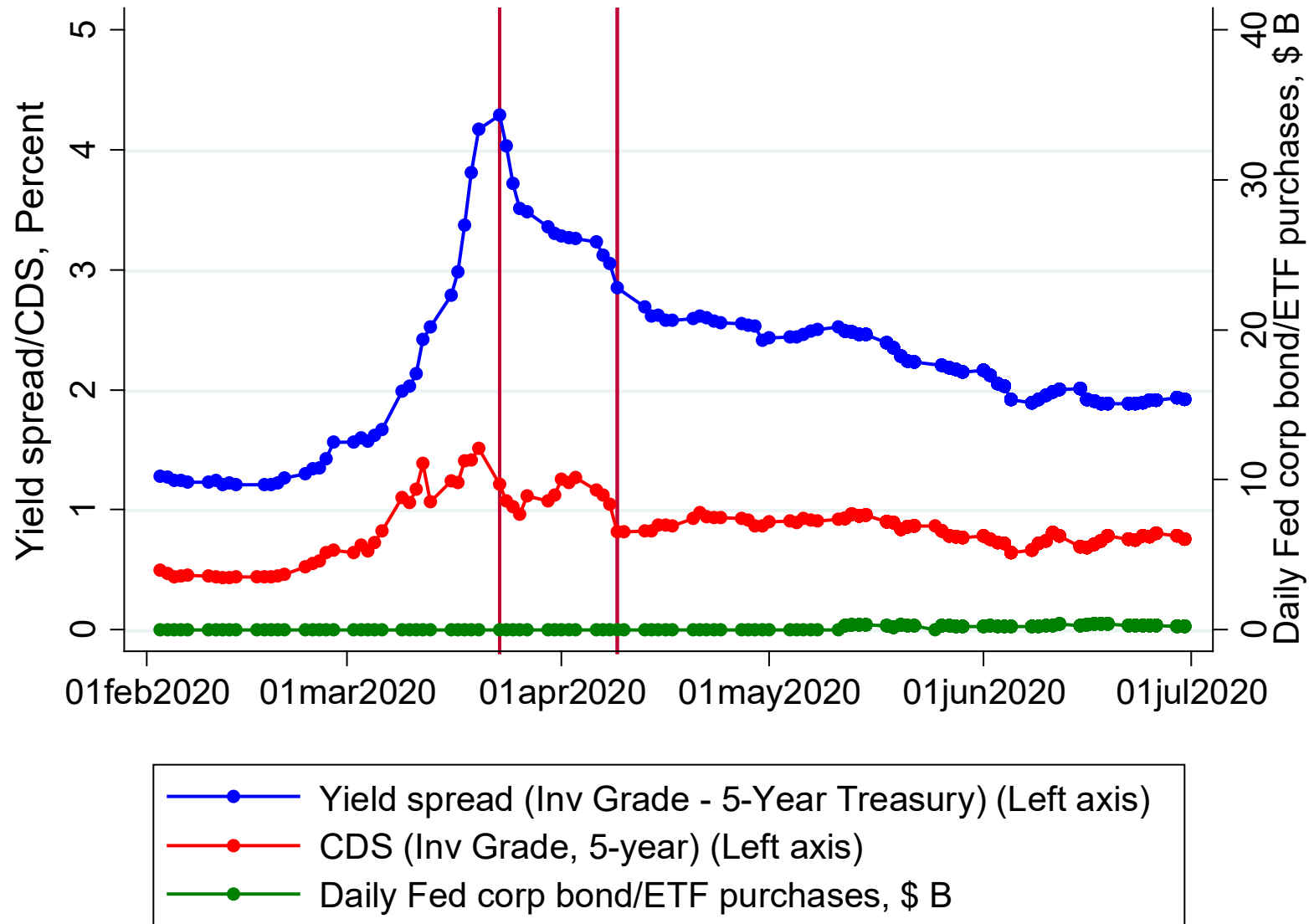
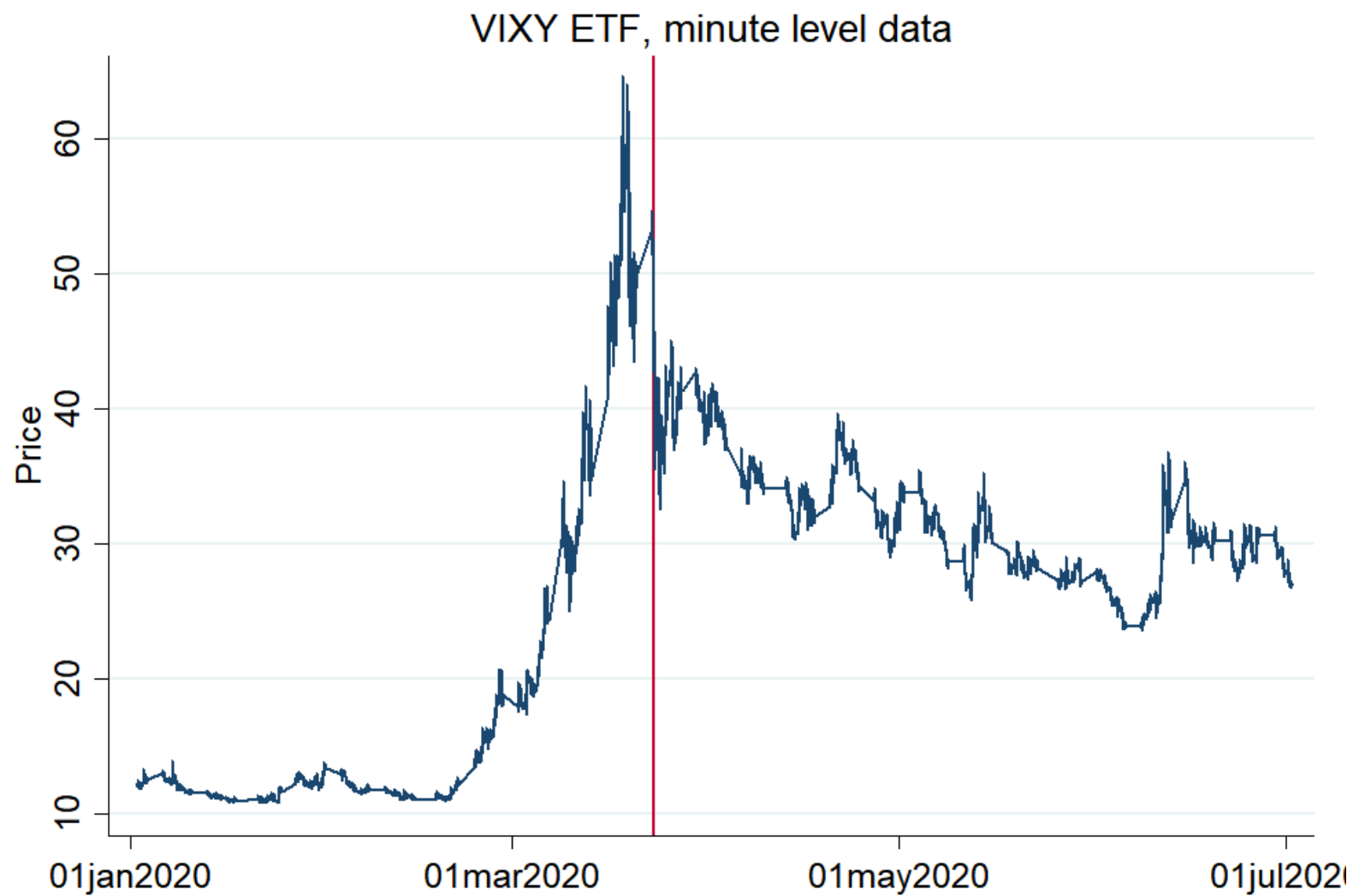


Figure 14: Event study around Fed announcements of bond purchases: CDS spreads. The figure reports the value the spread of the CDX IG and CDX HY every 30 minutes using transaction data. We report the implied increases in CDS spreads from the market opening one day before the announcement.

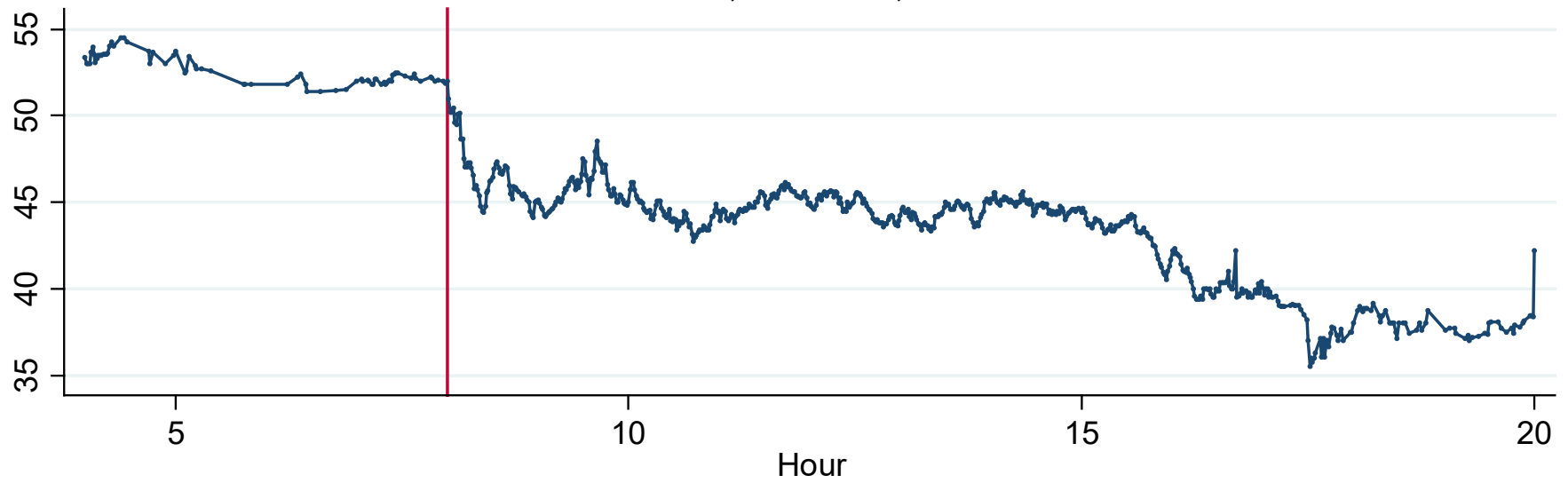
Purchases start only on May 12 and are small (total of \$12B by end of July):



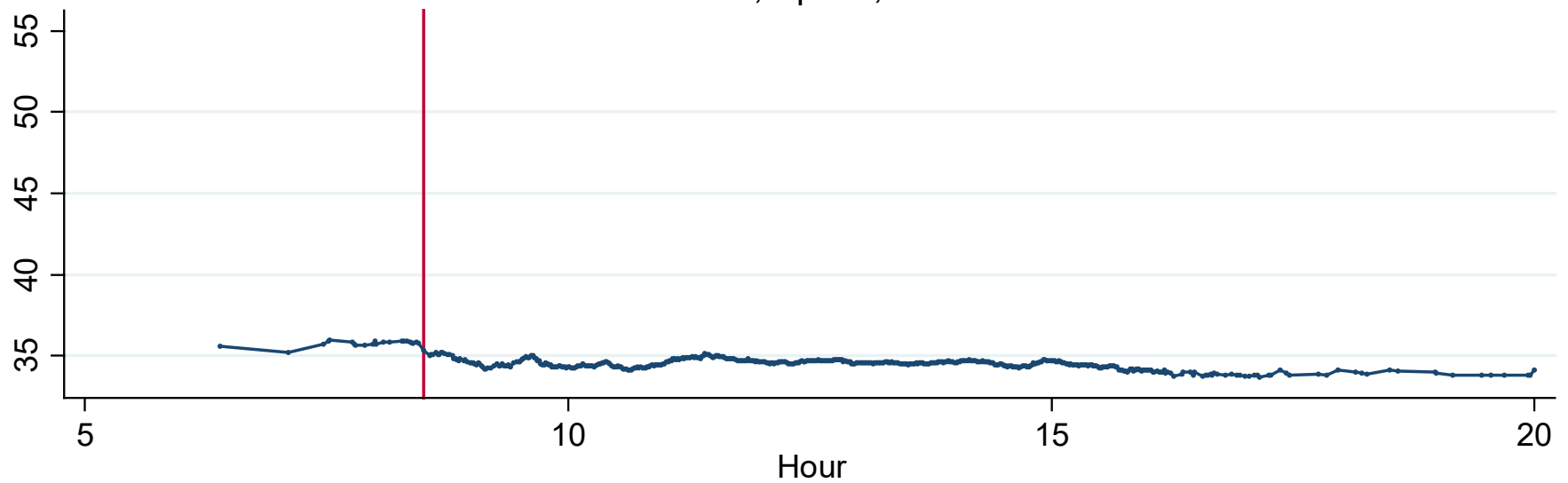
VIX plummets after the March 23, 8 am announcement:



Prices, March 23, 2020



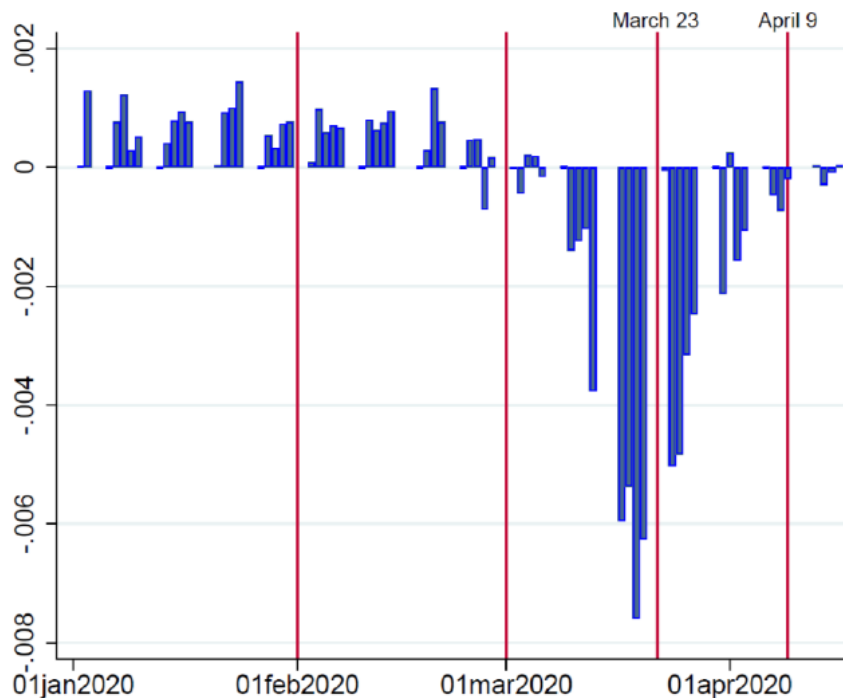
Prices, April 9, 2020



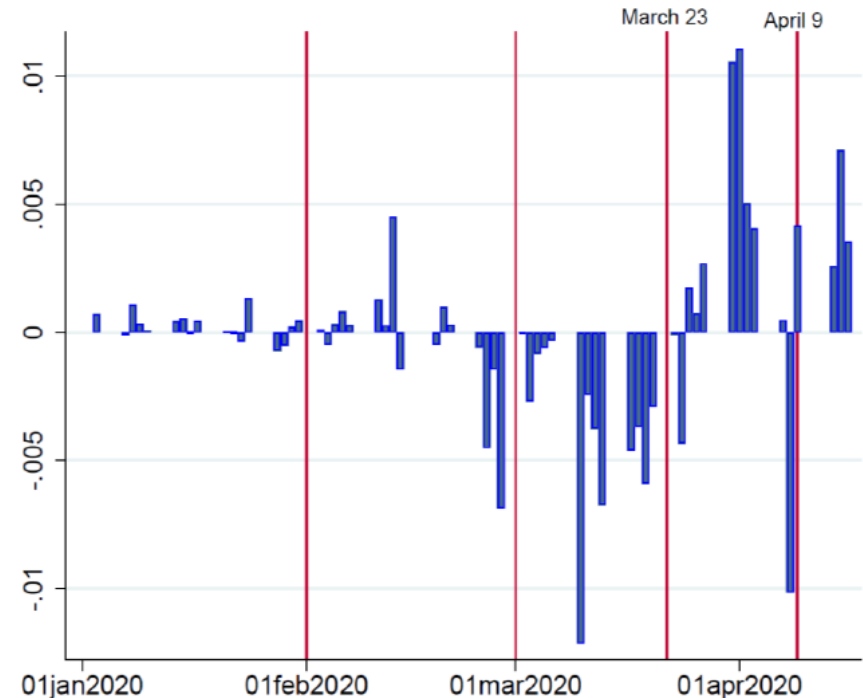
Lessons about how Fed corporate bond purchases worked during COVID crisis

- Corporate bond selling driven by concerns about corporate fundamentals and **mutual fund structure** (daily liquidity, externalities, similar holdings across funds)
 - Massive mutual fund redemptions from IG corporate (and other) bond funds
 - **Announcements by themselves calmed markets. A lot like the ECB's OMT**
 - IG fund outflows slow after 3/23. HY fund outflows revert after 4/9
- Falato, Goldstein, Hortacsu (2020):

Panel A: Investment-Grade Funds

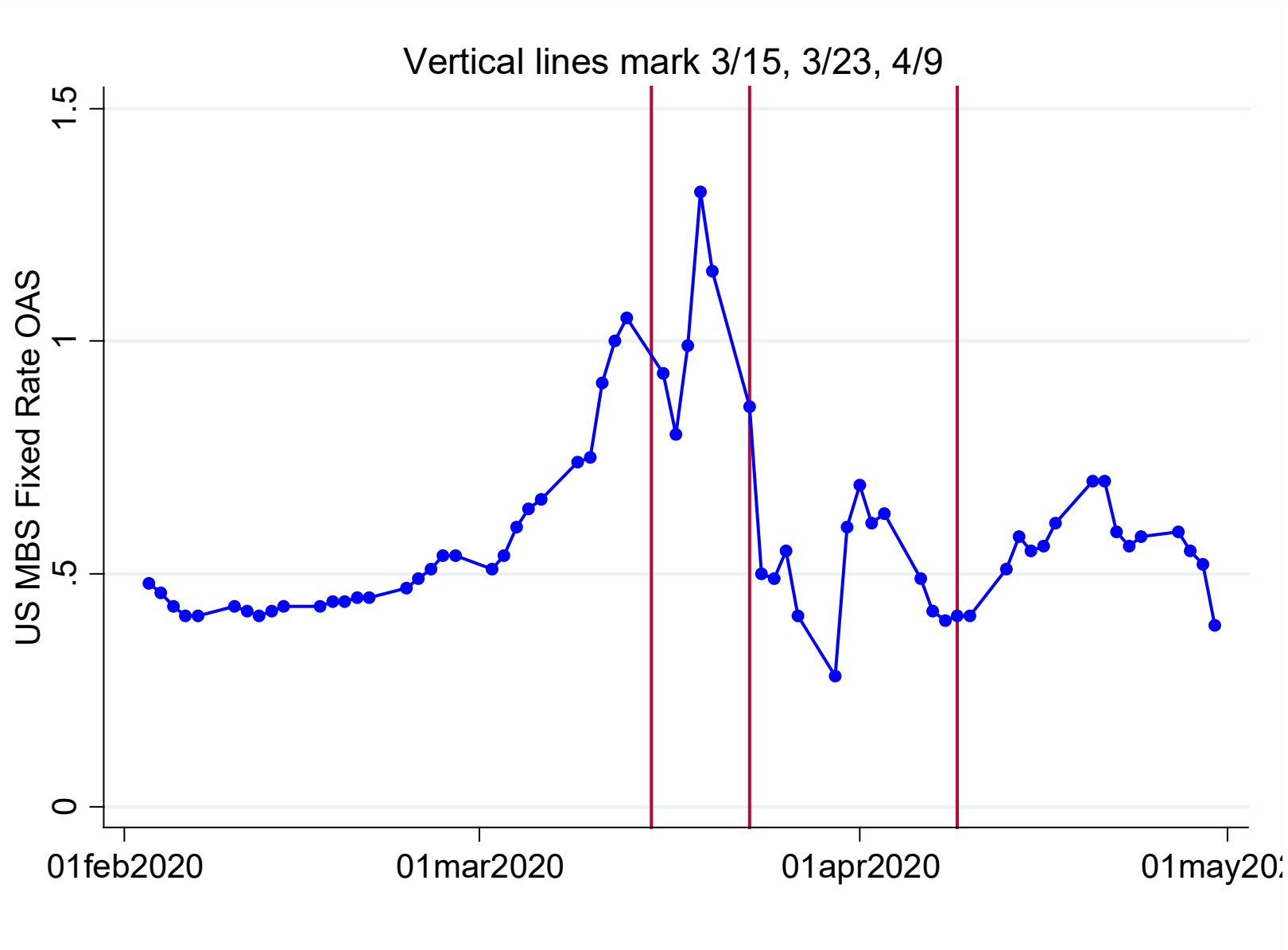


Panel B: High-Yield Funds

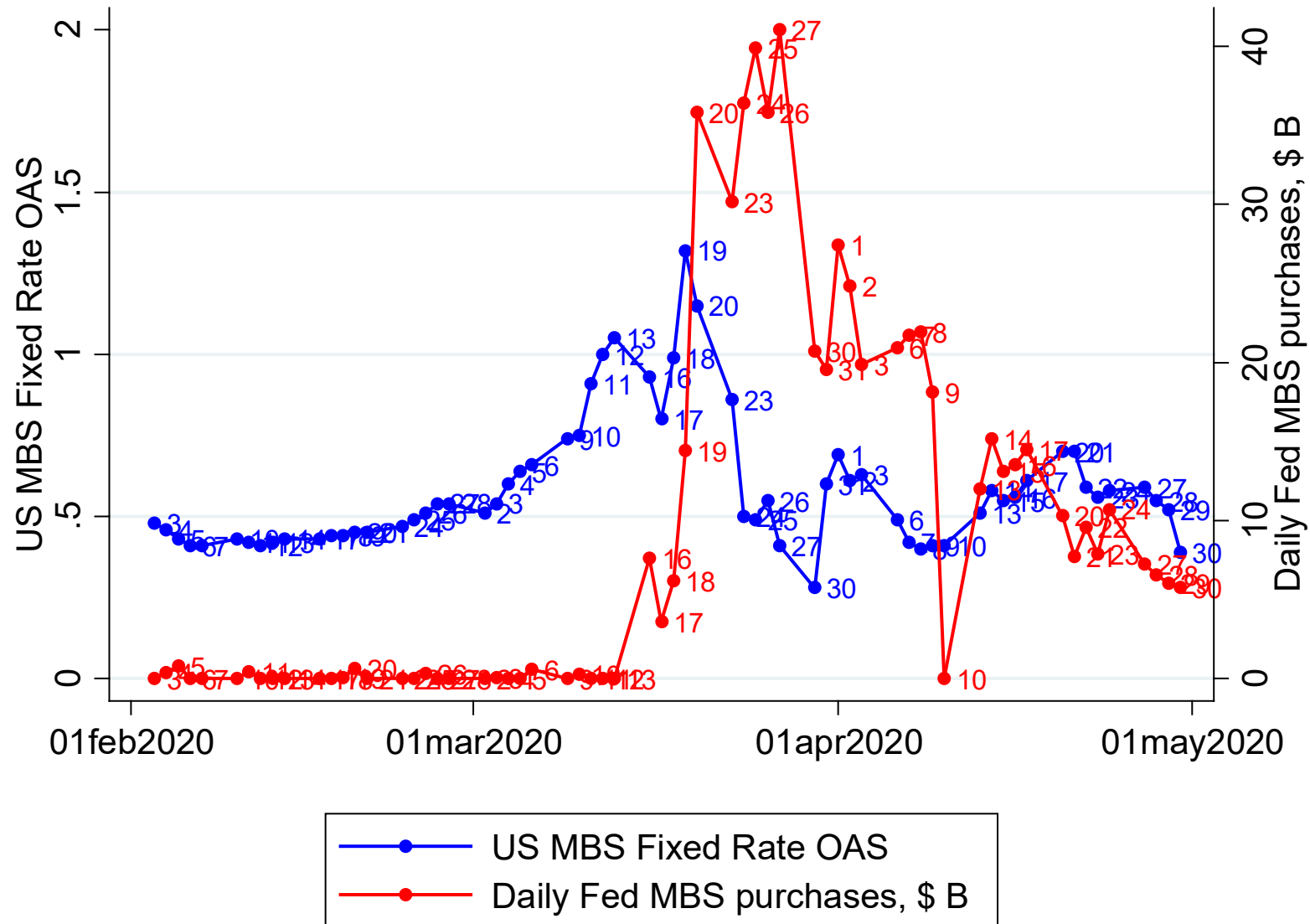


MBS purchases worked more like Treasuries than corporate

MBS risk premium spikes on March 19 despite March 15 announcement



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



MBS sellers included highly levered REITS

- Fed announcements on 3/15 and 3/23 apparently not enough to make them stop selling. MBS default risk due to COVID, MBS prepayments, repo funding problems

MBS: US Financial Accounts, L.213/F.213

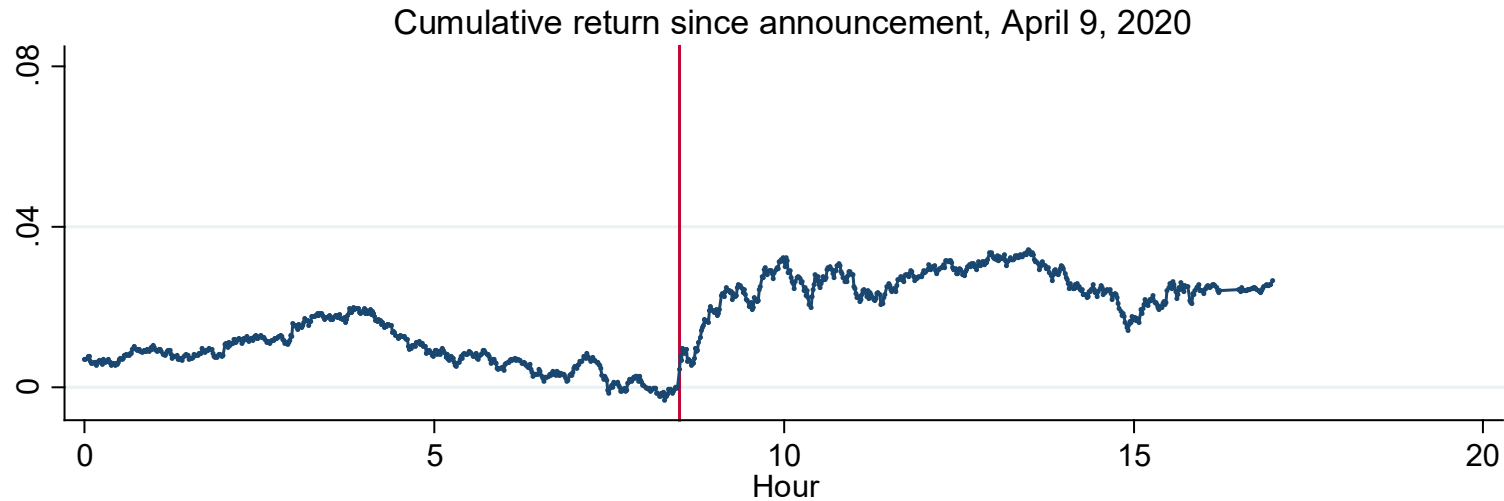
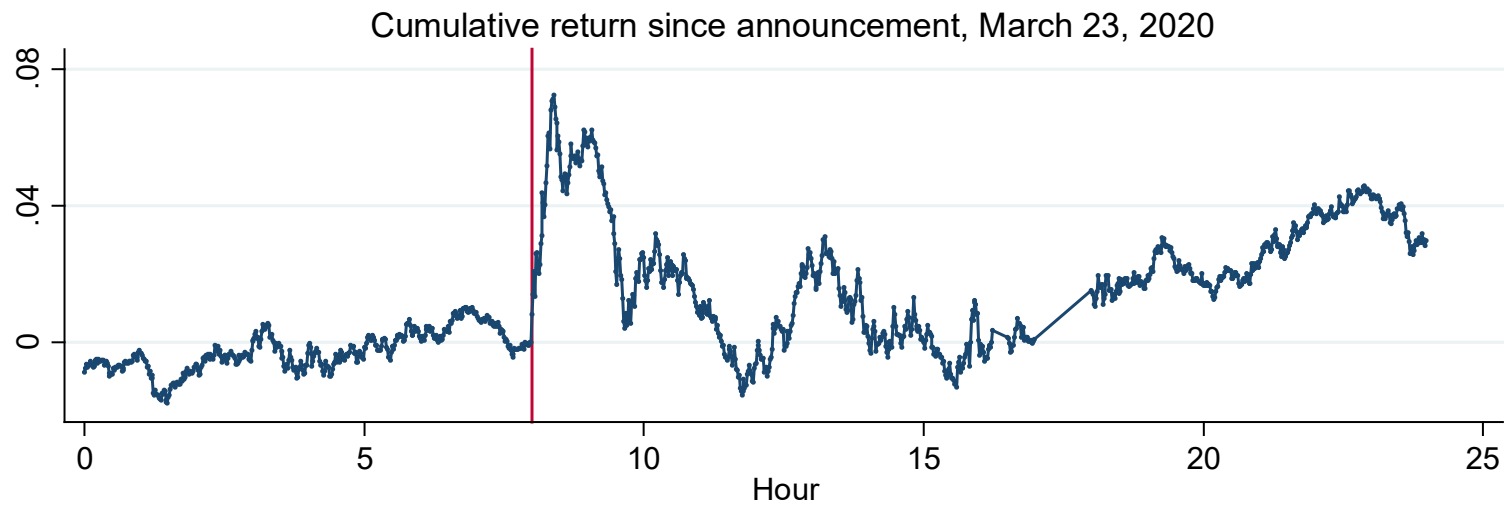
Sellers:

\$B	2019Q4	2020Q1	Holdings change	Traded
			2020Q1-2019Q4	Bought/sold in 2020Q1
Total liabilities	9431	9771	340	373
Total assets	9629	10176	547	373
REITs	335	219	-116	-116
Mutual funds	654	585	-69	-91
Holding companies	45	42	-3	-5
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
Credit unions	165	174	9	-1

DID FED BOND PURCHASE PROGRAMS HAVE REAL EFFECTS? LIKELY YES

- Corporate CDS rates fell
 - Indicates real effects if default has deadweight costs
Debate about whether large publicly traded firms could just restructure in default
- Large corporate bond and Treasury issuance after markets stabilized:
Corporate: \$1.25T in 2020 of which \$963B after March 23 (FT, today)
- Stabilizing markets helped prevent COVID crisis from turning into financial crisis with its associated credit contraction
- Large wealth-effects of Fed policy (incl stock market) → Consumption, investment
- We don't have a GDP-tracking asset, but effects on stock market and even commodities like copper were encouraging

S&P500 (ES futures, similar for VOO ETF) rallies after 3/23 and 4/9 announcements:



Concerns:

- Main Street Lending Program quantities much less encouraging
- Moral hazard is now an even bigger concern
- Zombie firms?