



JOHNSON  
Cornell University

# Anatomy of a Liquidity Crisis: Corporate Bonds in the Covid-19 Crisis

Maureen O'Hara, Cornell University  
Xing (Alex) Zhou, Federal Reserve Board

August 2020





Disclaimer: The views expressed herein are those of the authors and do not necessarily represent those of the Federal Reserve Board, the Federal Reserve System, or its staff.



# Things fall apart.....

- In March 2020, the U.S. corporate bond market faltered – yield spreads soared and liquidity seemingly evaporated.
  - Part of a large set of problems in the financial markets arising from the Covid-19 crisis.
- The Federal Reserve responded with a variety of facilities to address these economics and financial market issues, including for the first time agreeing to buy corporate bonds and bond ETFs.
  - The Fed as “market maker of last resort”



# The anatomy of a liquidity crisis

- We examine the evolution of this crisis by looking at trading, transaction costs and liquidity provision – the microstructure of liquidity.
- We examine the dealers who provide liquidity and their trading and inventory
- We look at electronic trading and how customers fared in these C-to-C venues
- We show how Fed actions (via the PDCF and SMCCF) directly and indirectly affected liquidity



## We show that in the crisis..

- Trading shifted to liquid bonds and transaction costs tripled before the Fed intervention; block trade transaction costs were particularly affected (24 bp to 150 bp)
- Transaction costs inverted – big larger than small
- Dealers, particularly non-primary, shifted from buying bonds to selling, resulting in a negative cumulative inventory position for the dealer community and further driving up TC.
- Electronic customer-to-customer trading costs were double those in c-to-d trading



# The Fed to the rescue

- We show that both Fed programs were effective in restoring liquidity
  - The PDCF (direct lending) had an almost immediate effect on primary dealers, who shifted to balanced trading
    - Addressing the funding liquidity problem
  - The SMCCF (promised buying) had almost immediate announcement effects (actual buying would not start for weeks)
    - A backstop for corporate bonds- addressing the one-sided market problem



# Fed actions and timeline

- March 6 – Corporate bond market falters.
- March 20 – Primary Dealer Credit Facility
  - Fed would lend overnight or with term loans to primary dealers on eligible investment-grade collateral.
- March 23 – Secondary Market Corporate Credit Facility (SMCCF)
  - Fed facility to purchase IG corporate bonds from US companies in the secondary market. Limited to eligible investment grade bonds with maturities of 5 years or less.



# Fed actions and timeline

- April 9 – SMCCF expansion
  - Facility purchase expanded to include High Yield bonds that were downgraded after March 22 (fallen angels) and ETFs.
- May 12 – SMCCF implementation
  - first ETF purchases
- Three sub-periods: normal (Feb.1- March 5); Crisis (March 6-19); Regulation (March 20 – May 19).





# Measuring liquidity

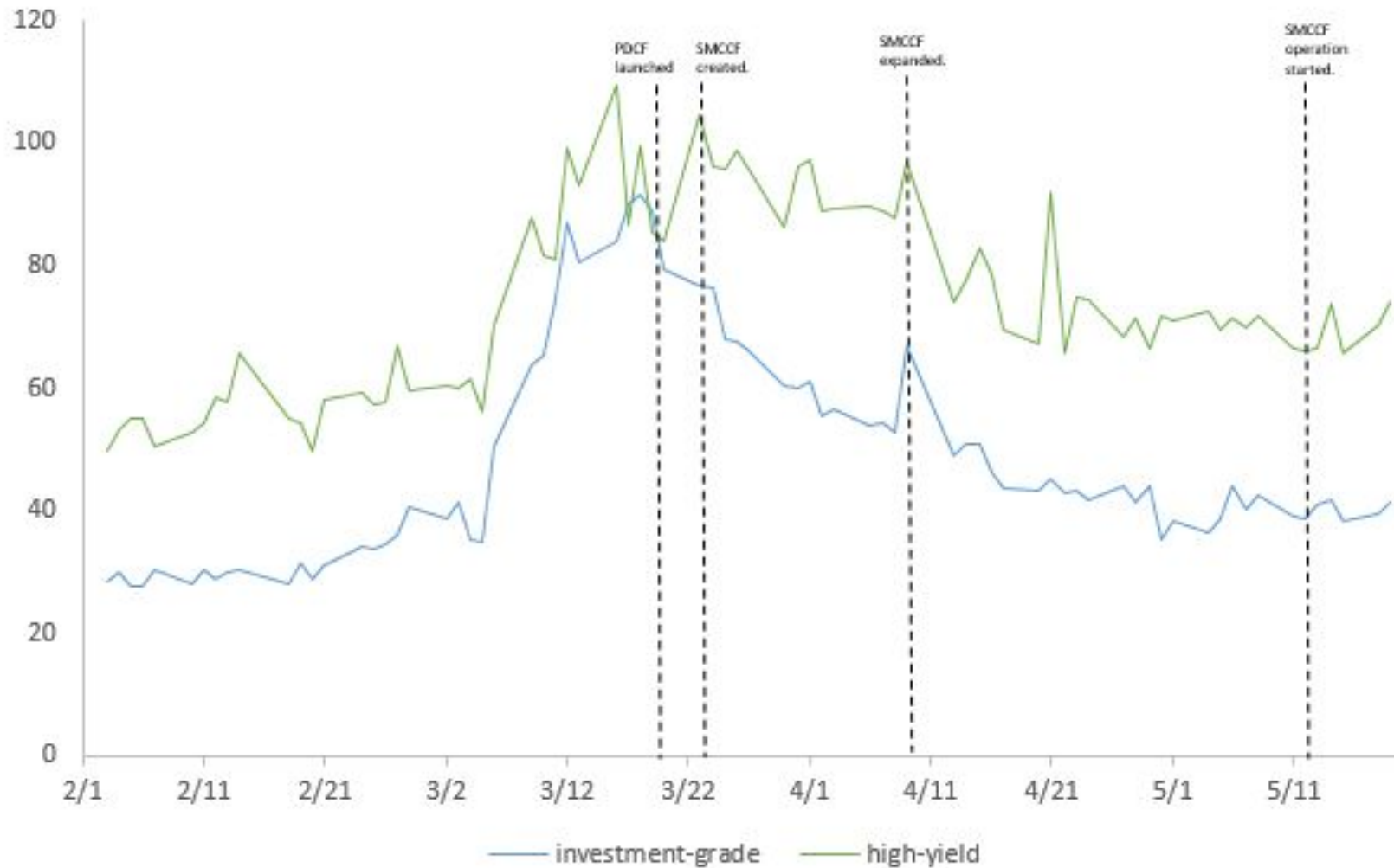
- We measure a bond's transaction cost by measuring its price impact (Hendershott-Madhavan [2015])

$$Cost_j = \ln(Trade Price_j / Benchmark Price_j) \times Trade Sign_j$$

where the benchmark price is the prior trade in that bond in the interdealer market



### Panel C. Transaction costs in investment-grade and high-yield bond





# Trading costs invert

Panel A. Investment-grade bonds





# Which bonds are traded during the crisis?

|                         | Log(Volume Normal)    | Log(Volume Crisis)    | Log(Volume Crisis)    |
|-------------------------|-----------------------|-----------------------|-----------------------|
| Cost_Normal             | -0.024***<br>(-10.48) |                       | -0.005***<br>(-5.78)  |
| Cost_Crisis             |                       | 0.007***<br>(8.99)    | 0.003***<br>(7.11)    |
| Log (Time to Maturity)  | 0.176***<br>(4.39)    | -0.339***<br>(-8.36)  | -0.138***<br>(-6.94)  |
| Log(Age)                | -0.682***<br>(-12.30) | -0.935***<br>(-14.09) | -0.251***<br>(-10.58) |
| Log(Amount Outstanding) |                       |                       | 0.418***<br>(15.10)   |
| Log(Volume_Normal)      |                       |                       | 0.639***<br>(36.32)   |
| Rating Fixed Effects    | Yes                   | Yes                   | Yes                   |
| Industry Fixed Effects  | Yes                   | Yes                   | Yes                   |
| Observations            | 7308                  | 7308                  | 7308                  |
| $R^2$                   | 0.32                  | 0.11                  | 0.76                  |

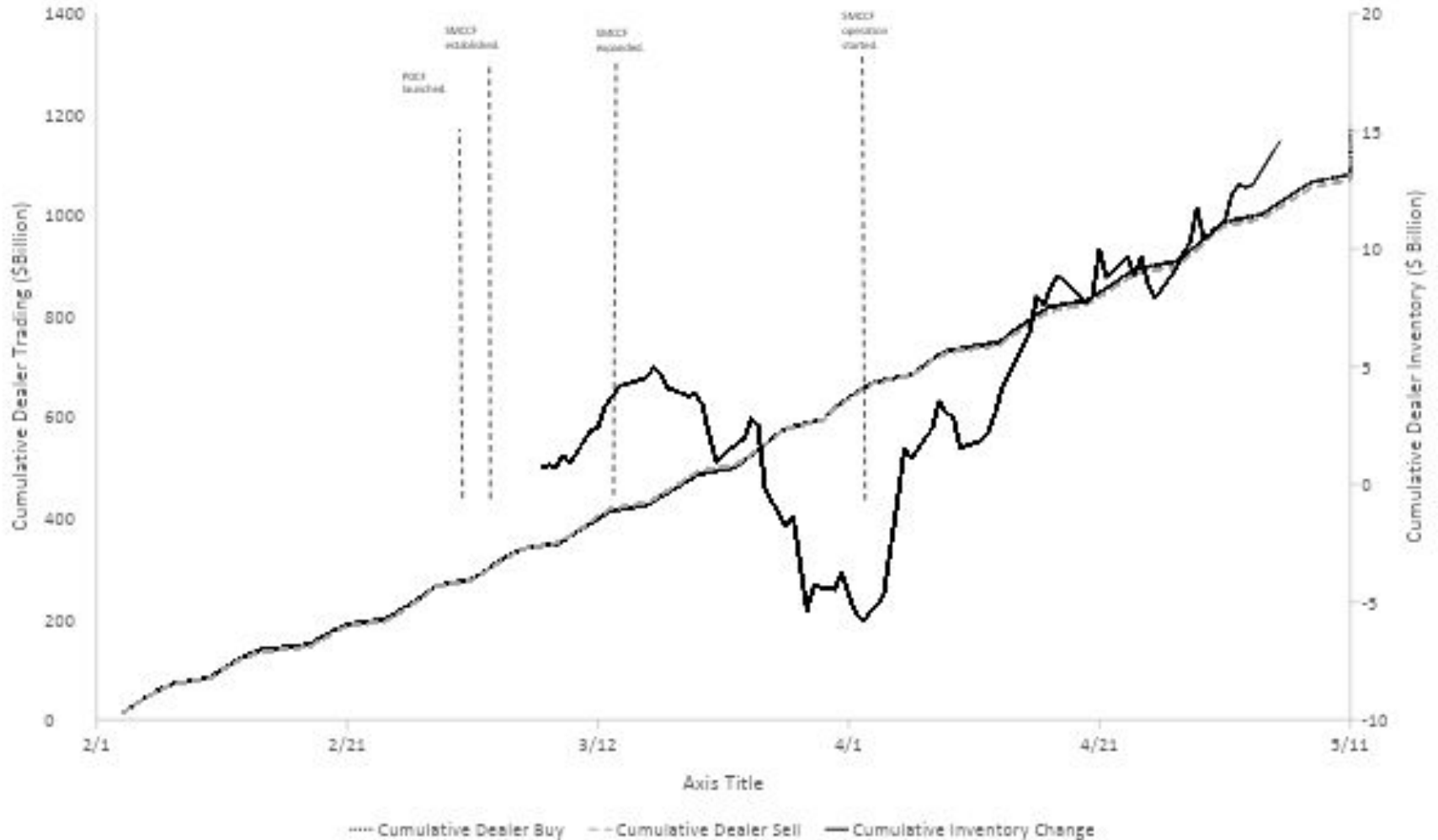


# What lies beneath?

- We turn to understanding the factors influencing the supply of corporate bond liquidity
  - Dealer behavior
  - Electronic customer-to-customer trading
  - Fed interventions

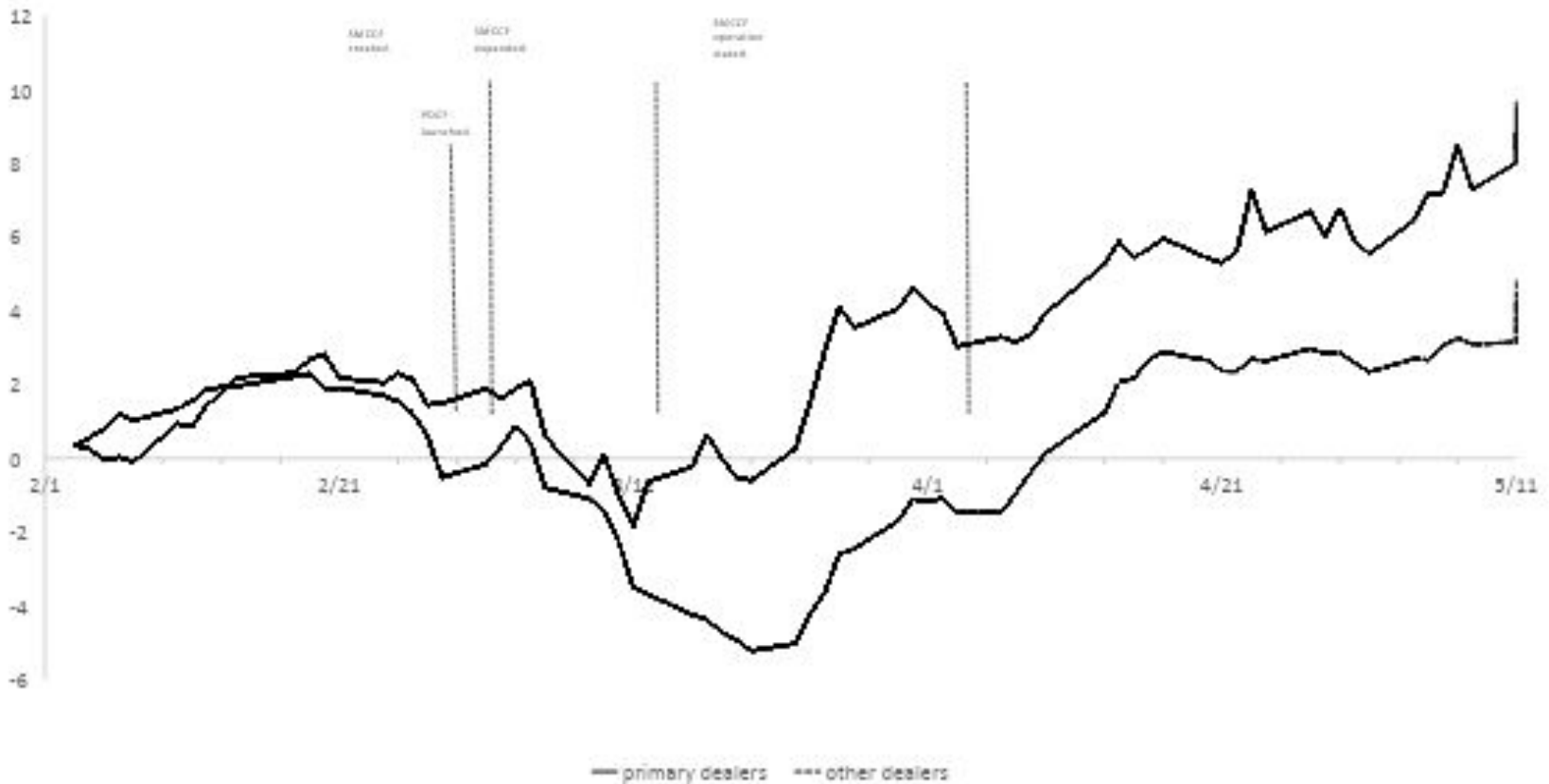


# Dealer cumulative inventory changes





# Cumulative inventory changes for primary and other dealers





# What affected dealer inventory changes?

|                            | 1. Full Sample      | 2. Regulation Effects | 3. Primary Dealers |
|----------------------------|---------------------|-----------------------|--------------------|
| Crisis                     | -1.835**<br>(-2.46) | -1.834**<br>(-2.46)   |                    |
| Regulation                 | 2.551**<br>(2.44)   | 2.893**<br>(2.33)     |                    |
| SMCCF Expansion            |                     | -0.613<br>(-1.34)     |                    |
| SMCCF Implementation       |                     | 0.362<br>(0.82)       |                    |
| IG*Prime Dealer            |                     |                       | -6.442<br>(-0.99)  |
| IG*Regulation              |                     |                       | 2.539<br>(1.44)    |
| Prime Dealer*Regulation    |                     |                       | -0.186<br>(-0.12)  |
| IG*Prime Dealer*Regulation |                     |                       | 19.947**<br>(2.18) |





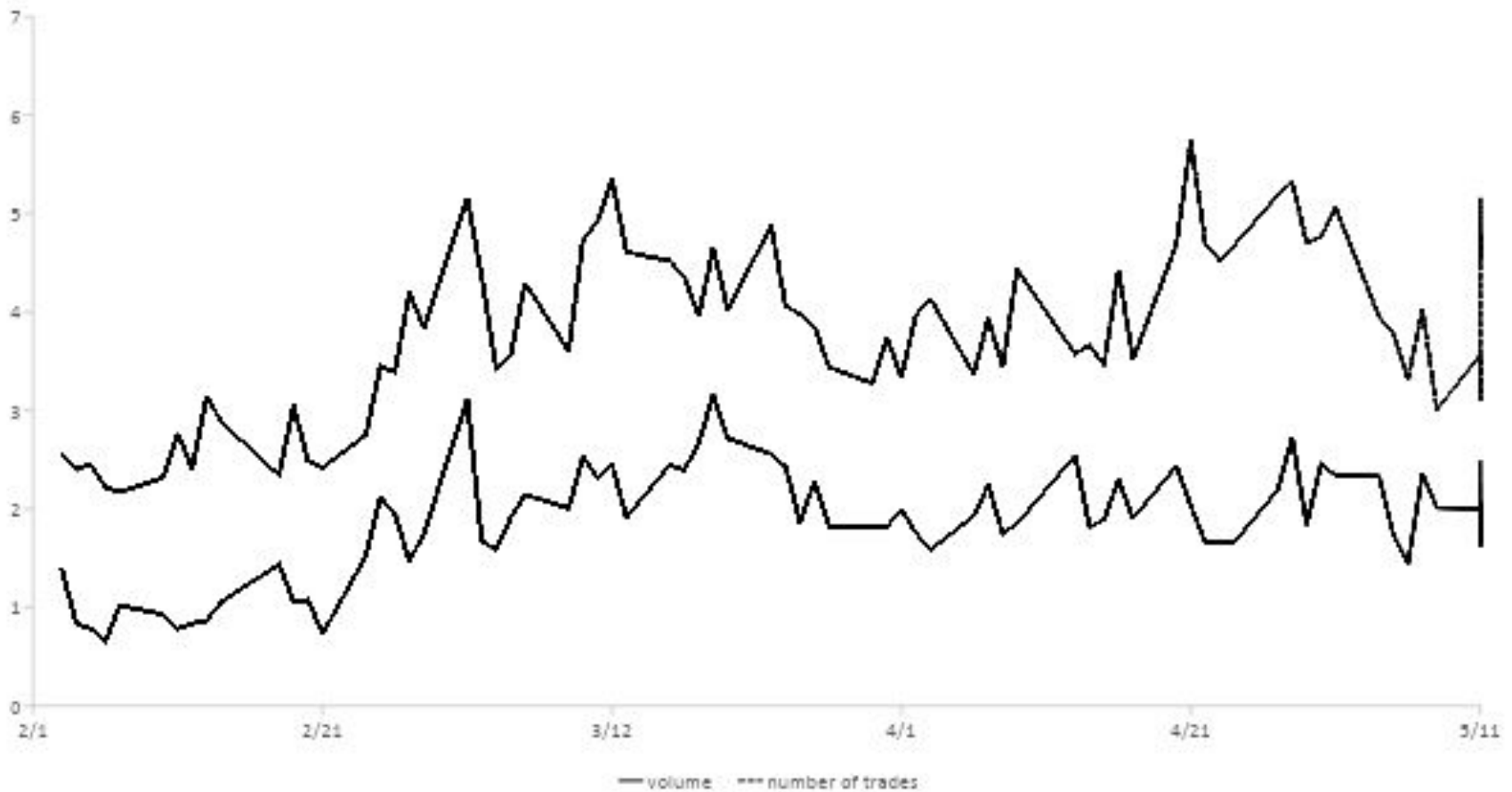
# Dealer inventory and transaction costs

Feb.2-May 19,2020

|                                | 1. Dealer Net Buy<br>Effects | 2. Cumulative Dealer<br>Net Buy Effects | 3. Dealer Trade Effects<br>over Time |
|--------------------------------|------------------------------|---|--------------------------------------|
| Dealer Net Buy                 | -0.025***<br>(-4.19)         |   |                                      |
| Cum Dealer Net Buy             |                              | -0.068***<br>(-4.98)                    | 0.016<br>(0.71)                      |
| Crisis* Cum Dealer Net Buy     |                              |   | -0.064***<br>(-3.43)                 |
| Regulation* Cum Dealer Net Buy |                              |   | 0.053***<br>(3.01)                   |
| Log(Time to Maturity)          | 11.596***<br>-11.48          | 11.577***<br>-11.45                     | 11.589***<br>-11.46                  |
| Log(Age)                       | 6.789***<br>-19.96           | 6.720***<br>-20.18                      | 6.689***<br>-20.09                   |
| Bond Fixed Effects             | Yes                          | Yes                                     | Yes                                  |
| Credit Rating Fixed Effects    | Yes                          | Yes                                     | Yes                                  |
| Dealer Fixed Effects           | Yes                          | Yes                                     | Yes                                  |
| Trade Size Fixed Effects       | Yes                          | Yes                                     | Yes                                  |
| Day Fixed Effects              | Yes                          | Yes                                     | Yes                                  |
| Observations                   | 1,224,923                    | 1,224,923                               | 1,224,923                            |
| R <sup>2</sup>                 | 0.32                         | 0.32                                    | 0.32                                 |

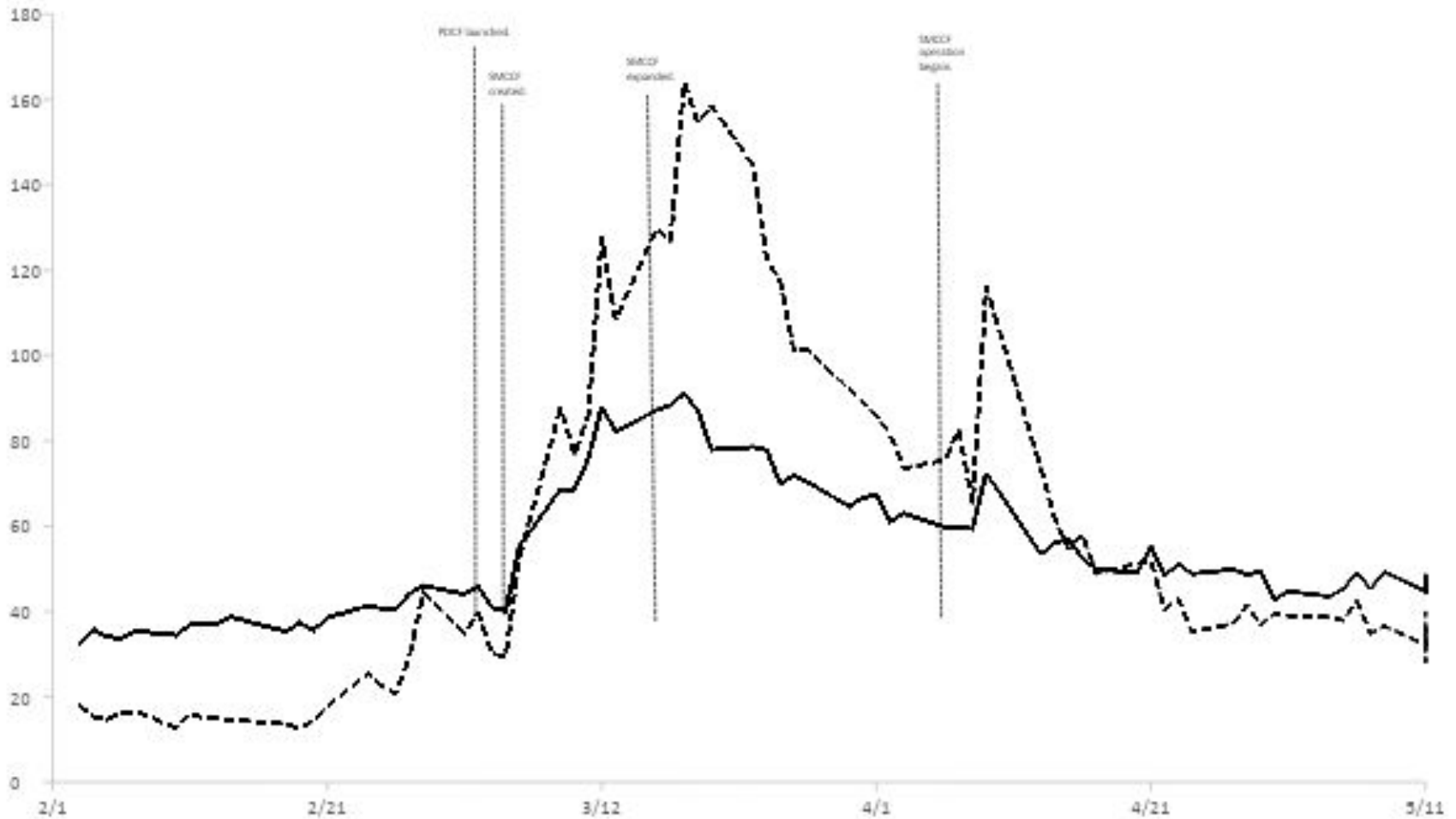


# Customer to customer trades market share





# Transaction costs: C-to-C vs. C-to-D





# Fed interventions

- Identification issues – how to sort this out?
  - diff-in-diff approaches and focus on the bond market segment directly affected by facility
    - PDCF only accepts IG as collateral so expect this funding channel to matter for **primary dealers** in IG from March 20. Also expect it to **matter most for bonds around IG/HY cutoff**
    - SMCCF only accepts bonds with **maturities of 5 years or less**. If SMCCF affects bond liquidity we would expect these effects to be concentrated in short maturity bonds



# The effects of SMCCF and PDCF on bond liquidity in the crisis period

|                              | PDCF Effects          |                     | SMCCF Effects        |                         |
|------------------------------|-----------------------|---------------------|----------------------|-------------------------|
|                              | IG vs. HY             | BBB- vs. BB+        | LT vs. ST            | 4.5 years vs. 5.5 years |
| IG*Regulation                | -2.44<br>(-1.26)      | 6.261<br>(1.35)     | 0.112<br>(0.04)      | 10.642<br>(1.26)        |
| IG*Primary Dealer            | -9.289***<br>(-3.02)  | 7.498<br>(1.11)     |                      |                         |
| Primary Dealer*Regulation    | -1.741<br>(-0.44)     | 4.409<br>(0.62)     |                      |                         |
| IG*Primary Dealer*Regulation | -10.420***<br>(-2.50) | -16.380*<br>(-1.85) |                      |                         |
| Short Term                   |                       |                     | -19.586<br>(-1.34)   | -57.533***<br>(-1.99)   |
| Short Term * Regulation      |                       |                     | 7.348***<br>(2.05)   | 14.333<br>(1.33)        |
| IG*Short Term                |                       |                     | 12.77<br>(1.10)      | 52.304*<br>(1.66)       |
| IG*Short Term*Regulation     |                       |                     | -9.367***<br>(-2.45) | -21.234*<br>(-1.80)     |
| Bond Level Controls          | Yes                   | Yes                 | Yes                  | Yes                     |
| Credit Rating Fixed Effects  | Yes                   | Yes                 | Yes                  | Yes                     |
| Dealer Fixed Effects         | Yes                   | Yes                 | Yes                  | Yes                     |
| Trade Size Fixed Effects     | Yes                   | Yes                 | Yes                  | Yes                     |
| Day Fixed Effects            | Yes                   | Yes                 | Yes                  | Yes                     |



# Conclusions

- Market liquidity is not a given- it emerges from a complex set of interactions
- We show that as the crisis unfolded, trading changed, dealer behavior changed, and illiquidity emerged
  - Primary dealers played a mostly positive role
  - Electronic C to C trades prohibitively expensive
- We also show how Fed interventions contributed to easing the crisis



## A new normal?

- Corporate bond liquidity is not yet back to pre-crisis levels
- The Fed's new role – is market maker of last resort a new direction for central banking?
- Should the Federal Reserve continue its purchases of corporate bonds and ETFs?