

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

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October 20, 2020

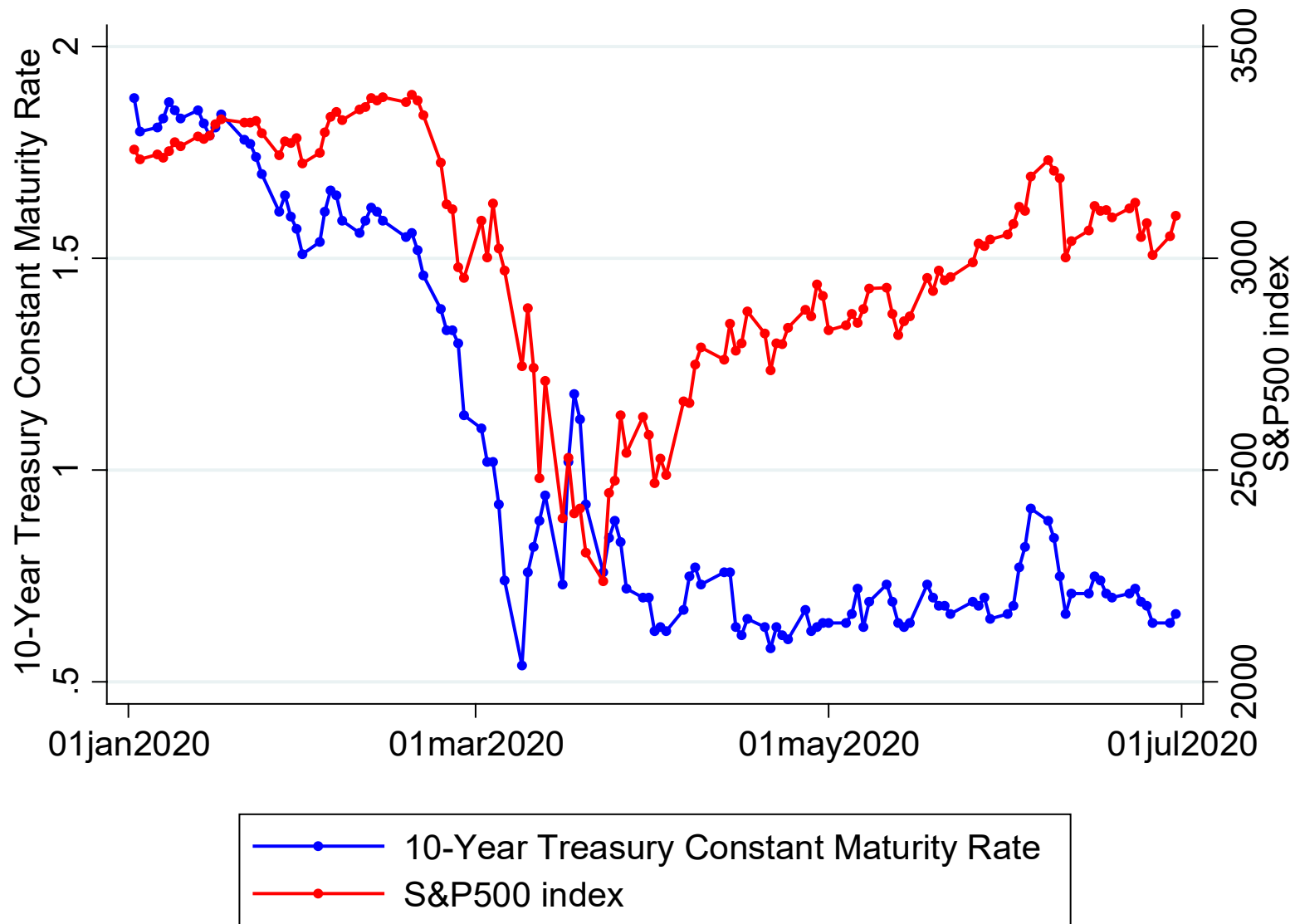
(First version August 26, 2020)

1. **Dislocations in Treasury** and **investment-grade** bond markets in March  
Yields increasing sharply, much more than CDS
  
2. **Who were selling? Why?**
  - Outflows from bond mutual funds, especially investment-grade corporate funds
    - Contributed to both Treasury and corporate market price pressure
    - Can be rationalized by **disappearing safety-effect**
  - **Rest of the world** (incl central banks and hedge funds) and household sector
  
3. **Fed facilities** to **stabilize bond markets** and **stimulate the economy**
  - **Treasuries**: Purchase announcement did not stop yield increase, but **very large actual purchases** did:
    - **Providing liquidity** requires **large purchases**
    - Worked different than Treasury QE during financial crisis
  
  - **Corporate bonds**: Purchase **announcements** lowered yields, actual **purchases were delayed and modest**
    - **Can stop a run buying very little** with a sufficiently strong announced willingness to buy
    - Worked different than ECB Corporate Sector Purchase Program

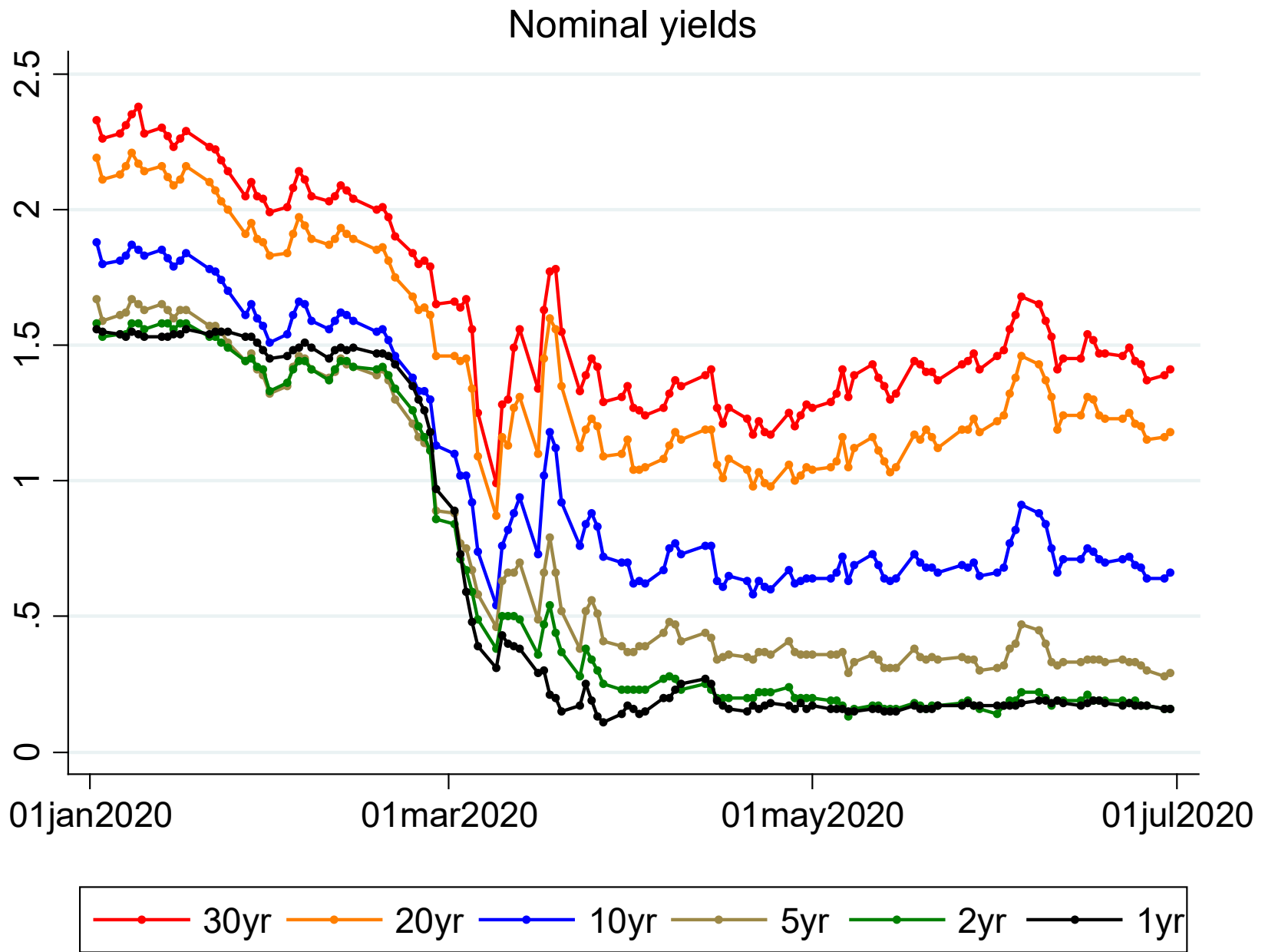
## BOND MARKET DISLOCATIONS IN MARCH 2020

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

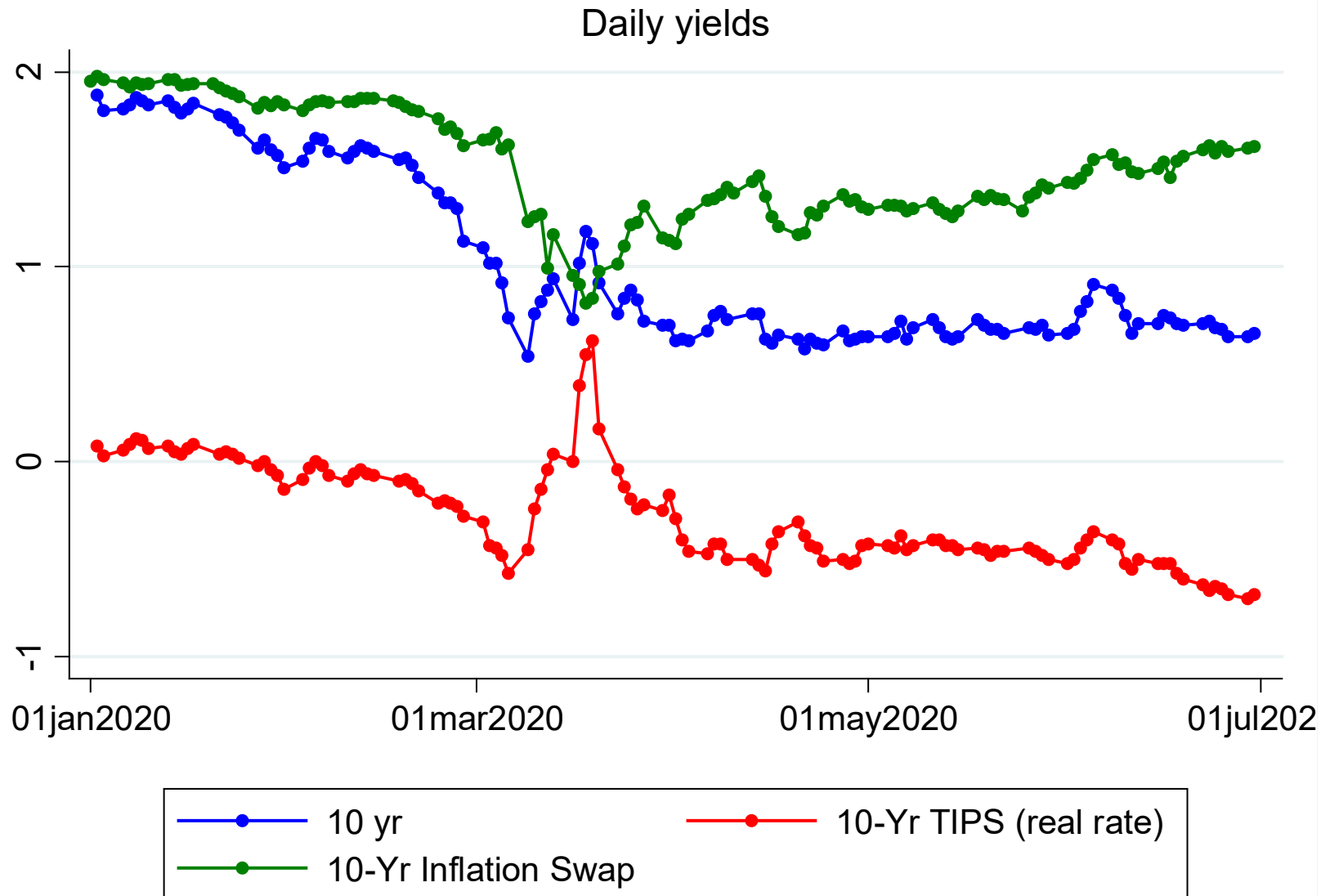
10-year yield +64 bps from 3/9 to 3/18



## Treasury yields spike more at longer maturities



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

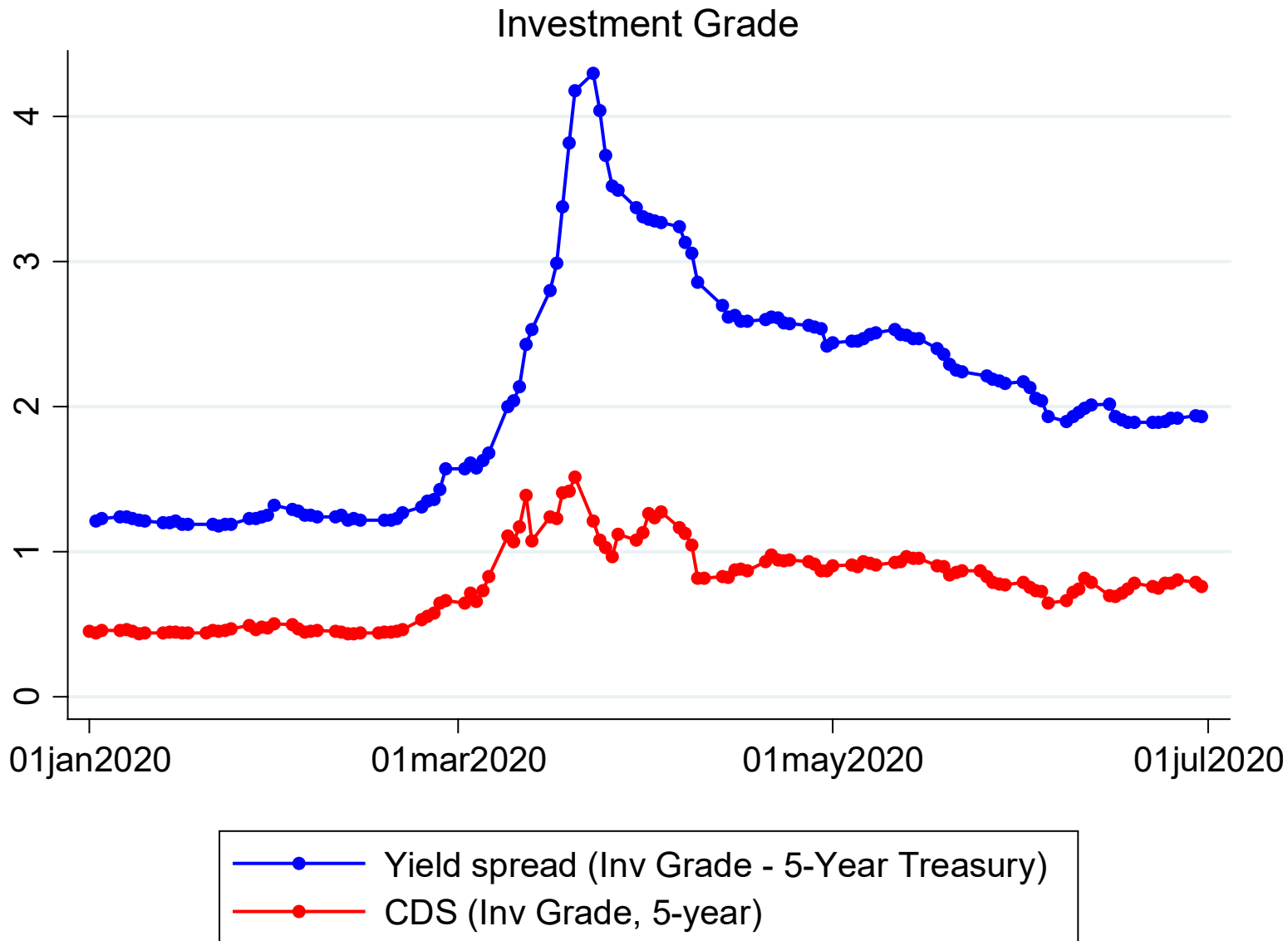


# Treasury CDS largely unchanged (5 yr graphed below)

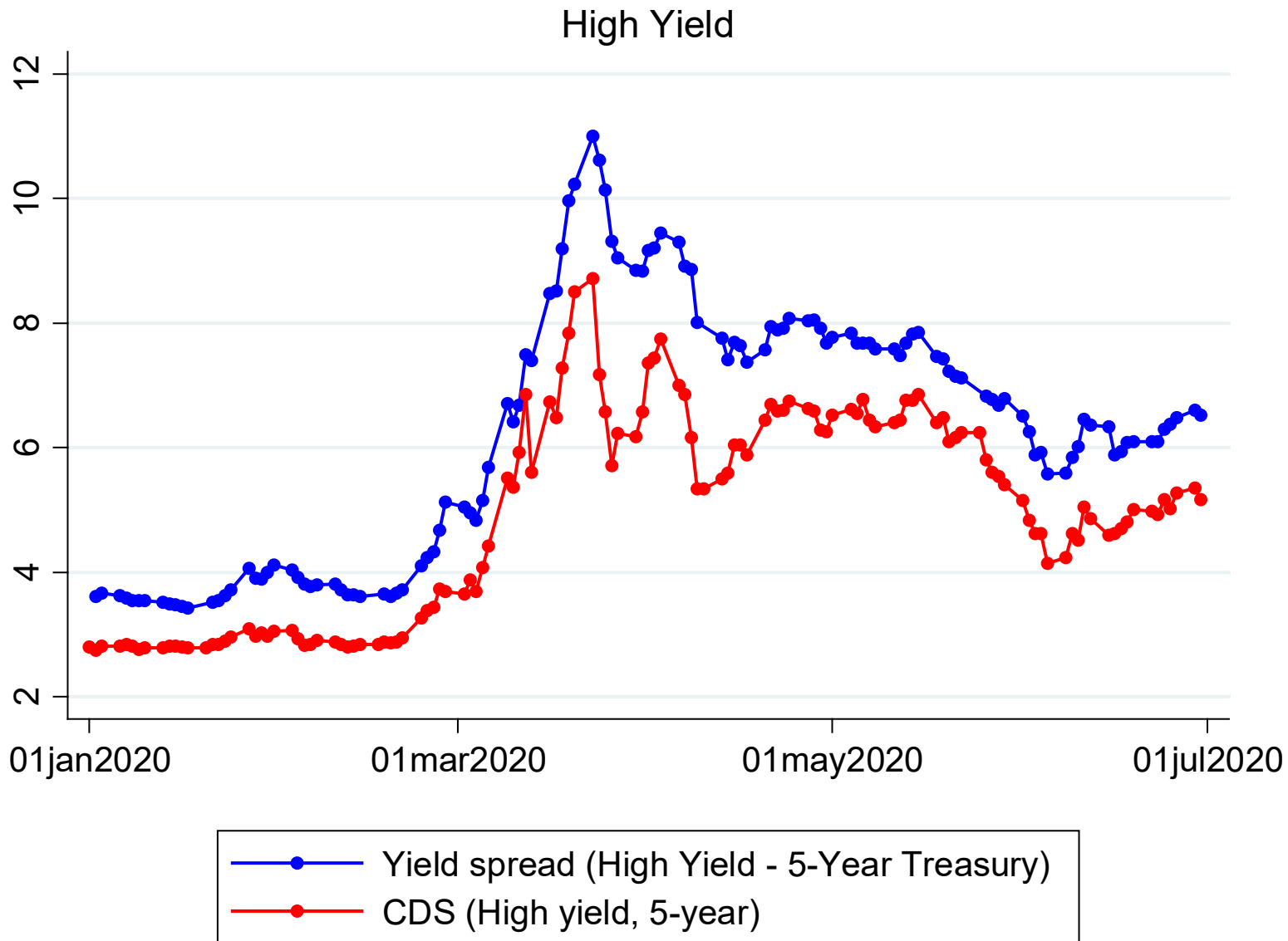


## Investment grade corporate bond spreads spiked, much more than their CDS

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



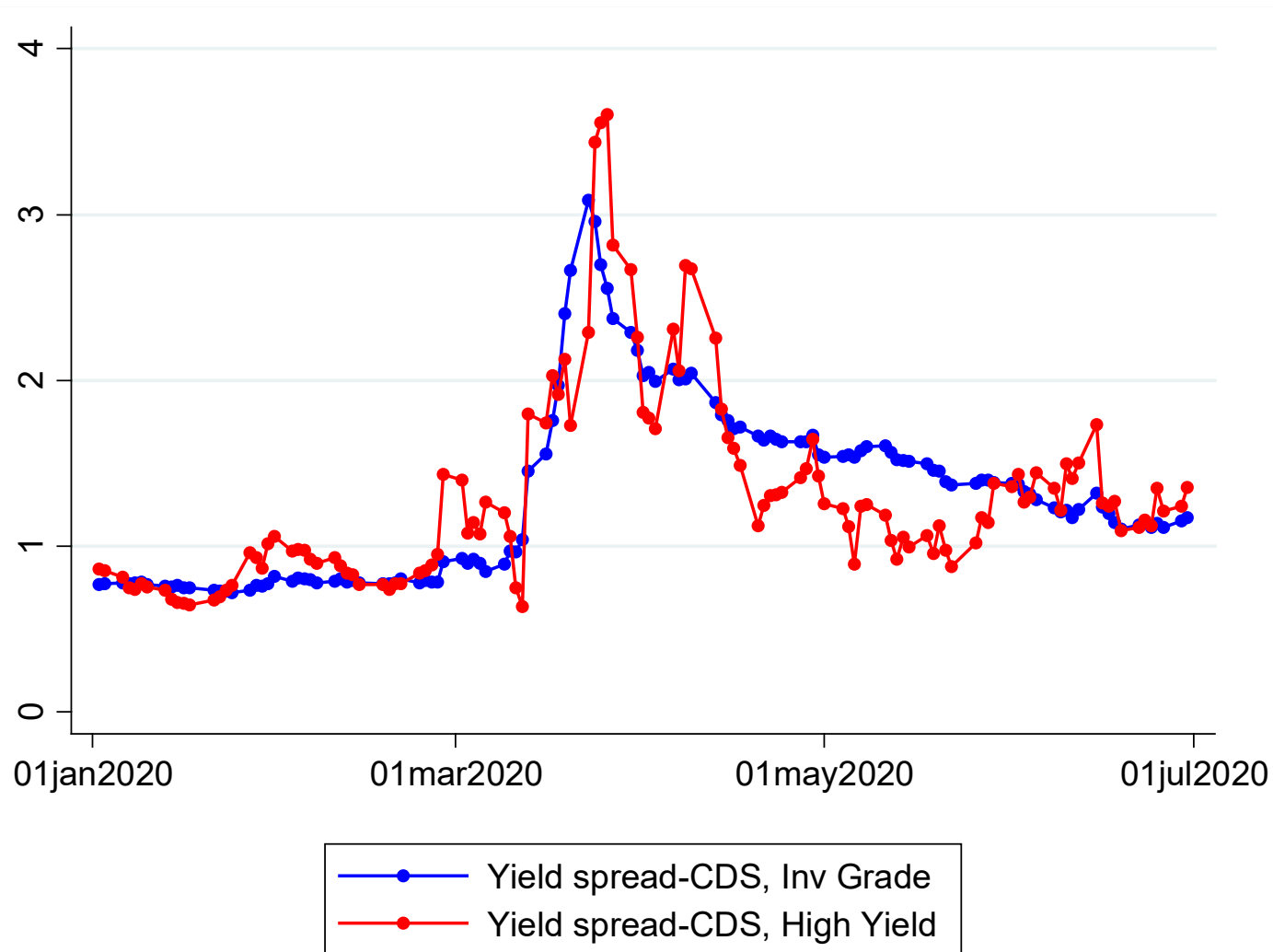
## High yield corporate bond spread follows its CDS more closely





## Yield spread-CDS peaks at about the same value for HY bonds and IG bonds, despite much higher credit risk for HY

- Fall 2008: Yield spread-CDS much higher for HY than IG (Bai and Collin-Dufresne '18)



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

## WHAT HAPPENED? 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

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

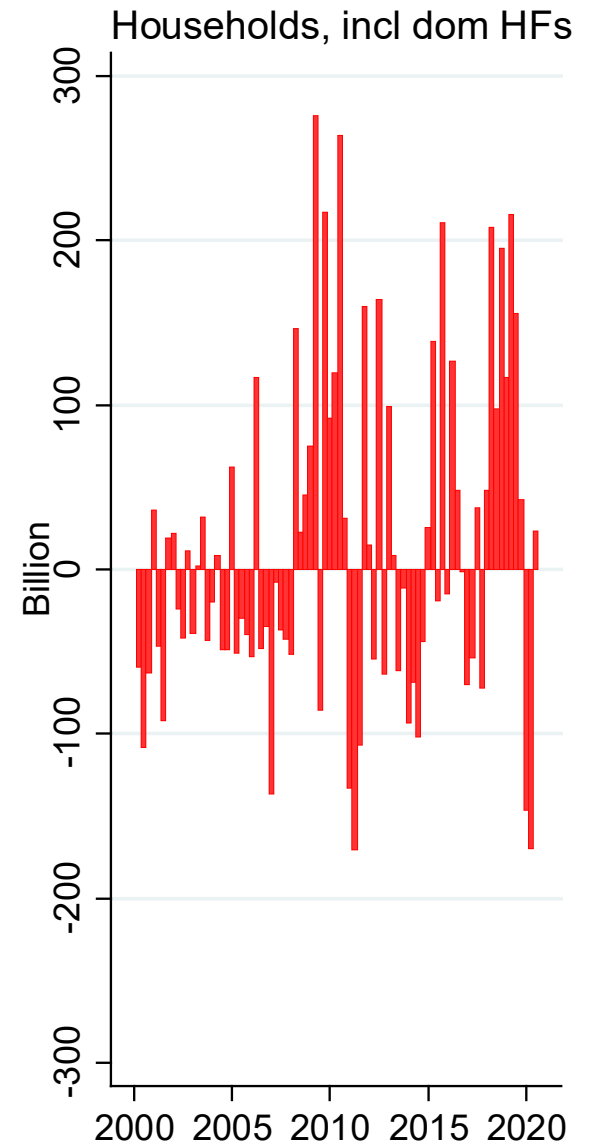
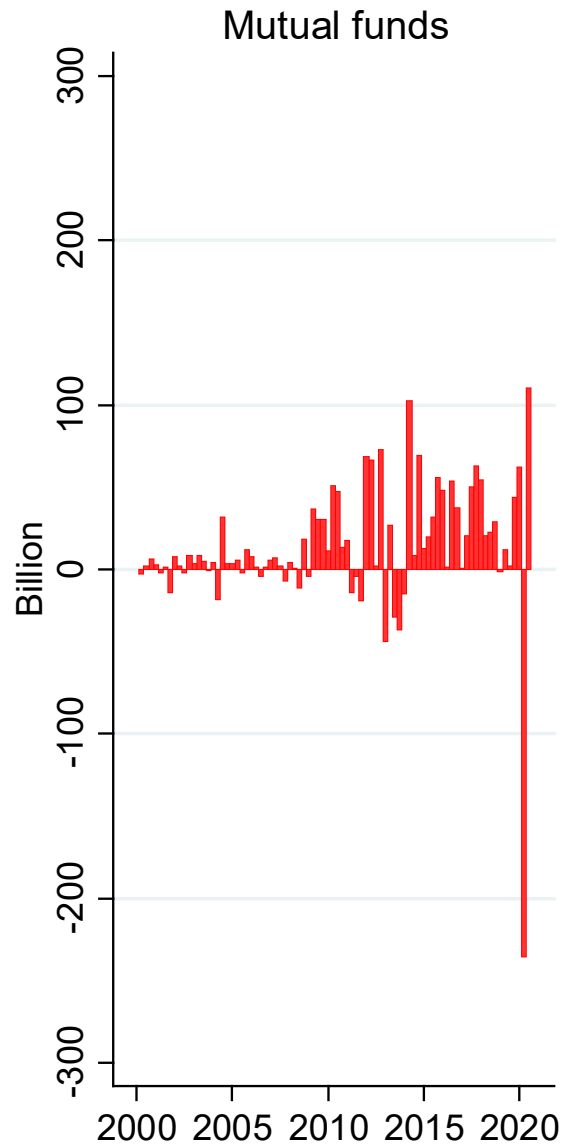
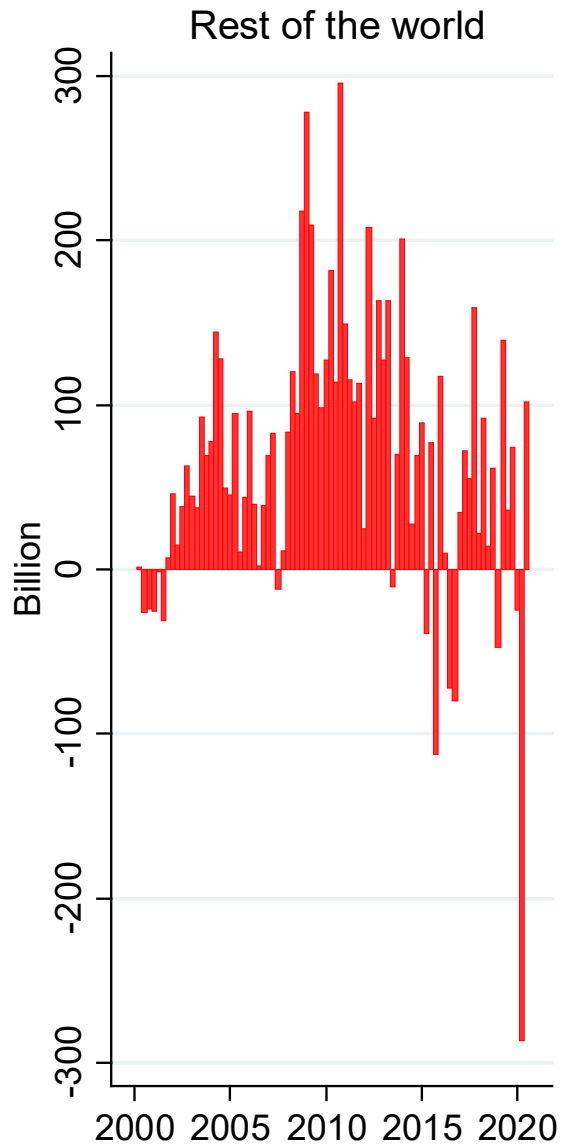
Sellers: Rest of the world, mutual funds, households

\$B	Holdings change			Traded	
	2019Q4	2020Q1	2020Q1-2019Q4	Bought/sold in 2020Q1	
<b>Total liabilities</b>	19,019	19,518	500	500	
<b>Total assets</b>	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	
Of which domestic hedge funds	219	188	-31	?	
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

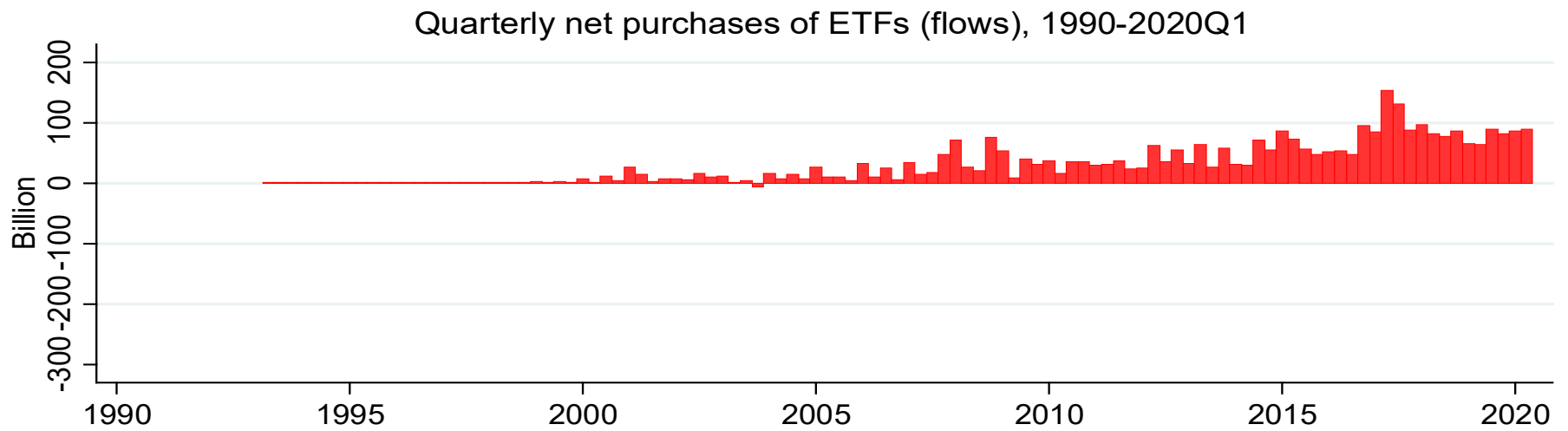
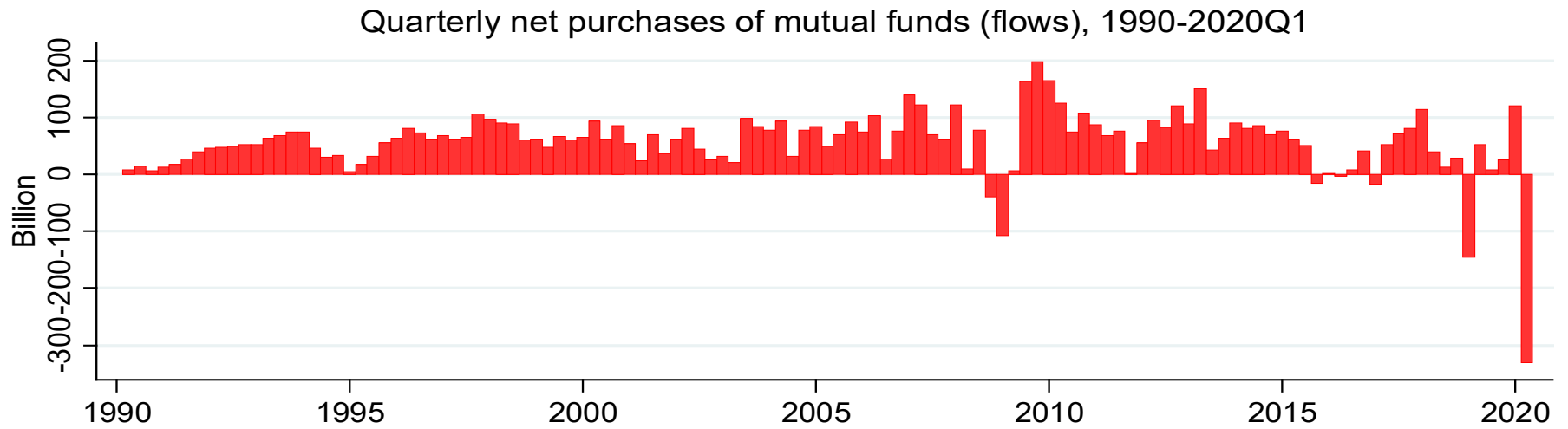
\$B	Holdings change			Traded	
	2019Q4	2020Q1	2020Q1-2019Q4	Bought/sold in 2020Q1	
Monetary authority	2,541	3,757	1217	1019	Notes/Bonds: +863, Bills: +156
Money market funds	1,037	1,268	231	231	Notes/Bonds: +36, Bills: +195
Exchange traded funds	232	263	31	20	
Nonfinancial corporate business	48	69	21	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 despository institutions	704	724	20	3	
Discrepancy	-407	-1181	-773	0	

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

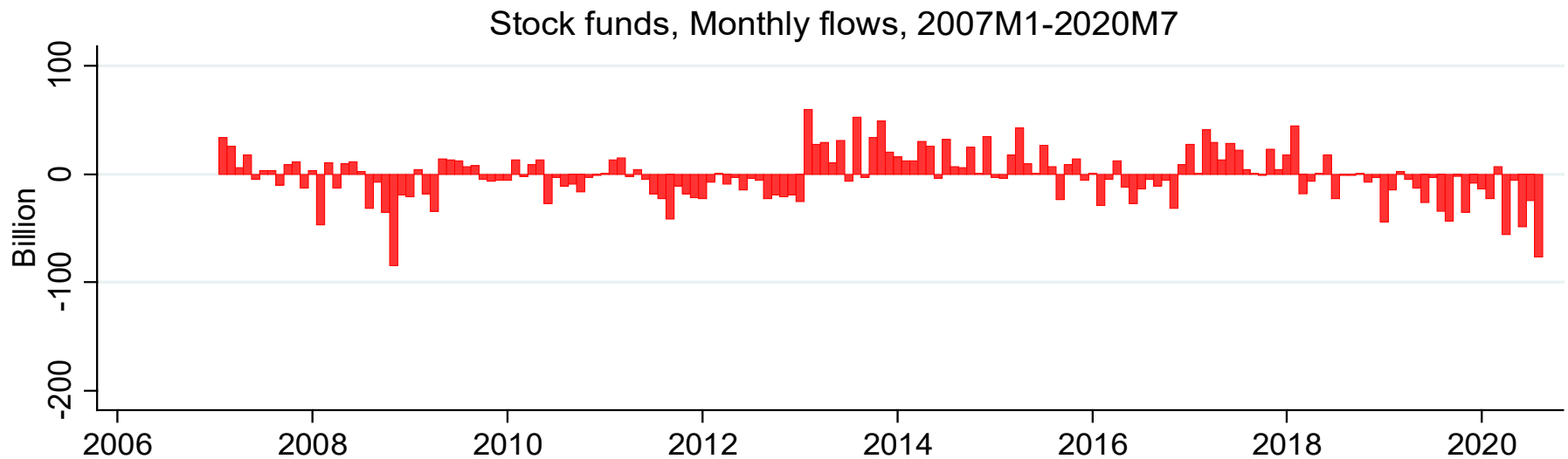
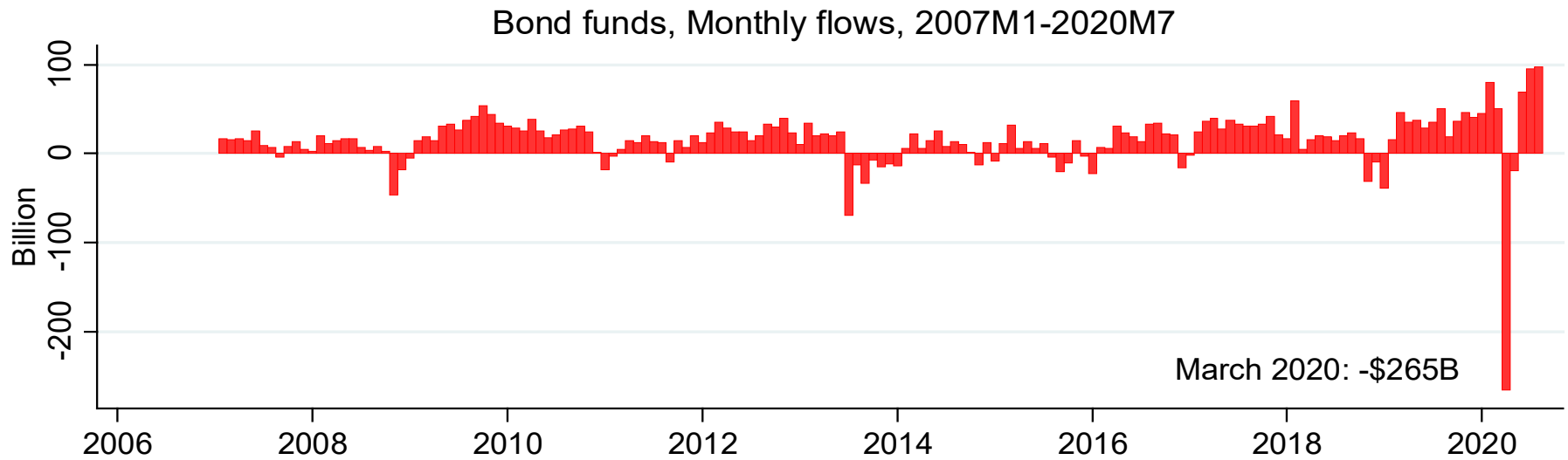


# MUTUAL FUND OUTFLOWS

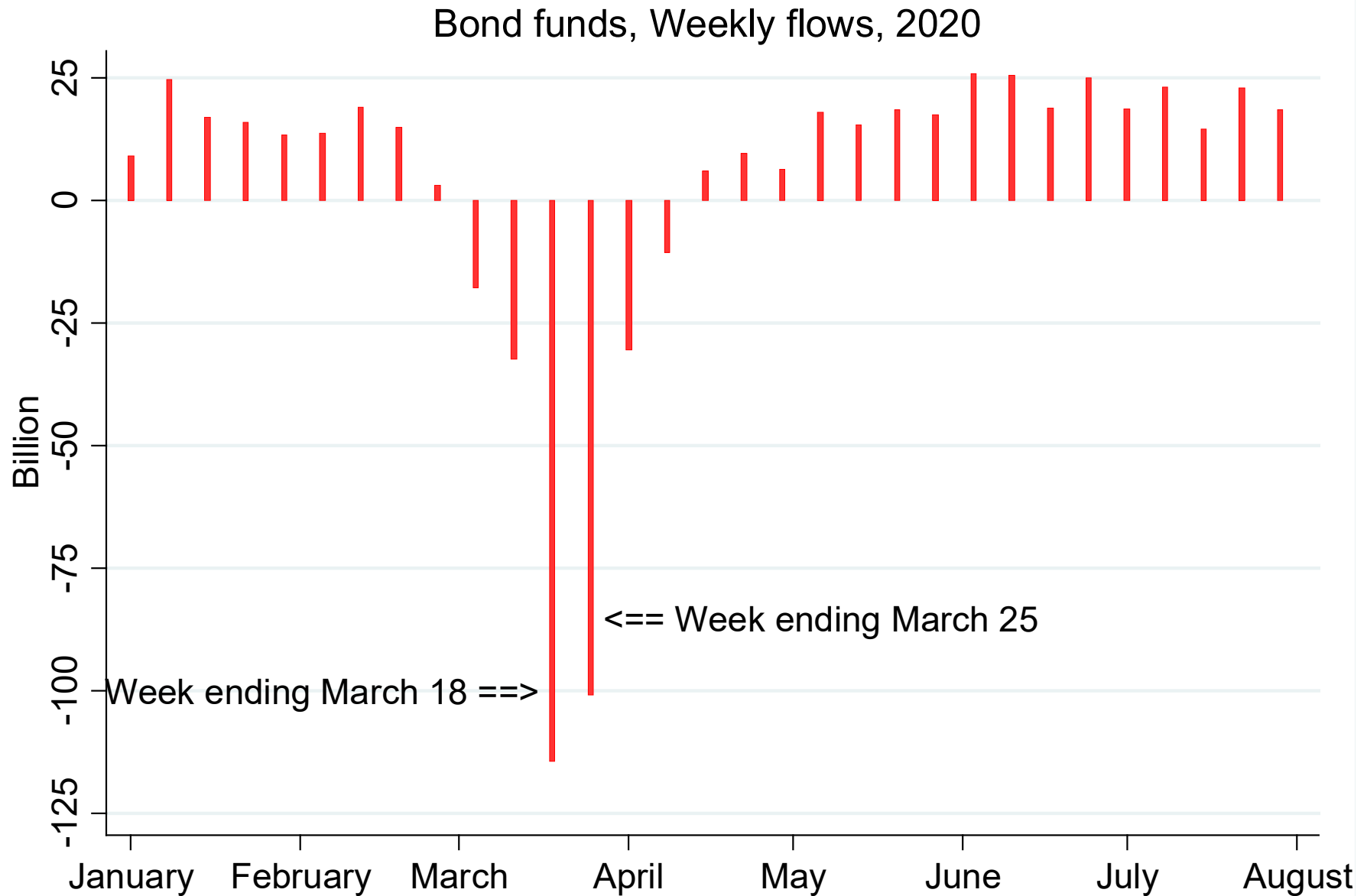
## Massive outflows from mutual funds: US Financial Accounts, F.122, F.124



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

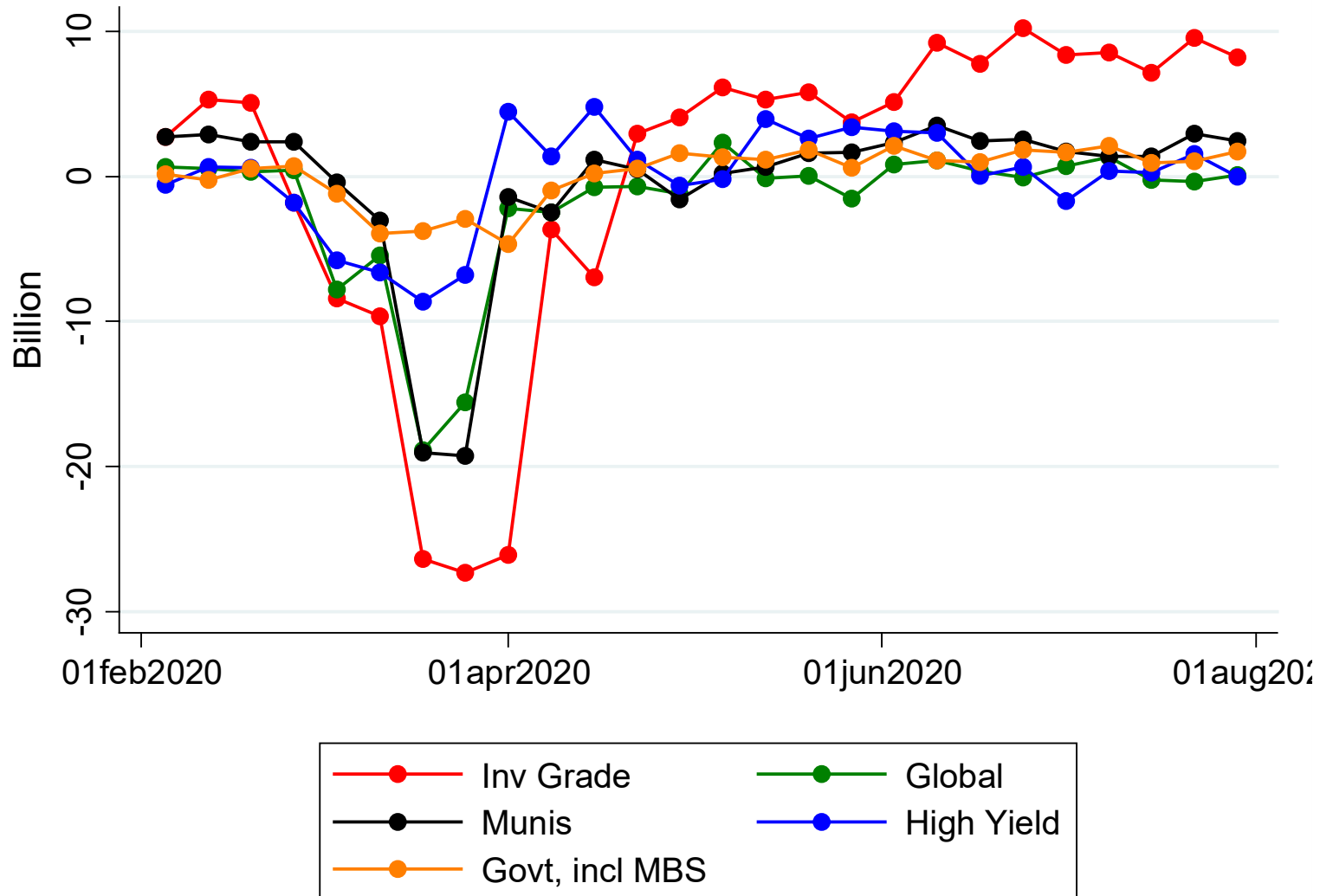


## Bond fund outflows peaked in same week as Treasury yields spiked: ICI data





## Small outflows for government funds, larger for all riskier bond funds, especially investment grade 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):

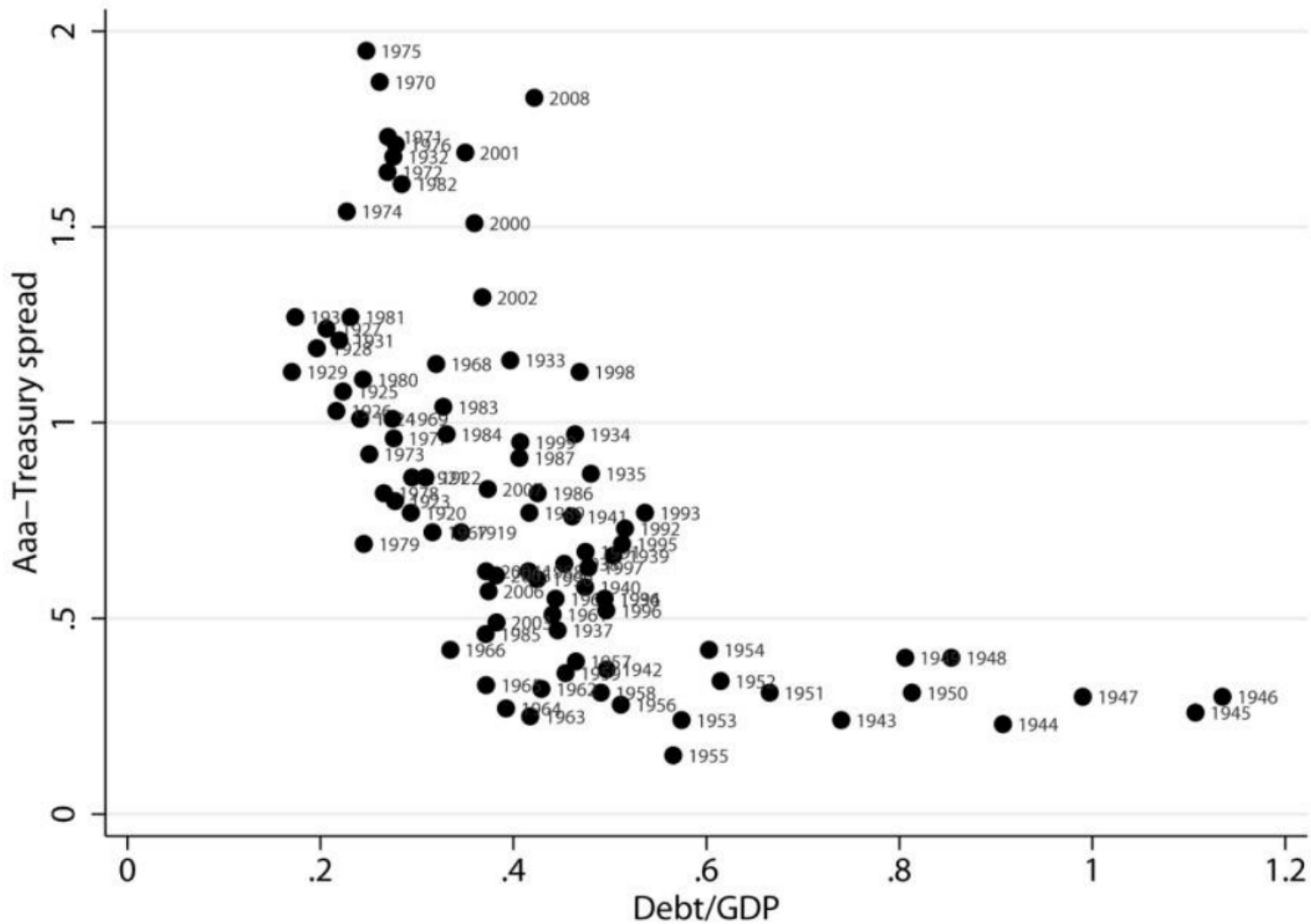
- Corporate bond fund outflows in March 2020: **12%** of AUM
- Corporate bond fund cash holdings pre-covid: **<4%** of AUM for both IG and HY funds
- “when investors redeem their fund shares en masse, funds' **pecking order of liquidation** generates pronounced selling pressure for liquid assets”

## **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

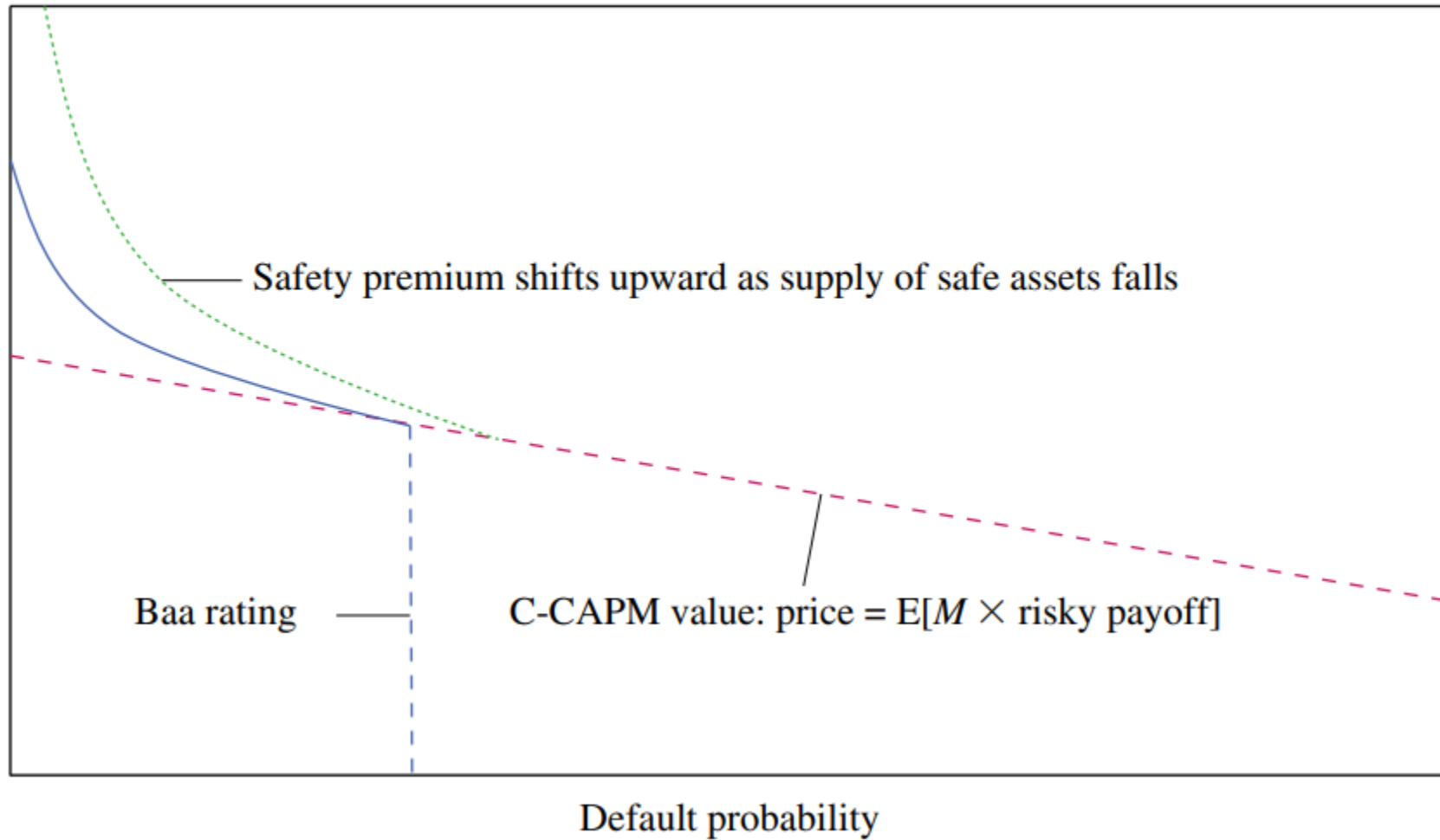
# Why so large distortions for IG compared to HY? Disappearing safety effect

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



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

Price



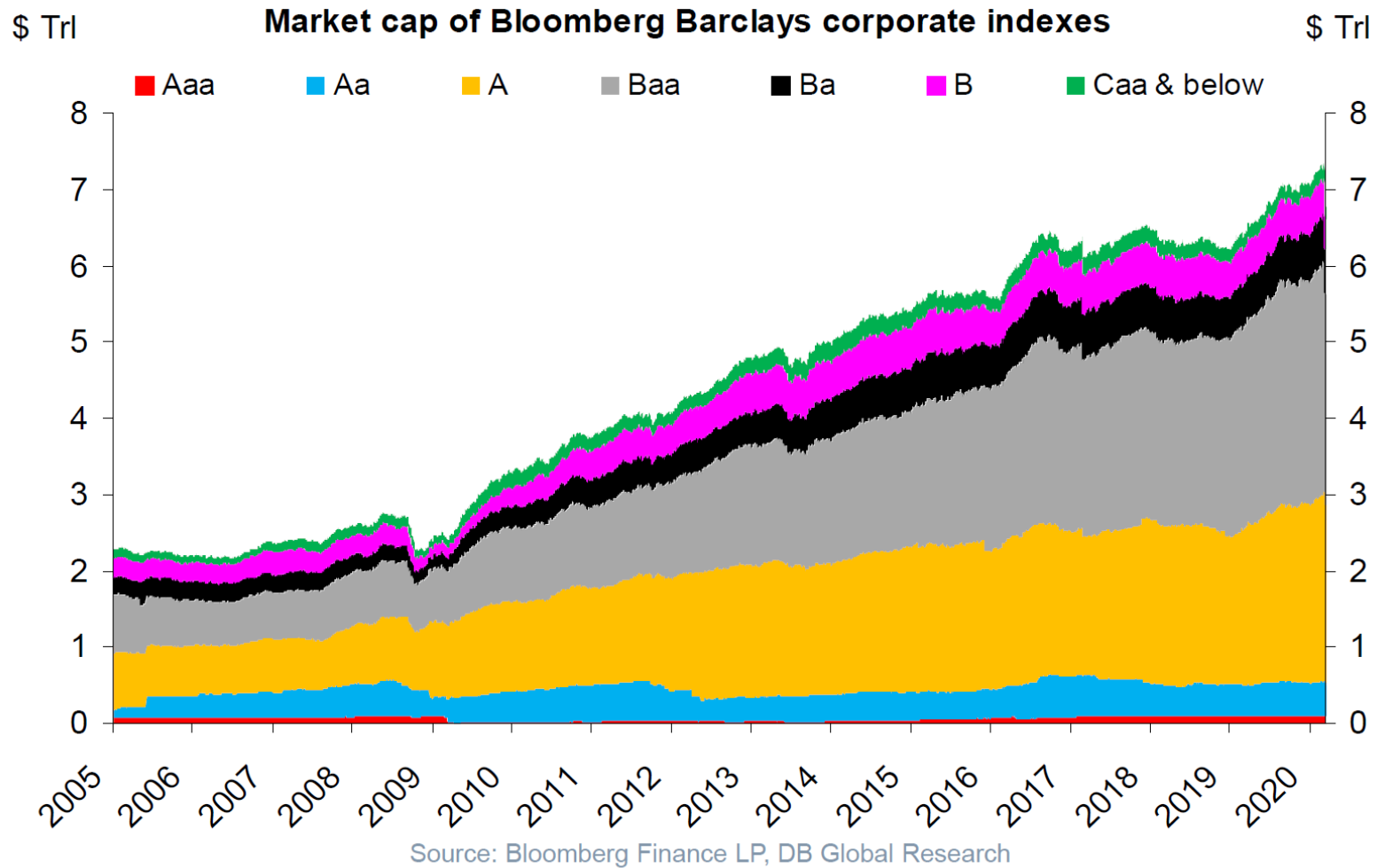
[Vissing-Jorgensen \(March 22, 2020\)](#), “The Case for Federal Reserve Corporate Bond Purchases” laid out **the case for corporate bond purchases** at the time

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

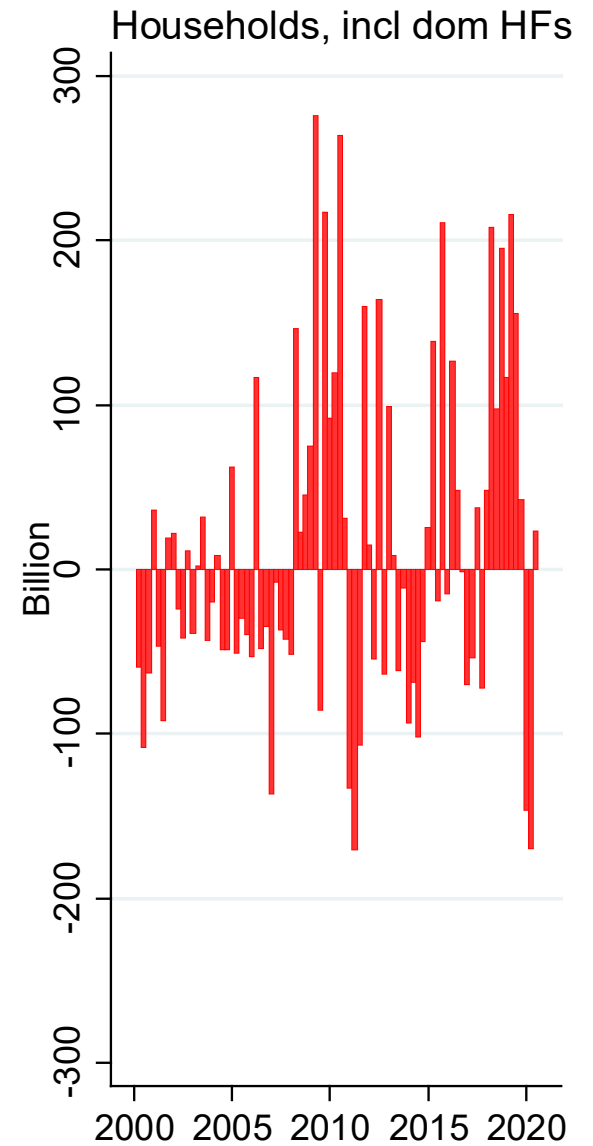
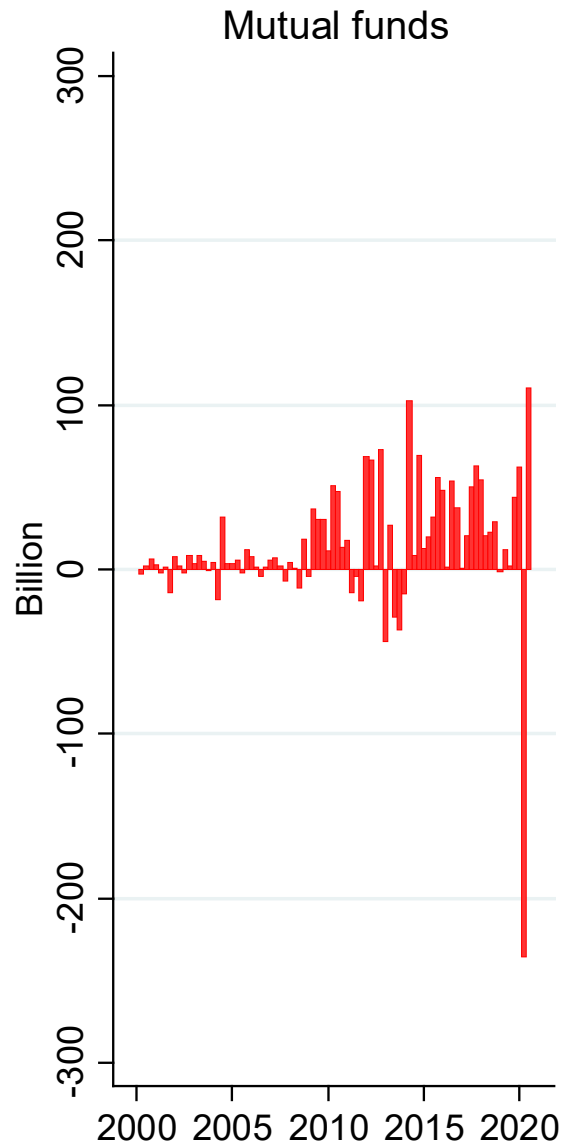
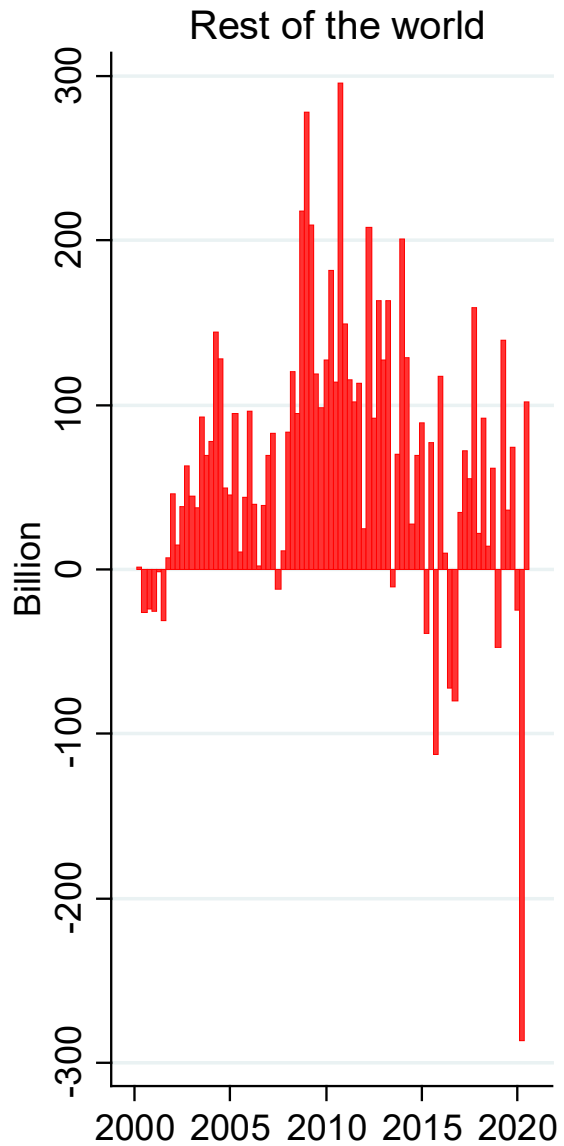
- (a) The current crisis is much **more severe**.
- (b) This is a **corporate crisis**, not a banking crisis.
- (c) The amount of corporate bonds **outstanding is much larger than in 2008**, implying worse real consequences if rollovers are not possible
- (d) **Half** of corporate bonds are **rated just 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



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





**Rest of the world sales** affected by:

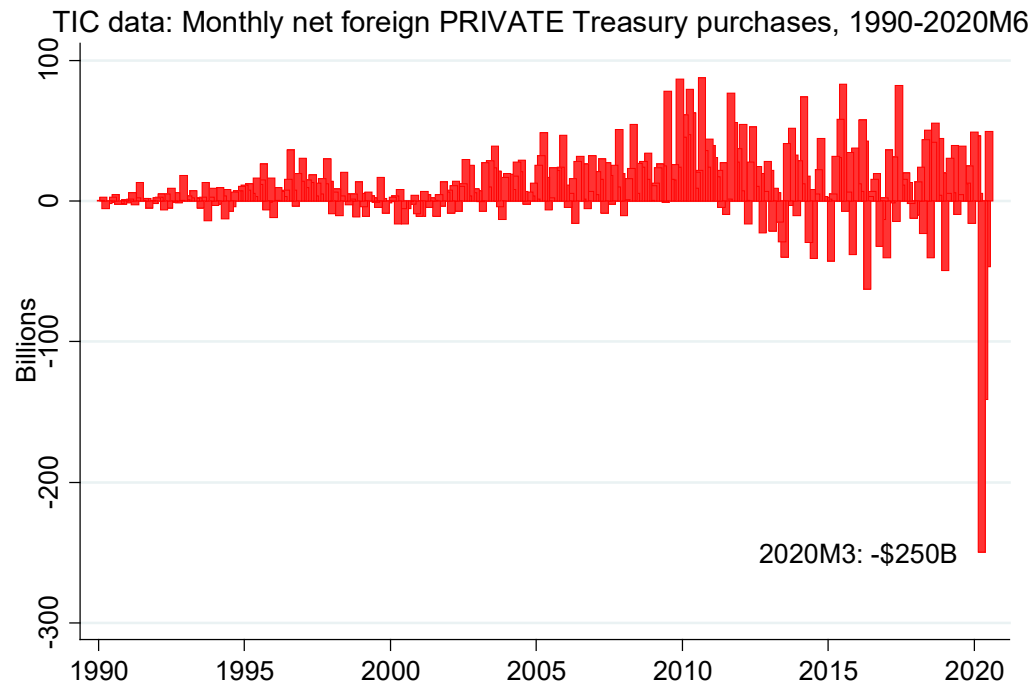
**1. Foreign official (from NY Fed Custody holdings): Sold \$109B in March**



“Countries reliant on oil exports and smaller Asian economies have been selling U.S. debt, according to traders and market makers familiar with the transactions, and central banks have been primarily offloading older, less-liquid Treasuries.” (Bloomberg)

- TIC data has -\$61B, but doesn't count foreign official sales to other foreigners

## 2. Foreign private sector:



## By country (official+private):

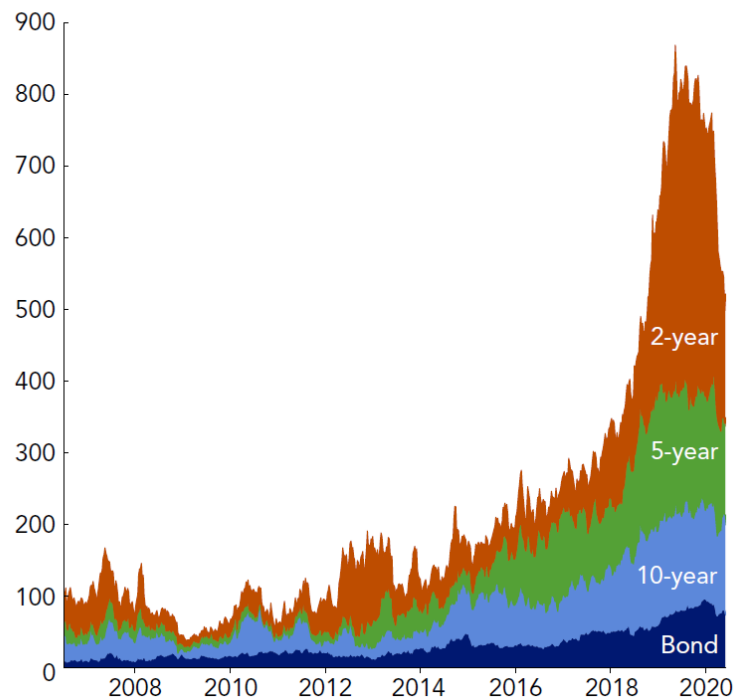
Country	Net Treasury sales, 2020M3 (\$B)
Cayman Islands	-118
United Kingdom	-32
Hong Kong	-23
Ireland	-16
Japan	-11
India	-11
Saudi Arabia	-11
Brazil	-10
France	-8
China	-8
Canada	-8
Mexico	-8
South Korea	-7
Germany	-6

- Large sales from Cayman Islands, a 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

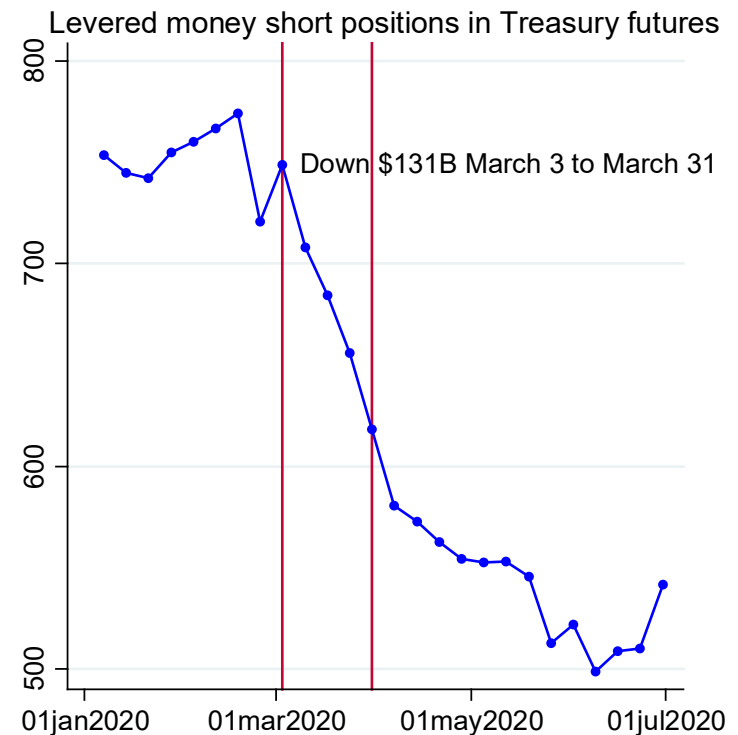
Figure 7. Hedge Fund Treasury Futures Short Positions (\$ billions)



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



## 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**

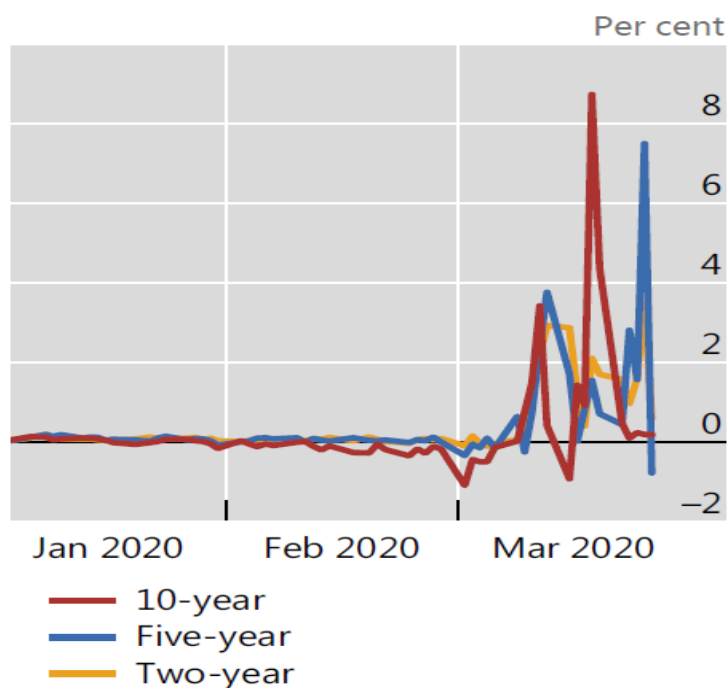
Profitable if at initiation the CTD Treasury is cheap relative to the future and you manage to **roll over the repo financing** at a cheap rate and **meet margin** along the way

- In mid-March, margin increased, leading to trade unwinding

## Schrimpf, Shin and Sushko (2020):

- CTD Treasury was *cheap* relative to futures and repo:  
Graph 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)

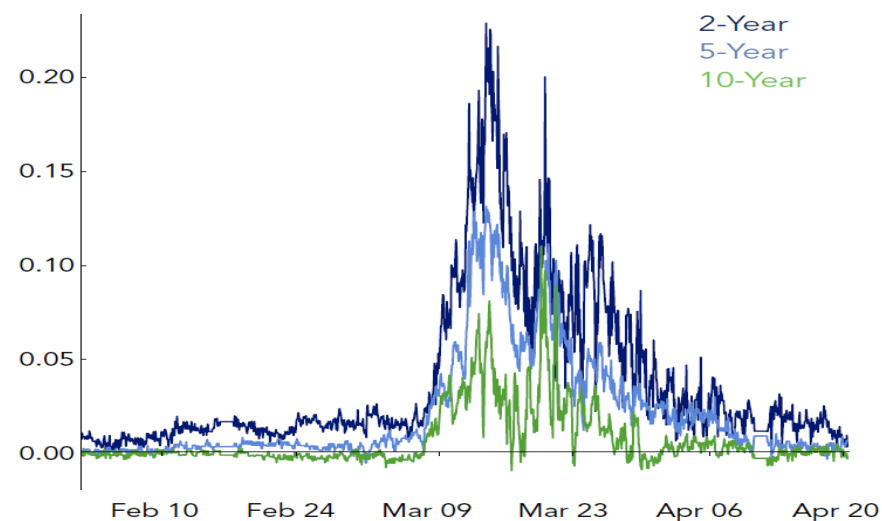
Cash treasury-futures dislocations<sup>1</sup>



## Barth and Kahn (OFR, 2020):

- CTD Treasury was *expensive* relative to similar but non-deliverable Treasuries.

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

## Given Barth and Kahn's finding, perhaps hedge funds were not dumping CTD Treasuries in severe distress but unwinding positions in a fairly orderly fashion?

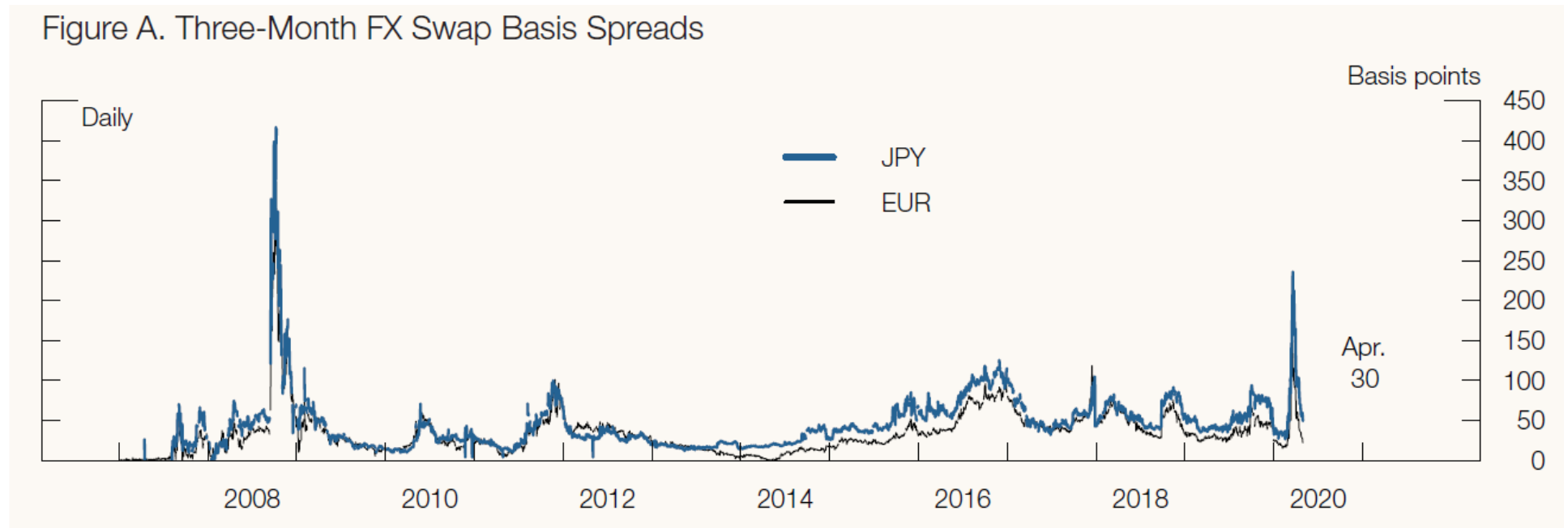
- And basis trade unwinds only account for about half of foreign private net selling

## What else may have led the foreign private sector to sell Treasuries? Dollar shortage?

**Example:** (Riksbank Financial Stability Report 2020:1, or BIS Bulletin No 1 2020)

- A Swedish pension fund wants US investments but no currency risk
- A Swedish bank borrows \$ in short-term dollar market (e.g., via commercial paper bought by a prime fund in the US)
- Fund and bank enter into FX swap: Fund gets \$ (pay Kr) upfront, pays \$ (get Kr) later.
- Normally: Bank funding and FX swap rolled over
- But if bank funding is not rolled over, neither is the FX swap → Fund will need to
  - Sell \$ assets to close out the FX swap
  - Or buy \$ for Kronor in the spot FX market (which may lead to FX intervention with the central bank selling \$ assets)

## FX swap pricing suggests clear dollar shortages



Source: Federal Reserve Financial Stability Report, May 2020

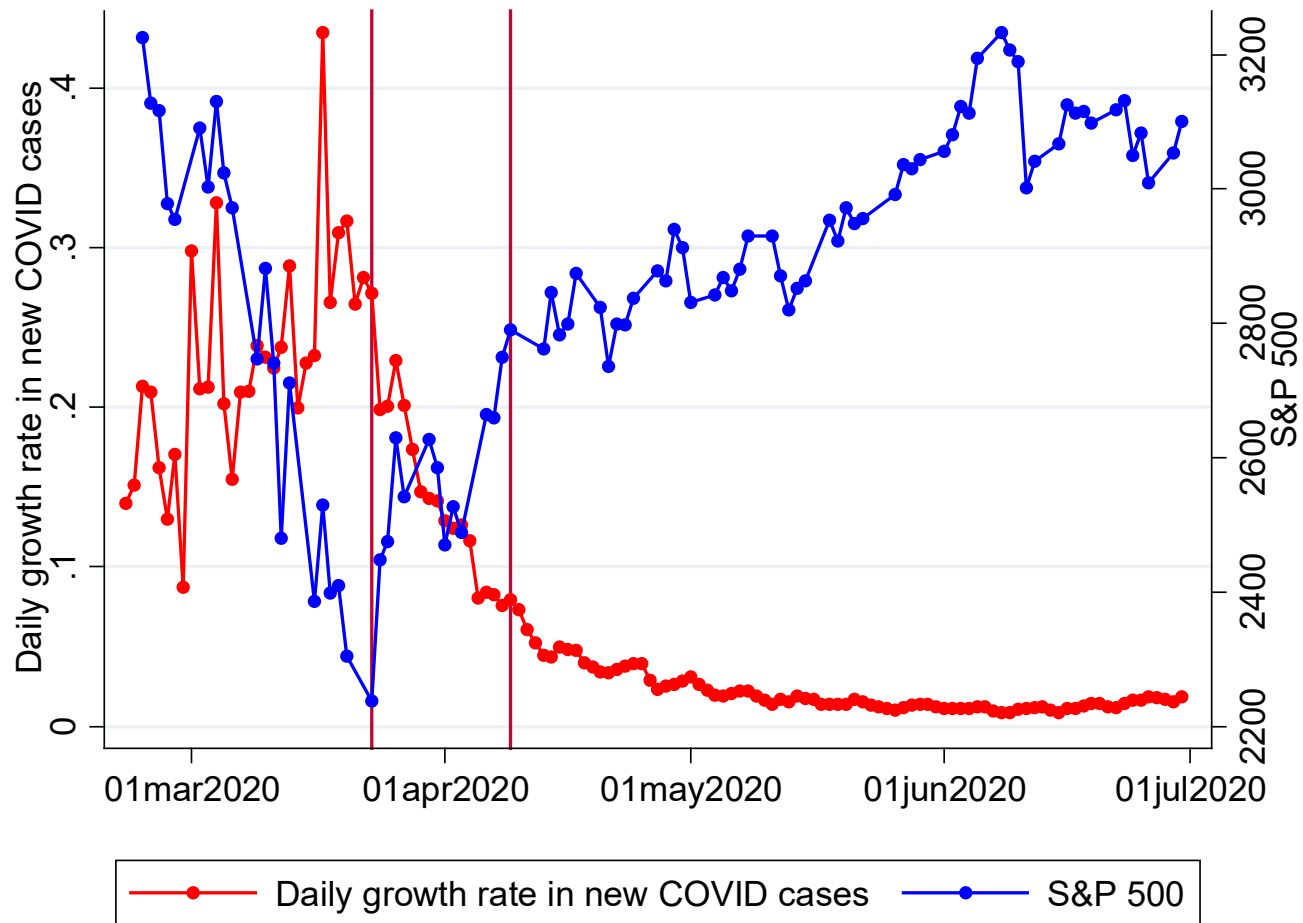
**But: There was a dollar shortage in 2008 too and foreigners didn't sell Treasuries back then**

- Below we'll see suggestive evidence that Fed's USD swap lines did help lower Treasury yields, implying a role for the dollar shortage for Treasury selling during COVID

## 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. US 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, corporate, munis, ABS)

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

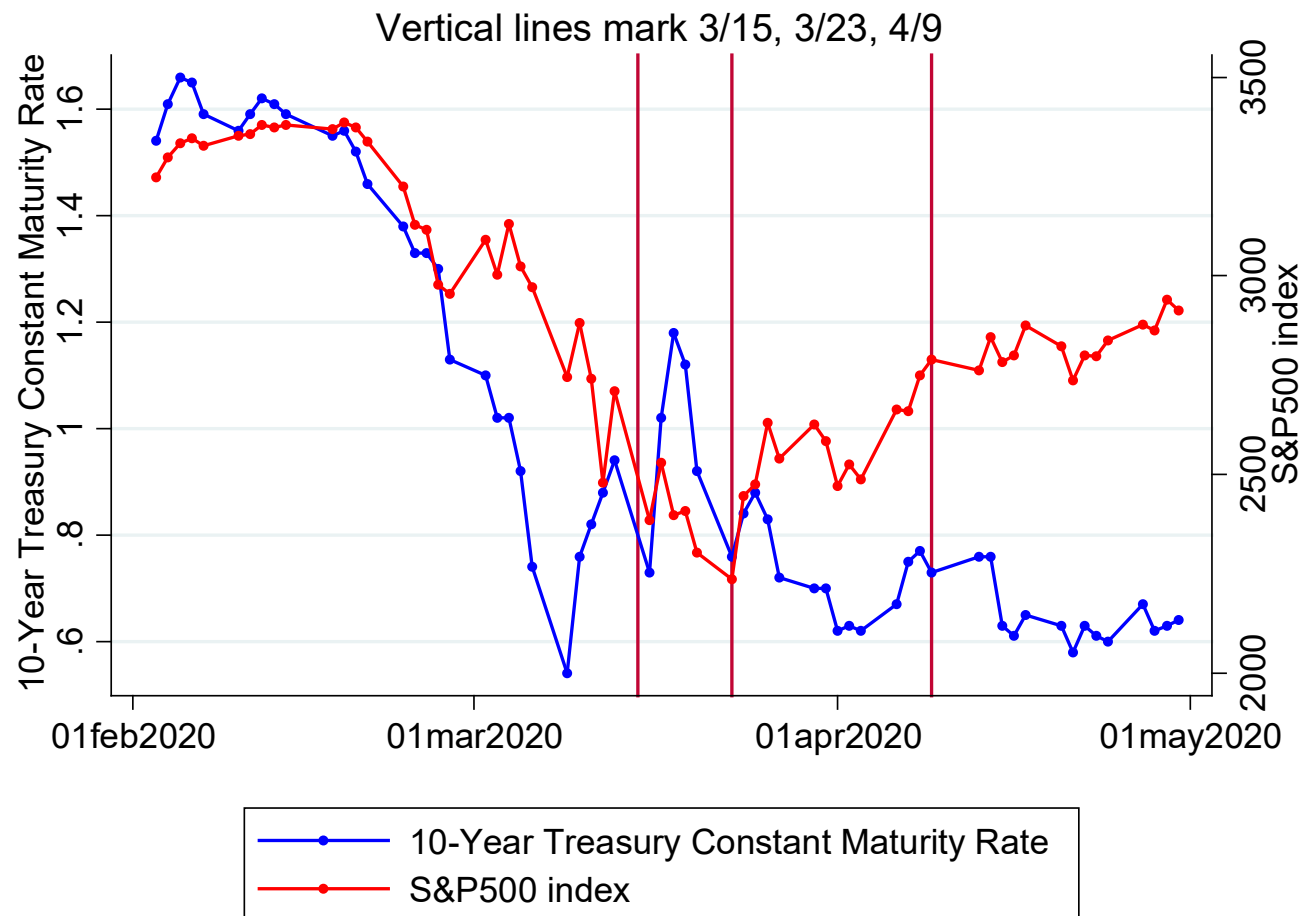
April 27-July 23: Term sheets updated for MLF, MSLP, PPPLF, TALF, SMCCF, PMCCF

## Identification:

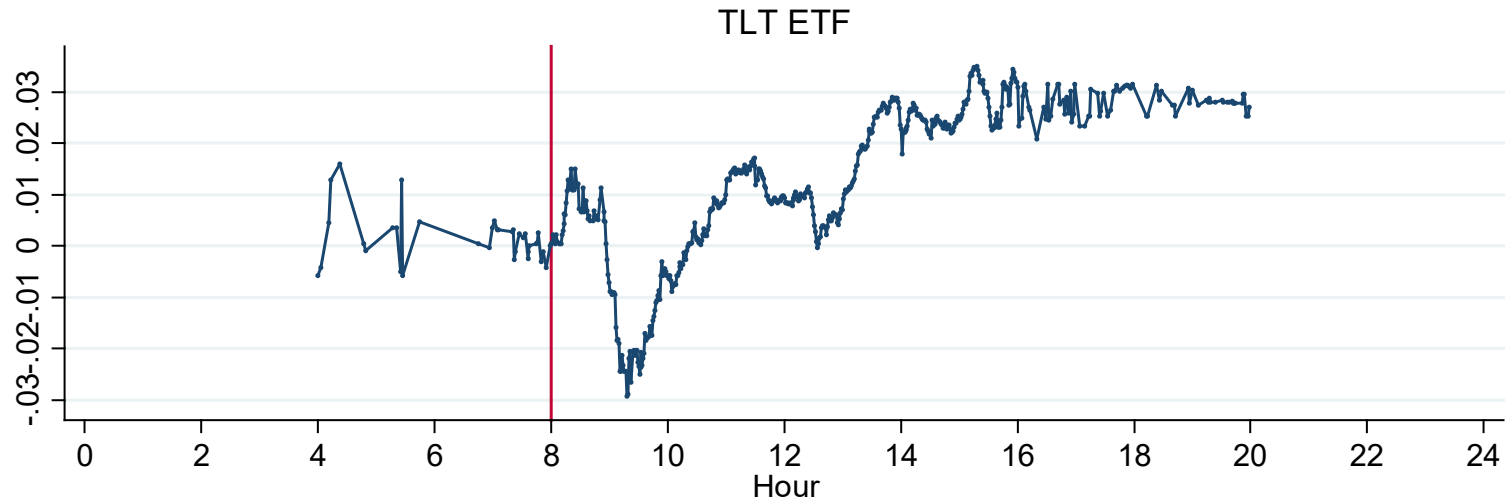
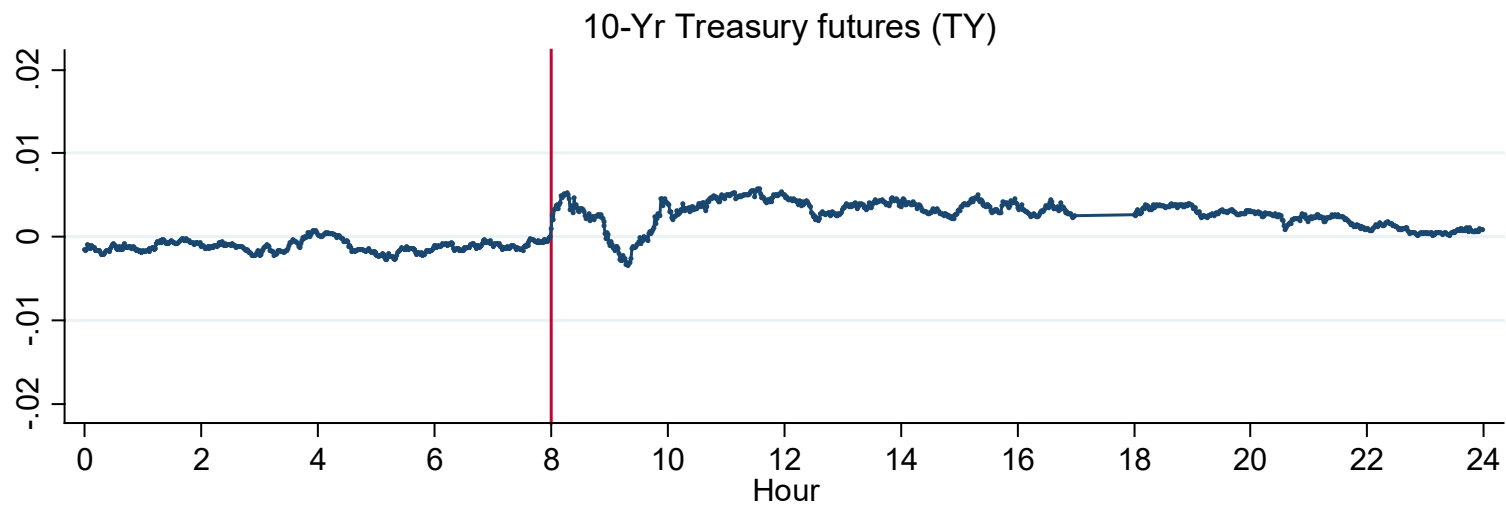
- Timing of Fed **announcements** and **purchases** + cross-section of securities
- Focus on 3/15, 3/23, 4/9 (no large effects of the others on bond markets)

## FED IMPACT ON TREASURY MARKETS

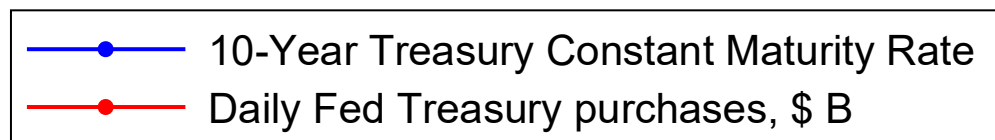
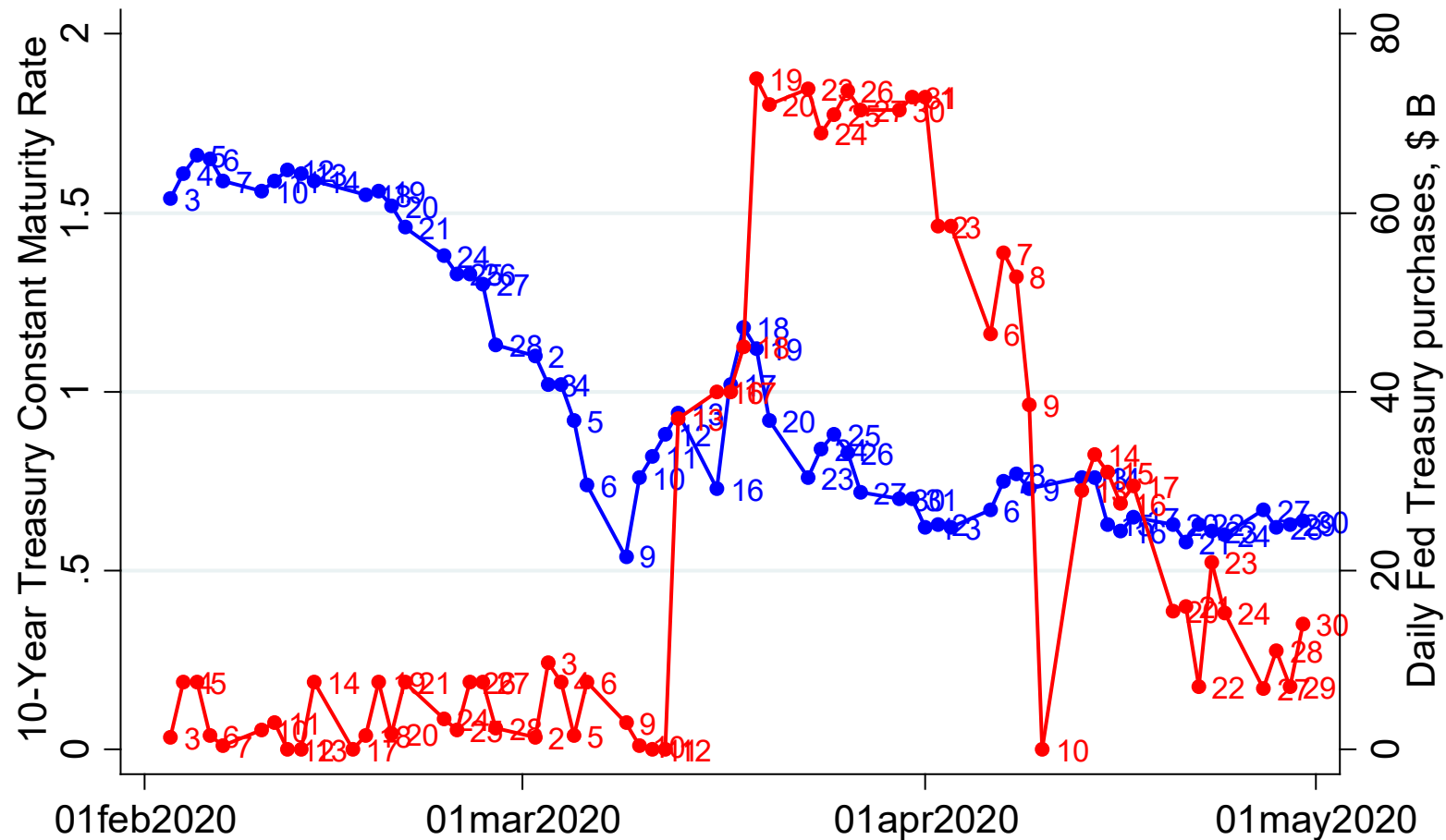
- 3/15: Announcement fails to stop yields from increasing on 3/17, 3/18
- 3/23: Yield falls, some of this drop is causal based on intra-day data  
But larger drop on 3/20. Why? Was policy not crucial for stabilizing markets? Yes!



## Intra-day Treasury returns, March 23, 2020



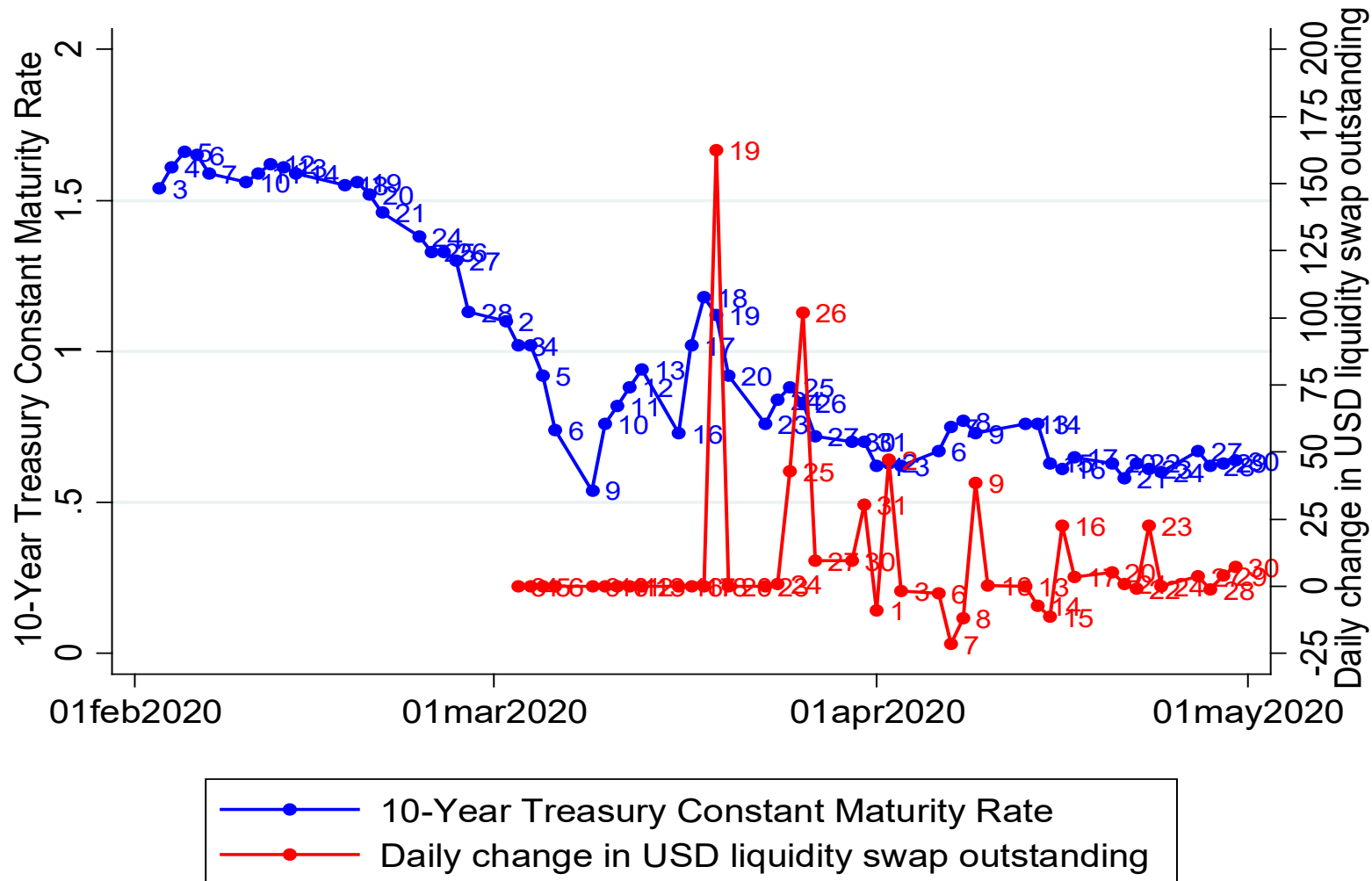
## Massive daily Fed purchases from March 19 helped bring Treasury yields down



Confounding factors? Corporate yields went *up* on March 20 and the stock market fell  
 → Unlikely that Treasury yield decrease on March 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 \$ availability to Treasury sales
- March 19 settlement amount about the same as Fed purchases on March 19+20

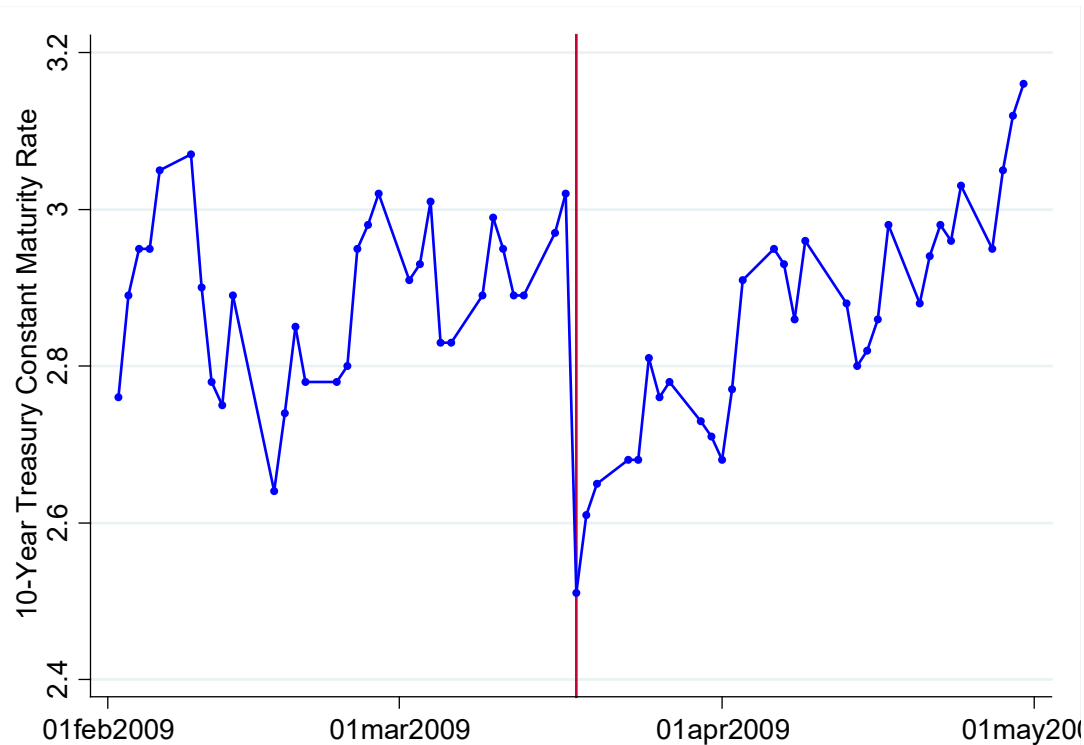




## Lessons about how Treasury QE worked during COVID crisis

- Treasury selling driven by liquidity needs, not loss of confidence in Treasuries
  - Corporate funds and other funds seeing outflows
  - Foreigners: Official, private hedge funds, other private (perhaps due to dollar shortages)
- 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

- 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



- 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)

## FED IMPACT ON CORPORATE MARKETS

3/23, 4/9 policy announcements involved corporate purchases and had large immediate effects on both IG and HY markets

- Causal effect based on intra-day data
- 3/23: Larger effects on IG than HY. Announcement said IG purchases only



- 4/9: HY yields fall more on 4/9 than 3/23. 4/9 announcement added HY (and more IG)

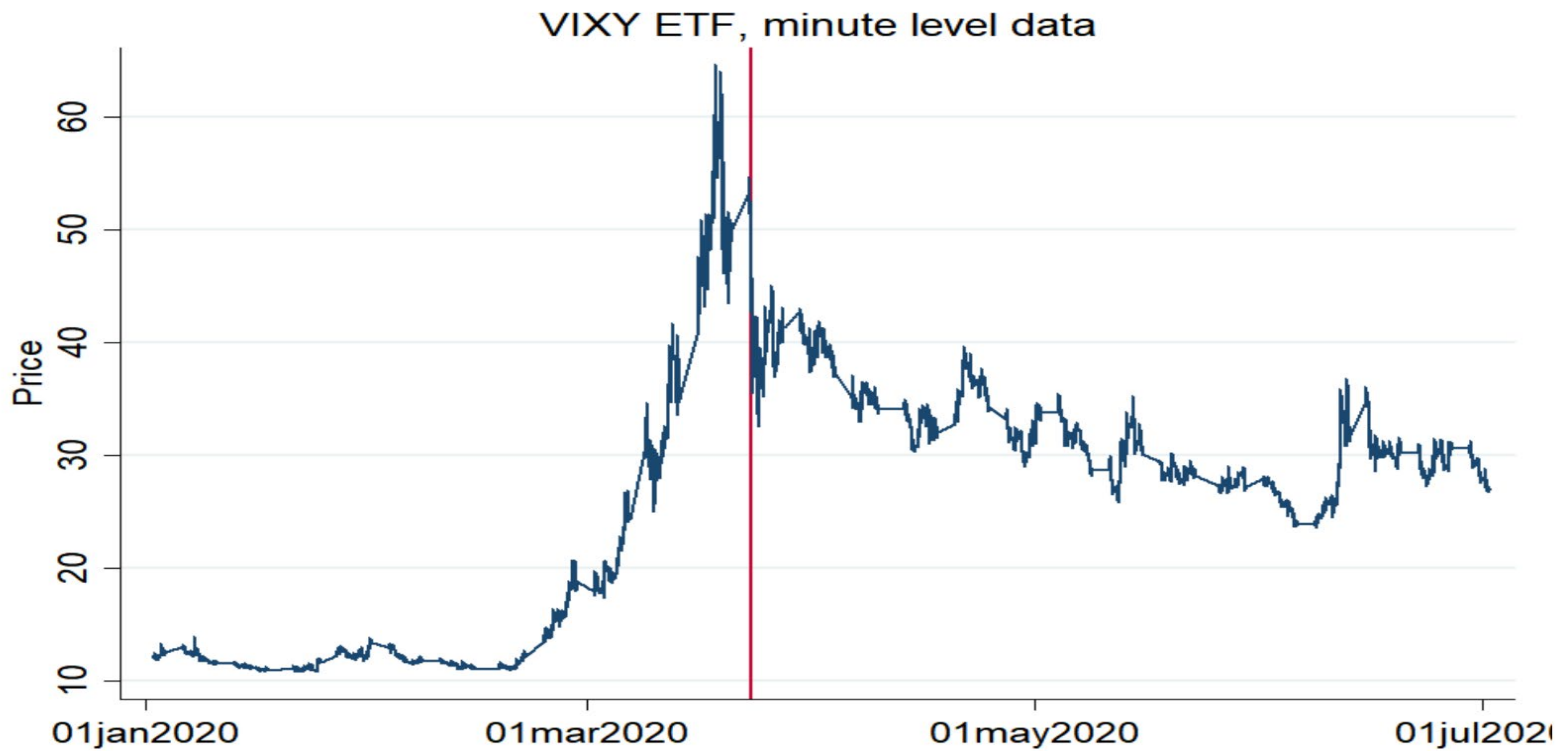


- Further evidence of causal effects of corporate bond purchases:  
[Gilchrist, Wei, Yue and Zakrajsek \(2020\)](#)
  - Exploit bond eligibility rules in SMCCP:  
Regression discontinuity around max 5 year remaining maturity
  - 70 bps lower yields for eligible IG bonds within 14 days.
  - For the same company: 20 bps lower yields for eligible IG bonds

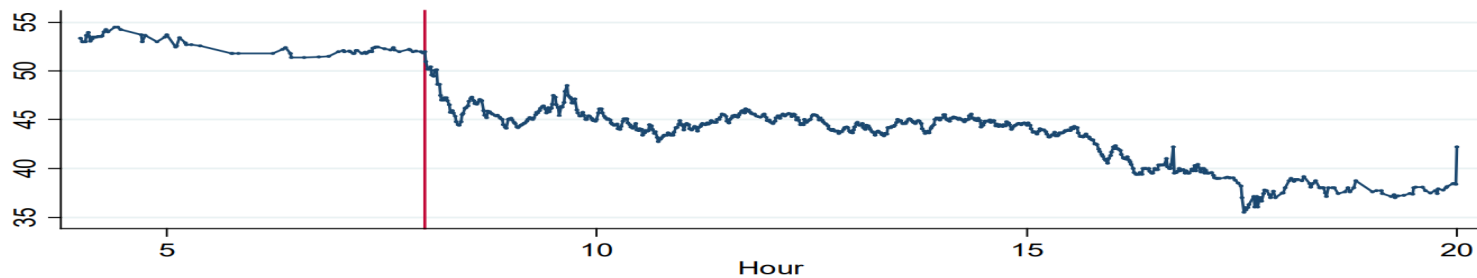
Does that imply effects of announced corporate purchases were all specific to eligible bonds?

- Hard to assess: There is a very large general reduction in risk premia on 3/23 but that could be due to other programs announced (unlimited Treasury & MBS purchases etc.)

## VIX plummets after the March 23, 8 am announcement:



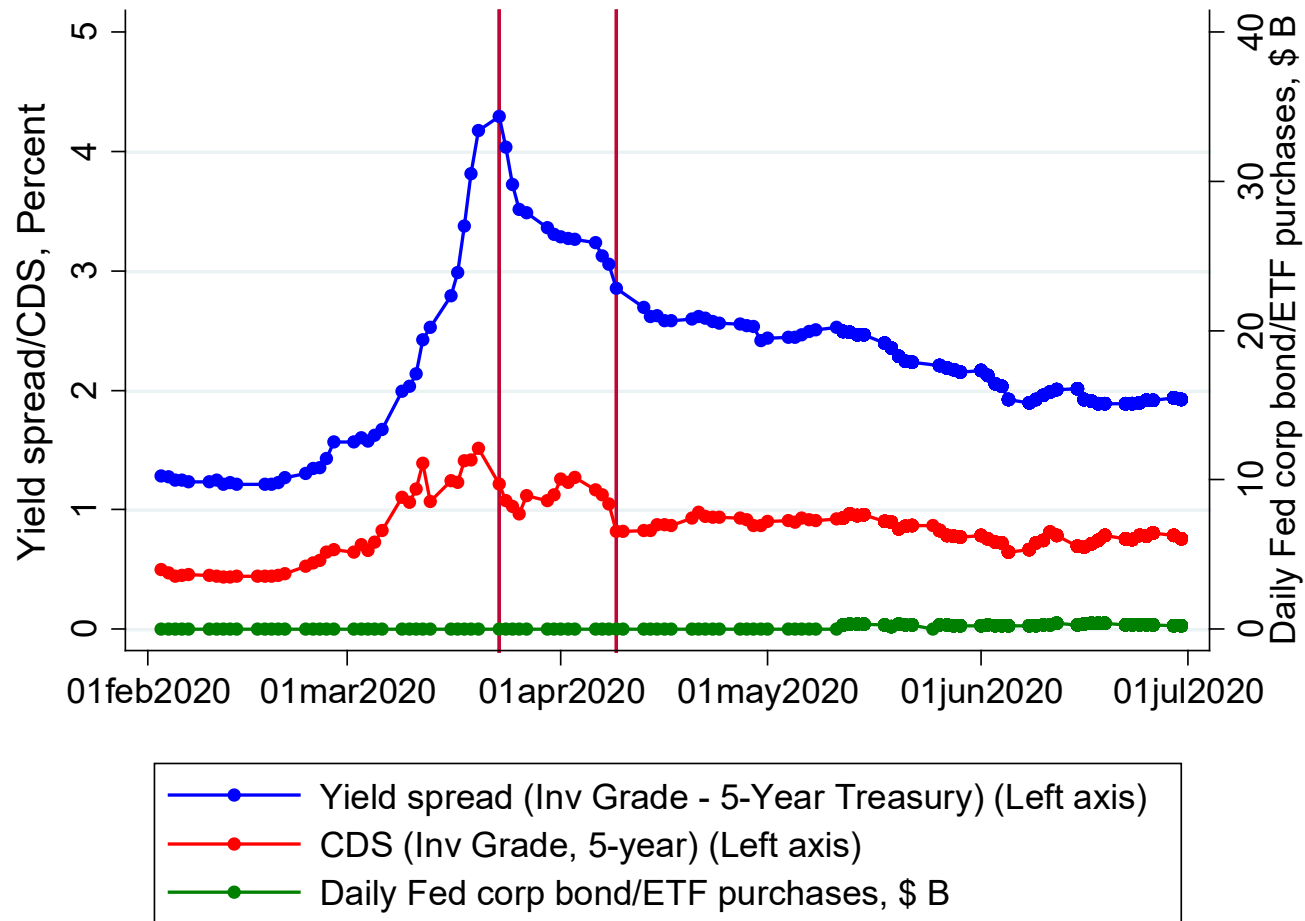
## Intra-day, March 23, 2020



- Knox and Vissing-Jorgensen (2020) maps this to a **2 pct point reduction in the 1-year equity premium on 3/23** (updating Ian Martin's EP data and linking EP & VIXY)

## What about announcement versus purchase effects for the corporate QE?

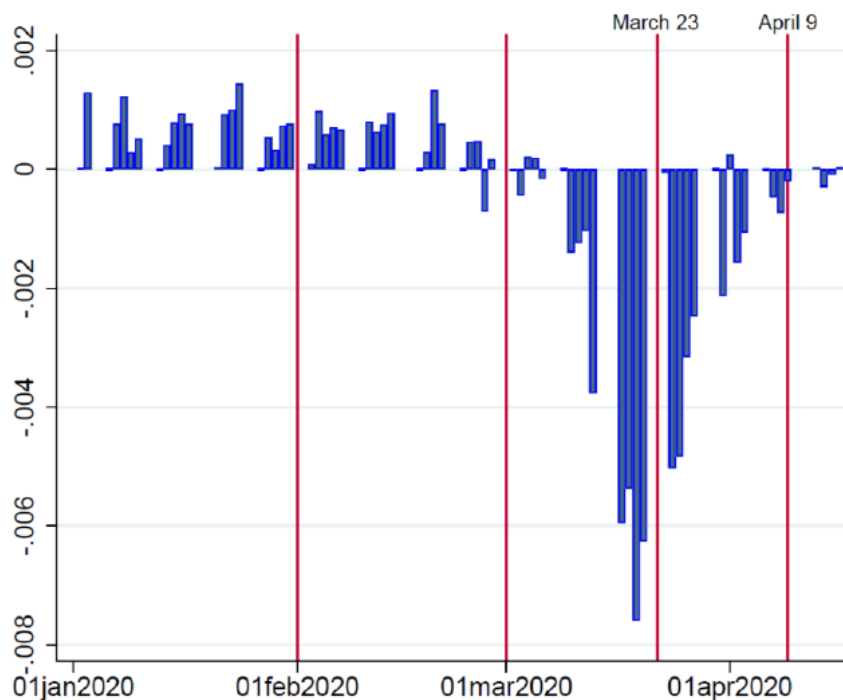
- Purchases started only on May 12 and have been small (total of \$13B by end of Sept, all under the SMCCF)
- Very different picture than for Treasuries!



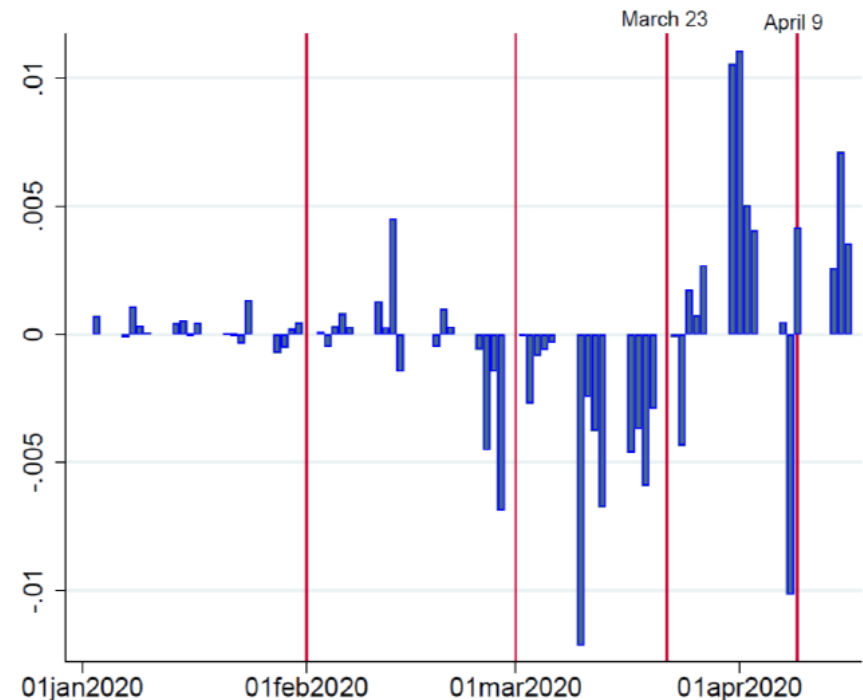
## Lessons about how corporate bond QE worked during COVID crisis

- 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

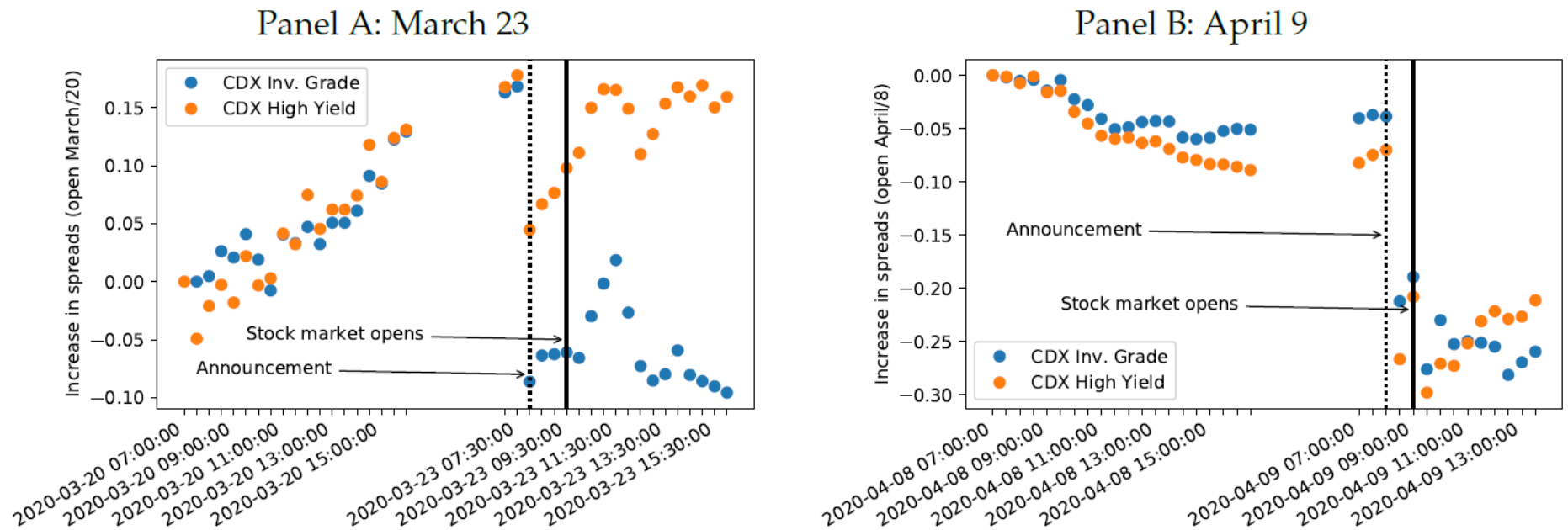




## What about real effects of Fed COVID facilities?

- Corporate CDS rates fell
  - Indicates real effects if default has deadweight costs

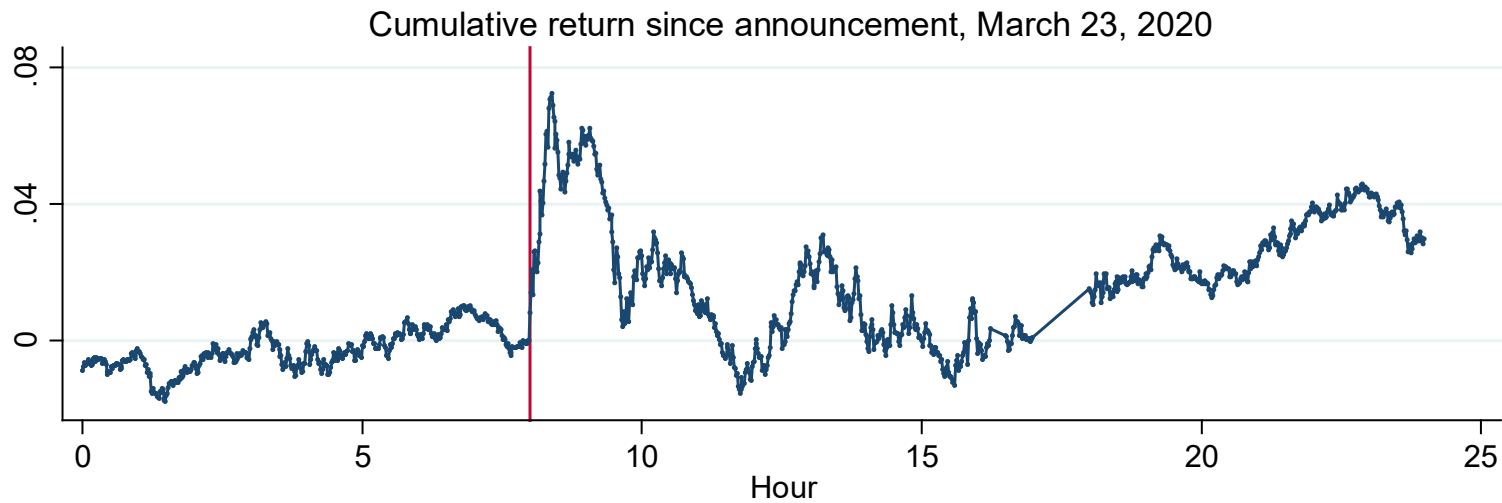
### Intra-day CDS data from Haddad, Moreira and Muir (2020):



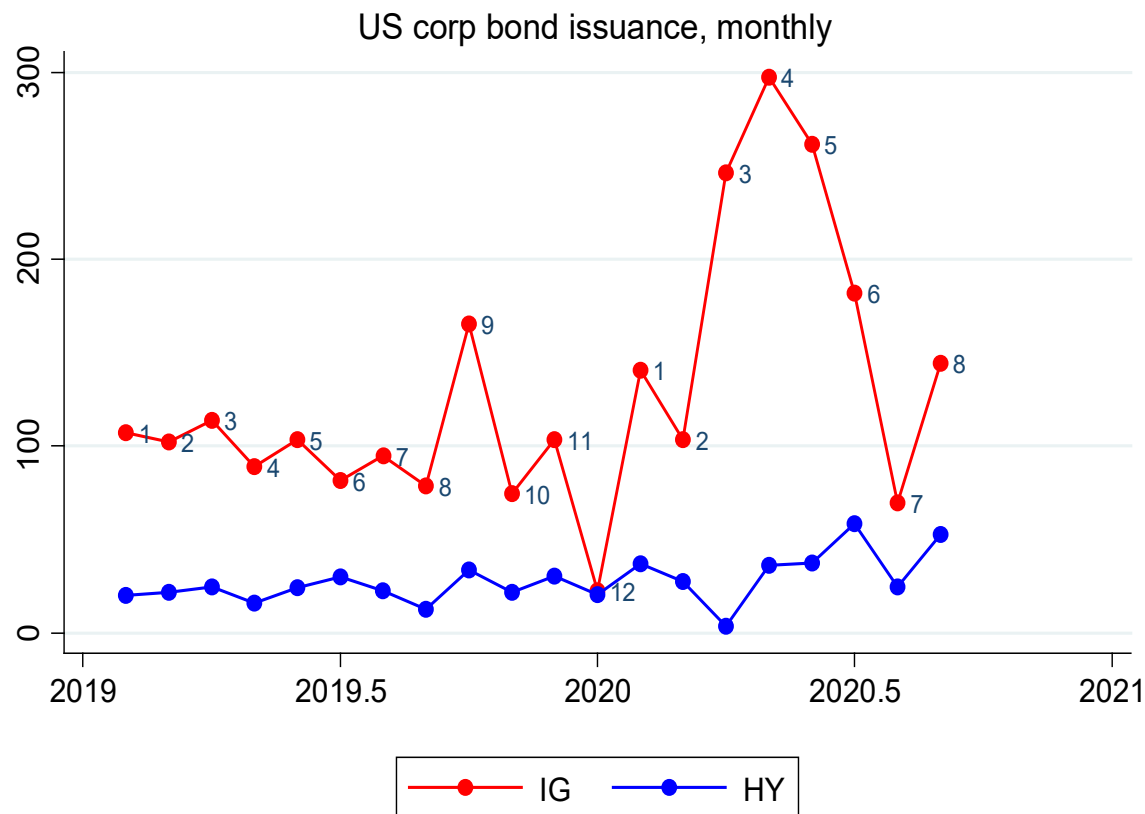
**Figure 14: Event study around Fed announcements of bond purchases: CDS spreads.** The figure reports the value the spread of the CDX IG and CDX HY every 30 minutes using transaction data. We report the implied increases in CDS spreads from the market opening one day before the announcement.

- Large wealth-effects of Fed policy (incl stock market) → Consumption

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



- Large **corporate issuance boom** after corporate program announced, >\$1T from March to June



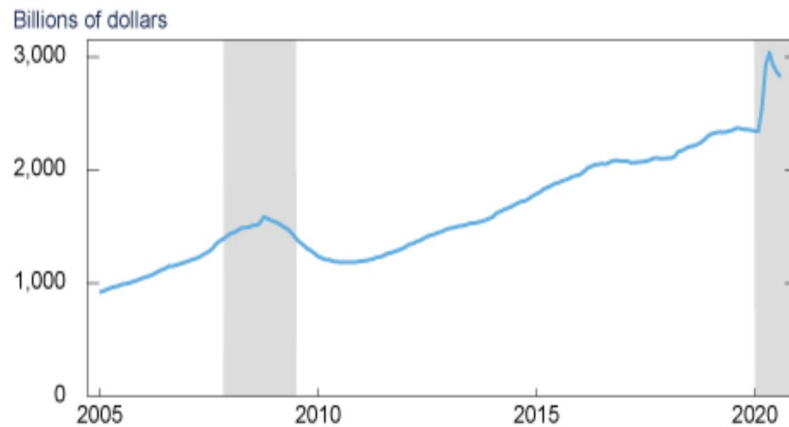
Does this mean there will be large **real effects**? From the ECBs Corporate Sector Purchase Program we learned that real effects may be indirect

- Issuers may just pay higher dividends (Todorov (2020))
- But **SMEs may benefit**: Large firms use up less of bank lending capacity (Grosse-Rueschkamp, Steffen and Streit (2019), Ertan, Kleymenova and Tuijn (2018))

# Bank lending during COVID: Increases for very large firms, not for SMEs

- Chodorow-Reich et al (2020):

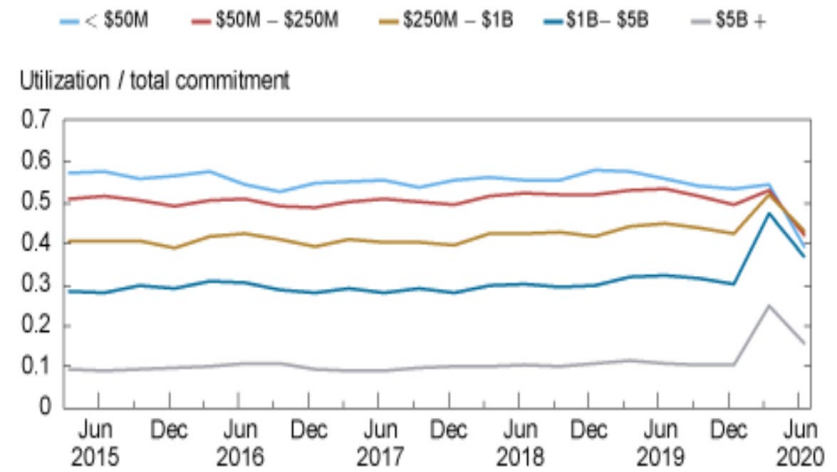
## U.S. Commercial & Industrial Lending



Source: Data from FRED series BUSLOANS and USRECM.

Note: The shaded areas indicate periods designated recessions by the National Bureau of Economic Research.

## Credit Utilization by Borrower Size



Source: Authors' calculations based on data from FR Y-14Q, Schedule H1B.

## Would SMEs have done even worse without Fed programs?

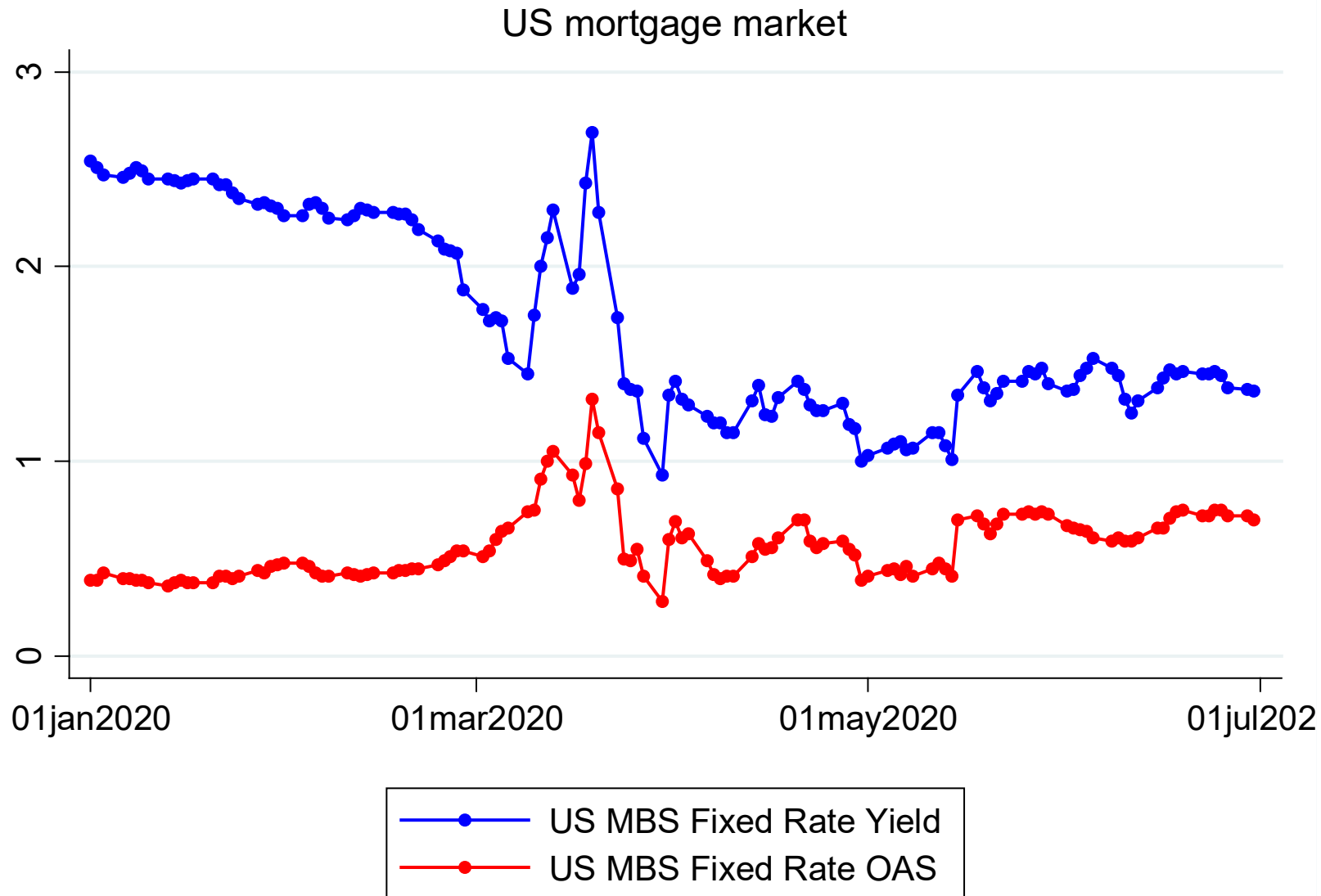
Large firms would likely have used credit lines even more.

- Test: Did SMEs that were customers of banks with higher (ex-ante) large firm credit line exposure borrow less during COVID than other SMEs?
- Test: Did counties whose banks (on avg.) had higher (ex-ante) large firm credit line exposure see more layoffs/slower recovery during COVID?

Not obvious what this will show: Perhaps loan SME demand is modest

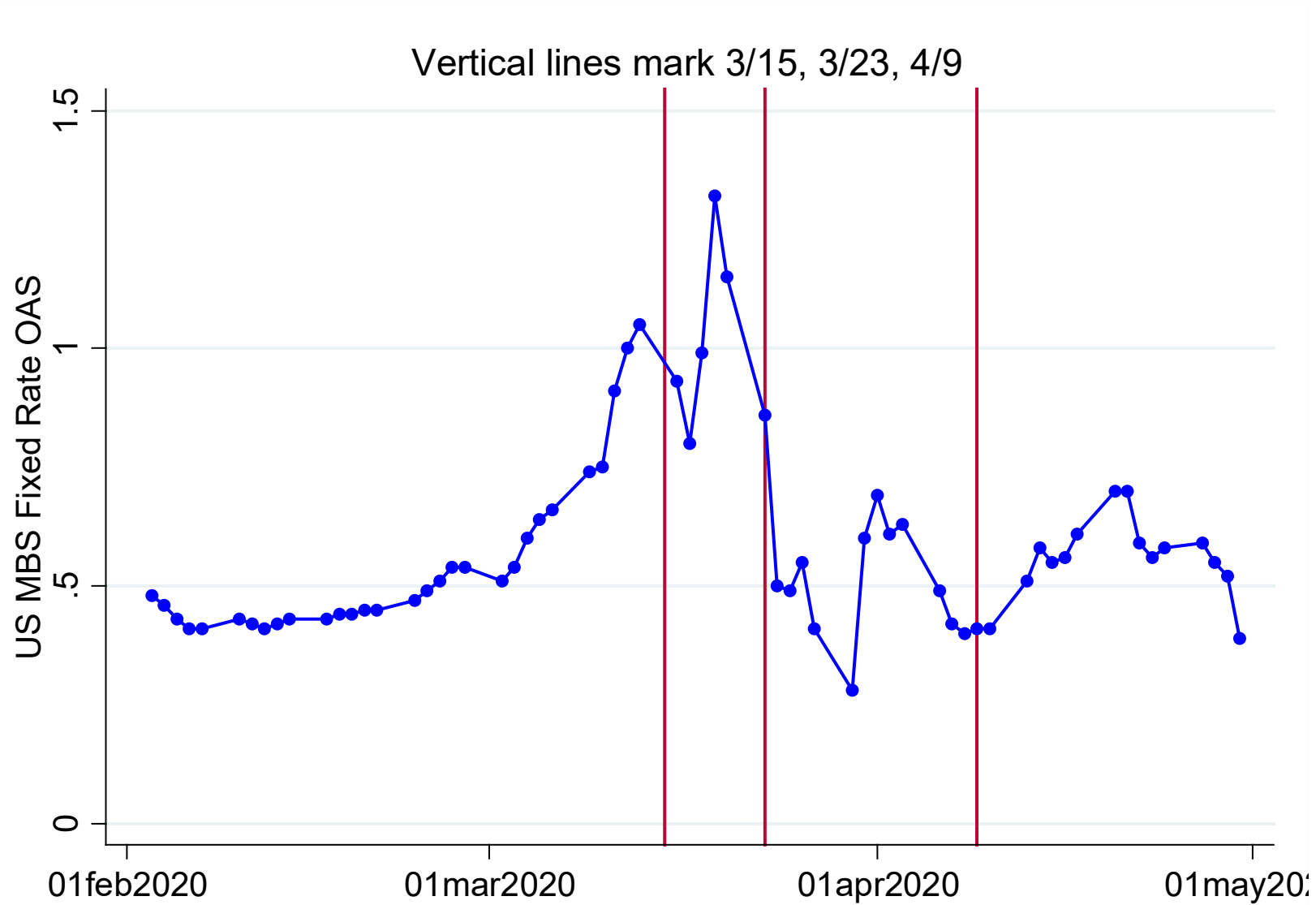
- Large amounts of Payroll Protection Program grants (loans that are forgiven)
- And you cannot borrow your way through insolvency (more relevant for smaller firms who even pre-crisis tended to have lower profits)

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

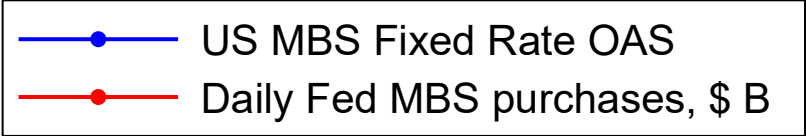
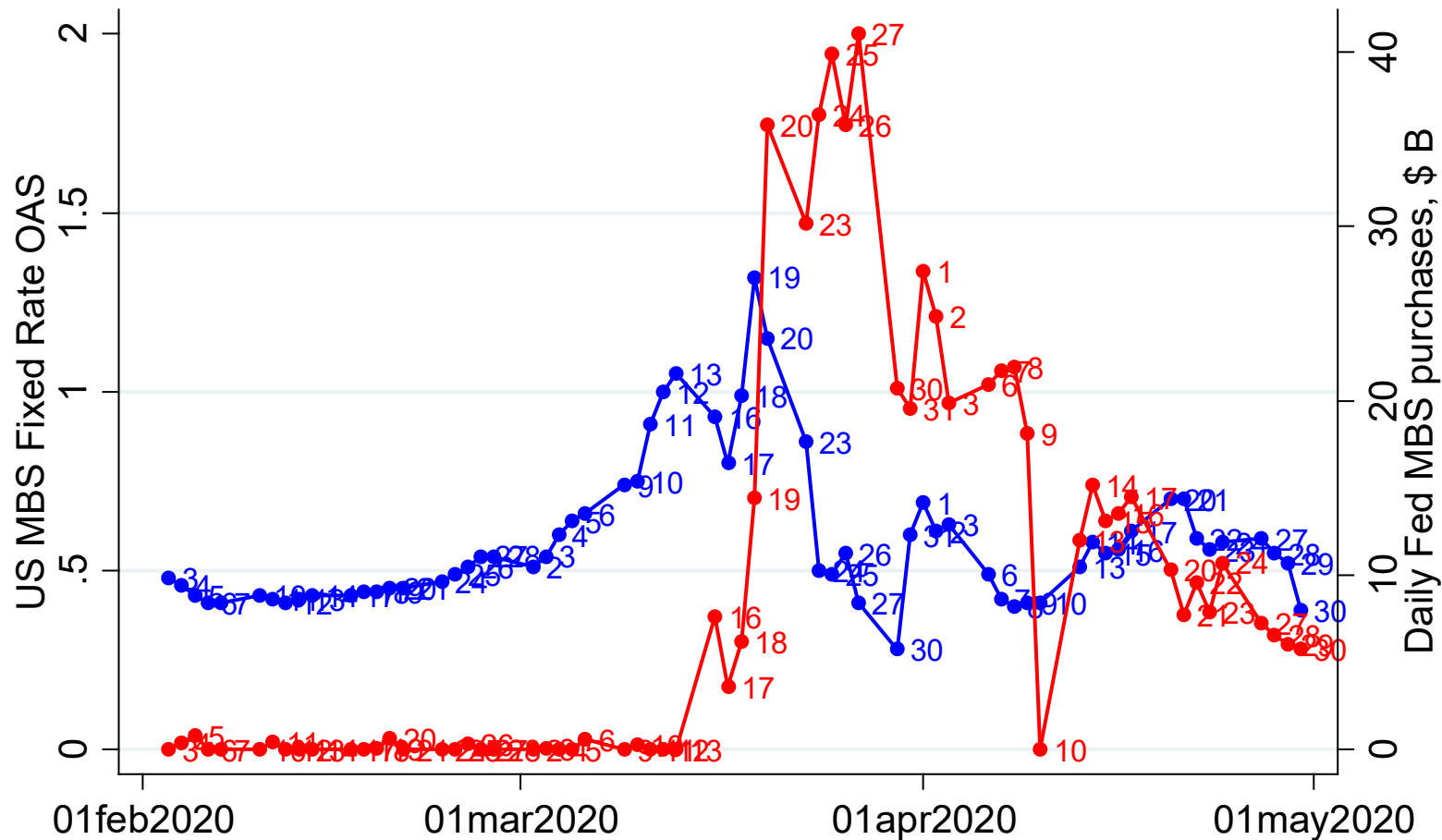


## MBS purchases worked more like Treasuries than corporate

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 apparently not enough to make them stop selling.
- Faced MBS default risk due to COVID, MBS prepayments, repo funding problems

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

### Sellers:

\$B	Holdings change			Traded
	2019Q4	2020Q1	2020Q1-2019Q4	Bought/sold in 2020Q1
<b>Total liabilities</b>	9431	9771	340	373
<b>Total assets</b>	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

## Final thoughts:

- Fed programs were central for stabilizing markets
- But moral hazard is now an even bigger concern