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

US mortgage market

US MBS Fixed Rate Yield
US MBS Fixed Rate OAS
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


Quarterly net purchases of mutual funds (flows), 1990-2020Q1

Quarterly net purchases of ETFs (flows), 1990-2020Q1
Dramatic (8 sigma) outflows from bond funds: ICI data (includes ETFs from 2013 on)

Bond funds, Monthly flows, 2007M1-2020M7

March 2020: -$265B

Stock funds, Monthly flows, 2007M1-2020M7
Bond fund outflows peaked in same week as Treasury yields spiked: ICI data

Bond funds, Weekly flows, 2020

Week ending March 18 ==> Week ending March 25

January  February  March  April  May  June  July  August
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

- Safety premium shifts upward as supply of safe assets falls
- Baa rating
- C-CAPM value: price = E[M × risky payoff]

Default probability
Visser-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.

Market cap of Bloomberg Barclays corporate indexes

Source: Bloomberg Finance LP, DB Global Research

Deutsche Bank Research  Torsten Slok, torsten.slok@db.com  +1 212 250-2155  March 2020
THE POSSIBLE ROLE OF HEDGE FUND TREASURY SELLING


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

Sellers: Hedge funds, foreigners, mutual funds

<table>
<thead>
<tr>
<th>$B</th>
<th>Holdings change 2020Q1-2019Q4</th>
<th>Traded Bought/sold in 2020Q1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total liabilities</td>
<td>19,019</td>
<td>500</td>
</tr>
<tr>
<td>Total assets</td>
<td>19,292</td>
<td>1327</td>
</tr>
<tr>
<td>Household sector, incl. hedge funds</td>
<td>1,896</td>
<td>-433</td>
</tr>
<tr>
<td>Rest of the world</td>
<td>6,695</td>
<td>118</td>
</tr>
<tr>
<td>Mutual funds</td>
<td>1,311</td>
<td>-78</td>
</tr>
<tr>
<td>State and local governments</td>
<td>712</td>
<td>13</td>
</tr>
<tr>
<td>Brokers and dealers</td>
<td>230</td>
<td>29</td>
</tr>
<tr>
<td>Foreign banking offices in U.S.</td>
<td>121</td>
<td>-5</td>
</tr>
<tr>
<td>Holding companies</td>
<td>58</td>
<td>-4</td>
</tr>
<tr>
<td>Nonfinancial noncorporate business</td>
<td>79</td>
<td>1</td>
</tr>
<tr>
<td>Banks in U.S. affiliated areas</td>
<td>17</td>
<td>-2</td>
</tr>
<tr>
<td>Credit unions</td>
<td>38</td>
<td>1</td>
</tr>
<tr>
<td>ABS issuers</td>
<td>33</td>
<td>-1</td>
</tr>
<tr>
<td>Closed end funds</td>
<td>3</td>
<td>-1</td>
</tr>
</tbody>
</table>
## Buyers: Fed, money market funds

<table>
<thead>
<tr>
<th></th>
<th>2019Q4</th>
<th>2020Q1</th>
<th>2020Q1-2019Q4</th>
<th>Bought/sold in 2020Q1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Monetary authority</strong></td>
<td>2,541</td>
<td>3,757</td>
<td>1217</td>
<td>1019</td>
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<tr>
<td><strong>Money market funds</strong></td>
<td>1,037</td>
<td>1,268</td>
<td>231</td>
<td>265</td>
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<tr>
<td>Federal government retirement funds</td>
<td>2,150</td>
<td>2,157</td>
<td>6</td>
<td>43</td>
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<tr>
<td>Private pension funds</td>
<td>468</td>
<td>538</td>
<td>70</td>
<td>31</td>
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<tr>
<td>Exchange traded funds</td>
<td>232</td>
<td>263</td>
<td>31</td>
<td>20</td>
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<tr>
<td>Nonfinancial corporate business</td>
<td>45</td>
<td>66</td>
<td>21</td>
<td>17</td>
</tr>
<tr>
<td>U.S. chartered depository institutions</td>
<td>704</td>
<td>725</td>
<td>21</td>
<td>16</td>
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<tr>
<td>Government sponsored enterprises</td>
<td>171</td>
<td>186</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Life insurance companies</td>
<td>215</td>
<td>244</td>
<td>28</td>
<td>11</td>
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<tr>
<td>Property casualty insurance companies</td>
<td>153</td>
<td>168</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>State and local govt retirement funds</td>
<td>383</td>
<td>417</td>
<td>34</td>
<td>2</td>
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<tr>
<td><strong>Discrepancy</strong></td>
<td>274</td>
<td>1,101</td>
<td>827</td>
<td>0</td>
</tr>
</tbody>
</table>
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

Quarterly net foreign purchases of US Treasuries, 1980-2020Q2
Foreign official vs. foreign private, TIC data

Quarterly net foreign OFFICIAL purchases of US Treasuries, 1980-2020Q2

Quarterly net foreign PRIVATE purchases of US Treasuries, 1980-2020Q2
Main seller (official plus private) is Cayman Islands

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

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)**
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)](image-url)

*Note: Spread is the yield on a similar maturity non-deliverable 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 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:
  - 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

![Graph showing daily growth rate in new COVID cases and S&P 500 over time.]

- **Daily growth rate in new COVID cases**
- **S&P 500**
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:

Cumulative return since announcement, March 23, 2020

Cumulative return since announcement, April 9, 2020
High yield corporate bond returns (HYG ETF), intra-day

Cumulative return since announcement, March 23, 2020

Cumulative return since announcement, April 9, 2020
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:
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

Vertical lines mark 3/15, 3/23, 4/9
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:**

<table>
<thead>
<tr>
<th>$B</th>
<th>2019Q4</th>
<th>2020Q1</th>
<th>2020Q1-2019Q4</th>
<th>Bought/sold in 2020Q1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total liabilities</strong></td>
<td>9431</td>
<td>9771</td>
<td>340</td>
<td>373</td>
</tr>
<tr>
<td><strong>Total assets</strong></td>
<td>9629</td>
<td>10176</td>
<td>547</td>
<td>373</td>
</tr>
<tr>
<td>REITs</td>
<td>335</td>
<td>219</td>
<td>-116</td>
<td></td>
</tr>
<tr>
<td>Mutual funds</td>
<td>654</td>
<td>585</td>
<td>-69</td>
<td>-91</td>
</tr>
<tr>
<td>Holding companies</td>
<td>45</td>
<td>42</td>
<td>-3</td>
<td>-5</td>
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<tr>
<td>Government-sponsored enterprises</td>
<td>268</td>
<td>266</td>
<td>-2</td>
<td>-2</td>
</tr>
<tr>
<td>Property-casualty insurance companies</td>
<td>150</td>
<td>153</td>
<td>3</td>
<td>-2</td>
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<tr>
<td>Banks in U.S.-affiliated areas</td>
<td>8</td>
<td>7</td>
<td>-1</td>
<td>-1</td>
</tr>
<tr>
<td>Federal government retirement funds</td>
<td>11</td>
<td>10</td>
<td>0</td>
<td>-1</td>
</tr>
<tr>
<td>Credit unions</td>
<td>165</td>
<td>174</td>
<td>9</td>
<td>-1</td>
</tr>
</tbody>
</table>
DID FED BOND PURCHASE PROGRAMS HAVE REAL EFFECTS? LIKELY YES

• Corporate CDS rates fell
  o 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:

Cumulative return since announcement, March 23, 2020

Cumulative return since announcement, April 9, 2020
Concerns:

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