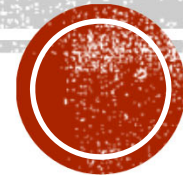


FINANCIAL FRAGILITY AND MUTUAL FUNDS

**THE 16TH ANNUAL CONFERENCE ON ASIA-PACIFIC
FINANCIAL MARKETS**



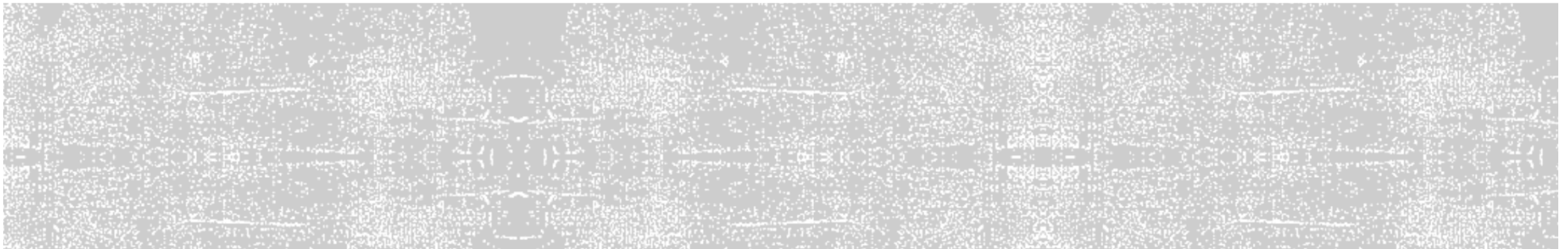
ITAY GOLDSTEIN, WHARTON

OUTLINE

- Liquidity Transformation and Fragility
- Early Evidence from Mutual Funds
- The Covid-19 Episode



LIQUIDITY TRANSFORMATION AND FRAGILITY



LIQUIDITY TRANSFORMATION AND FRAGILITY



A run on American Union Bank, 1931

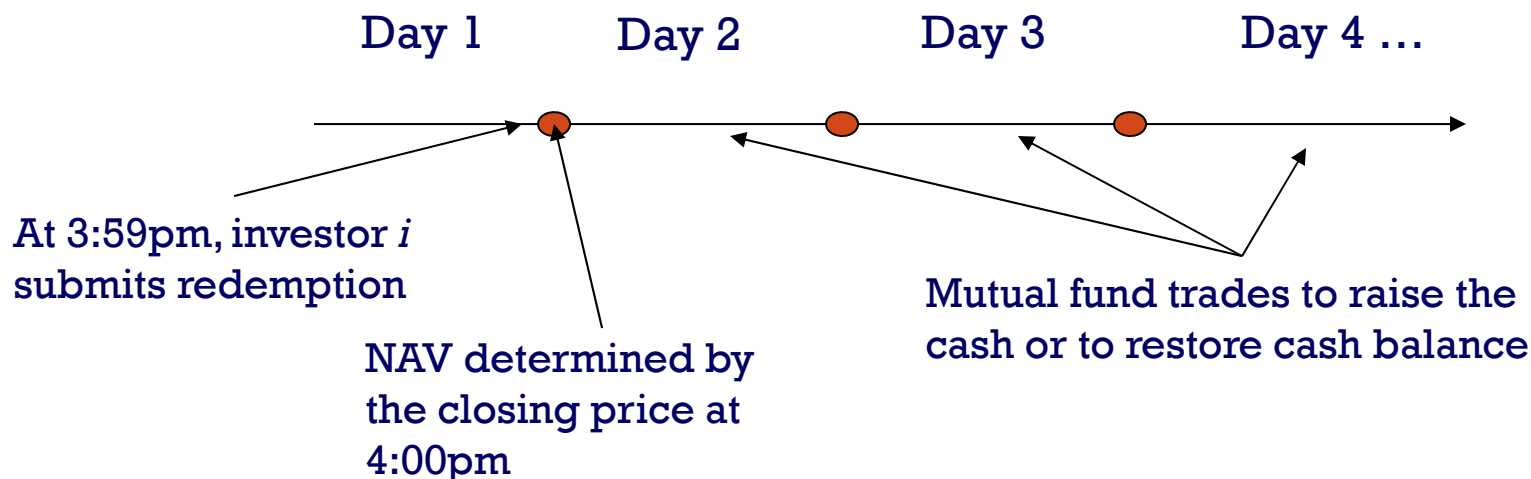
LIQUIDITY TRANSFORMATION AND FRAGILITY

- Liquidity transformation is at the core of financial services
 - Banks provide liquidity to their depositors and invest in illiquid assets
 - They create liquidity, but end up with liquidity mismatch
- Liquidity mismatch renders banks vulnerable to panic-based runs (Diamond and Dybvig, 1983)
 - Depositors rush to withdraw deposits expecting that others will do so
- Many government policies are enacted to alleviate panic-based runs
 - Deposit insurance, lender of last resort, etc.

HOW DOES IT WORK IN MUTUAL FUNDS?

- Open-end mutual funds are different from banks
 - They do not promise a fixed return, but rather pay according to a floating-NAV model
- Does this eliminate first-mover advantage and strategic complementarities?
- No!
 - In a floating-NAV environment, investors can redeem shares and get the NAV as of the day of redemption
 - But, their redemptions will affect fund trading going forward, hurting remaining investors in illiquid funds

MUTUAL FUNDS REDEMPTIONS



- Key point: redemptions impose costs – commissions, bid-ask spread, price impact, forced deviation from desired portfolio, liquidity-based trading – on remaining investors

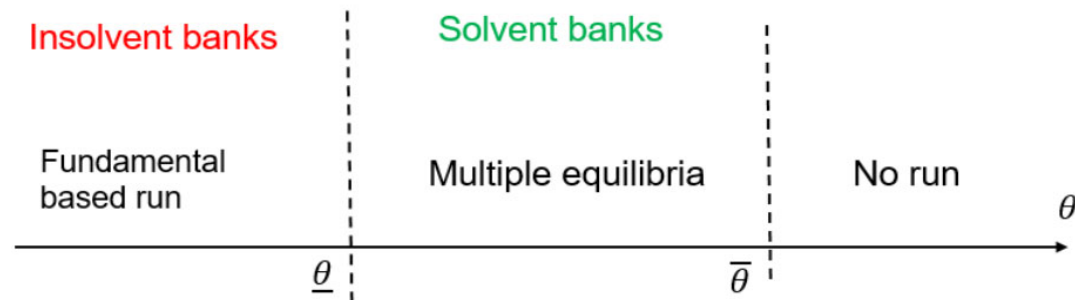
EMPIRICAL CHALLENGES

- Fundamental-based vs. panic-based runs:
 - Fundamental-based runs happen when investors withdraw just because of unfavorable news about fundamentals
 - Chari and Jagannathan, 1988; Jacklin and Bhattacharya, 1988; Allen and Gale, 1998
 - Panic-based runs happen when investors withdraw because they believe others will withdraw
 - The belief can be self-fulfilling because of strategic complementarity among investors (Diamond and Dybvig, 1983)
- Separating panic-based run from fundamental based run is important from a policy perspective
 - Many policies, such as deposit insurance, lender of last resort, suspension of convertibility, are premised on the idea that some runs are driven by panics
 - Many believe these policies distort incentives and create more problems than they solve

EMPIRICALLY TESTING FOR PANIC-BASED RUNS

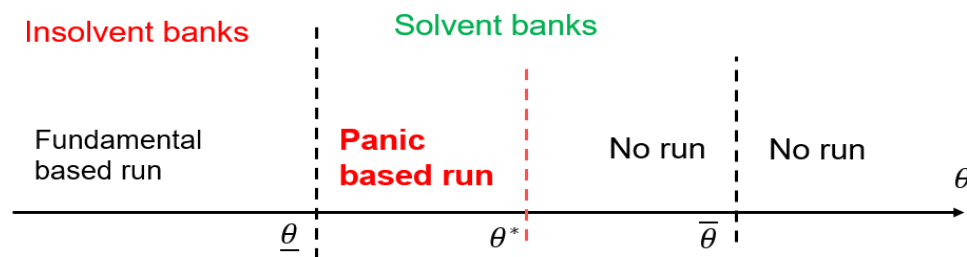
- Early evidence find strong association between bank runs and bank fundamentals (e.g., Gorton, 1988)
 - Such evidence is often interpreted as supporting fundamental based runs and *against* panic-based runs
- However, this interpretation is incorrect (e.g., Goldstein, 2013):
 - A pre-requisite for panic-based run is weaker fundamentals
 - Strategic complementarity among depositors can exacerbate/magnify the effect of fundamentals
 - Association between run and bad fundamental does not rule out the existence of panic-based behaviors

ILLUSTRATION: BASIC MODEL OF BANK RUNS



- Diamond and Dybvig (1983): depositors observe common, perfect signal about bank fundamental θ
- Without strategic complementarity among depositors, only insolvent banks with $\theta < \underline{\theta}$ should experience run
- With strategic complementarity, self-fulfilling panic-based run can take place (or not) for any solvent bank with $\theta \in [\underline{\theta}, \bar{\theta}]$
 - Multiple equilibria render the model empirically vacuous and untestable (Gorton, 1988)

ILLUSTRATION: UPDATED MODEL OF BANK RUNS



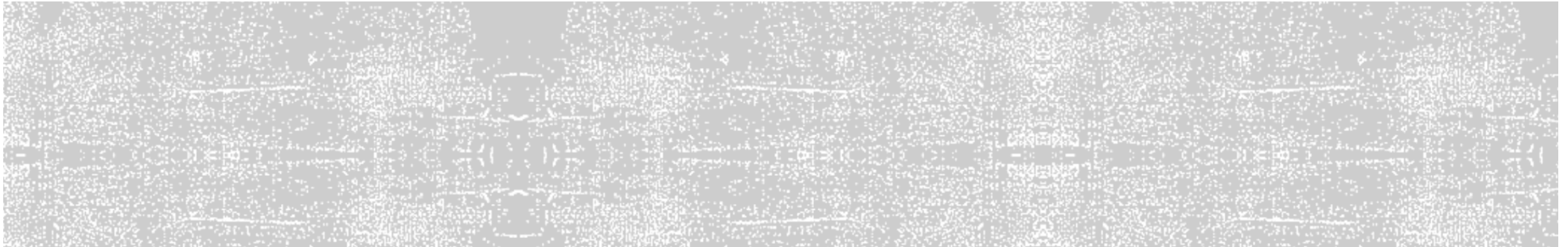
- Goldstein and Pauzner (2005): relax the assumption of common knowledge about fundamental
 - Generate unique equilibrium where runs happen for fundamental below a threshold level of θ^*
 - Runs when the fundamental is between $(\underline{\theta}, \theta^*)$ are considered panic-based, because they would not occur in the absence of coordination failure
 - But, they are still linked to fundamentals
- Theory is testable. Comparative statics: panic-run region is larger for banks with greater liquidity mismatch

EMPIRICAL PREDICTIONS AND TESTS

- For the same decline in fundamental, higher liquidity mismatch will generate more outflows
 - Testable implication: stronger sensitivity of outflows to performance when liquidity mismatch is higher
- Two papers tested this theory for mutual funds:
 - Chen, Goldstein, and Jiang (2010): Stronger sensitivity of outflows to negative performance in illiquid equity funds than in liquid equity funds
 - Goldstein, Jiang, and Ng (2017): Effect is much stronger in corporate-bond funds, where illiquidity of assets is a much bigger problem



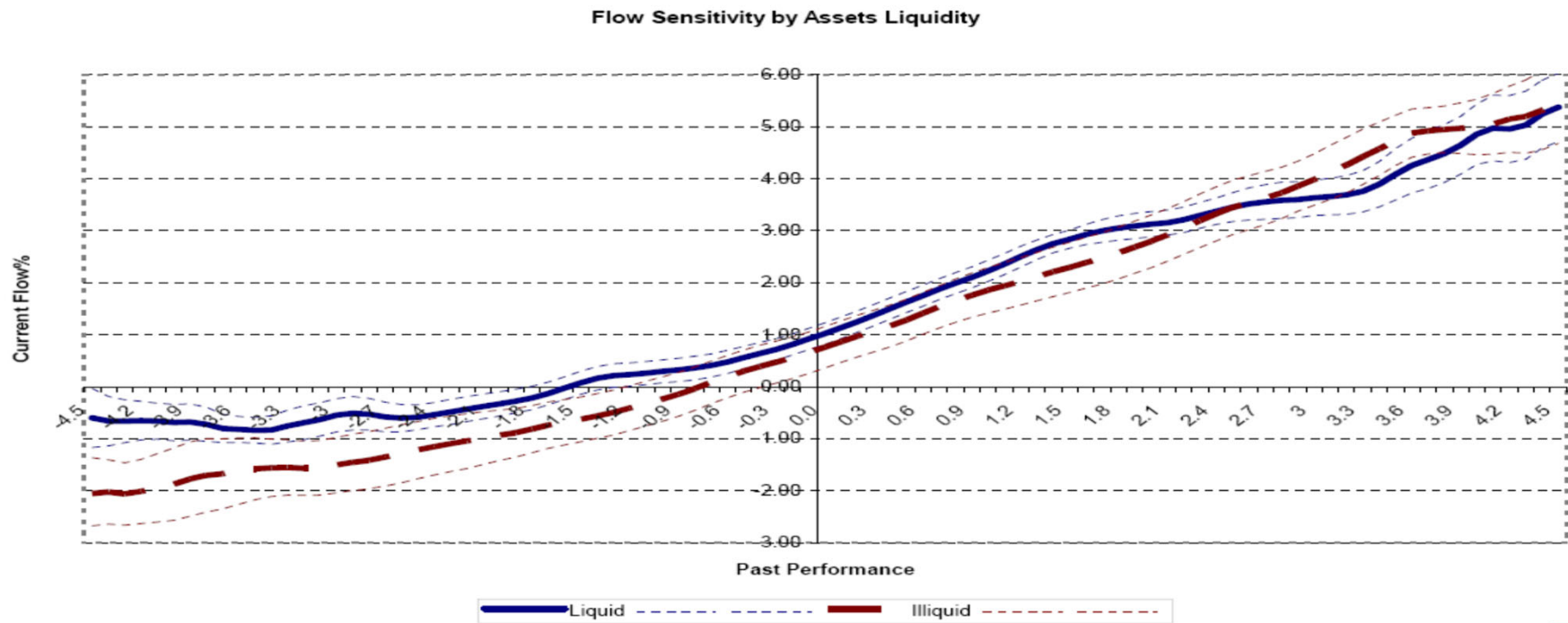
EARLY EVIDENCE FROM MUTUAL FUNDS



EMPIRICAL ANALYSIS OF FLOWS IN EQUITY MUTUAL FUNDS

- Chen, Goldstein and Jiang (2010)
 - Study flows in 4,393 actively-managed equity funds from 1995-2005
 - Find stronger sensitivity of outflows to negative performance in illiquid funds
 - These funds generate stronger complementarities
 - Illiquid funds are: small-cap & mid-cap equity funds (domestic or international), or single-country funds excluding US, UK, Japan and Canada.
 - Or continuous measure of liquidity of portfolio

EVIDENCE FROM CHEN, GOLDSTEIN, AND JIANG (2010)



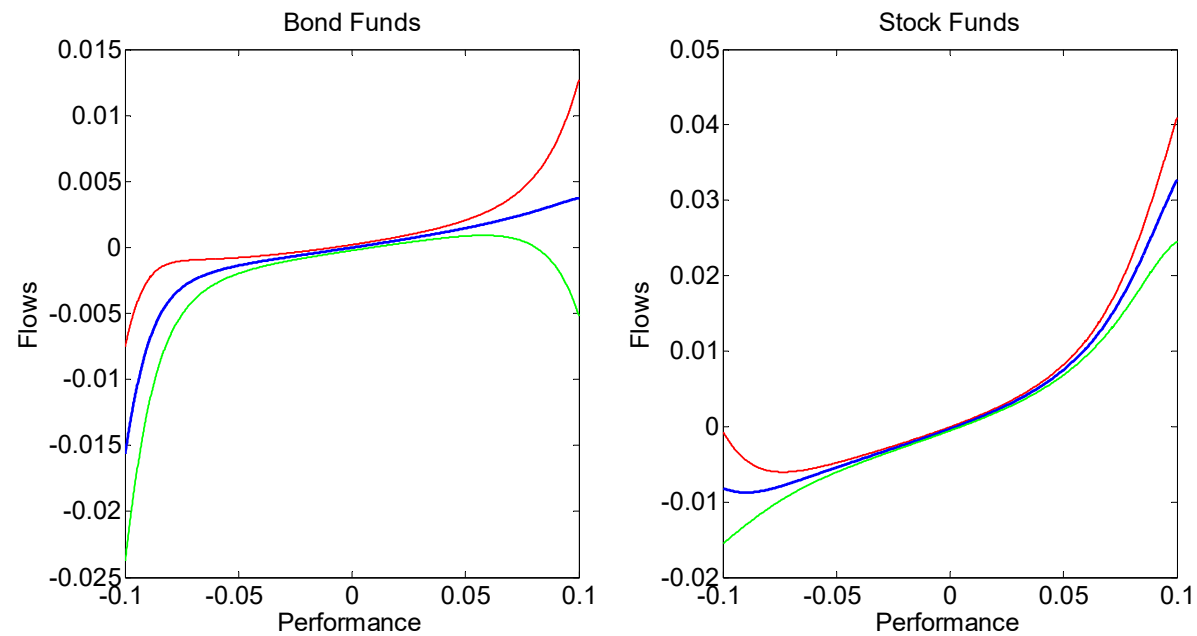
CORPORATE BOND FUNDS: GOLDSTEIN, JIANG, AND NG (2017)

- Following the crisis, massive inflows into corporate bond funds
 - Largely as a response to changes in investment opportunities and regulation elsewhere in the financial system
- Concerns mentioned about potential fragility mounting in the corporate bond funds sector, e.g., Feroli, Kashyap, Schoenholtz, and Shin (2014)
 - Concerns are stronger due to greater illiquidity of underlying asset

EMPIRICAL ANALYSIS OF FLOWS IN CORPORATE BOND MUTUAL FUNDS

- Goldstein, Jiang and Ng (2017) study flows in 1,660 actively-managed corporate bond funds from 1992-2014
- Large literature on the flow-to-performance relation in equity funds, finding convex relation
- We find that corporate bond funds are different:
 - Flow-to-performance relation tends to be concave
 - Pattern strengthens with illiquidity across funds and over time

FLOW PERFORMANCE RELATION OF CORPORATE BOND FUNDS VS. EQUITY FUNDS



FLOW-PERFORMANCE IN UNDERPERFORMING FUNDS IN ILLIQUID TIMES

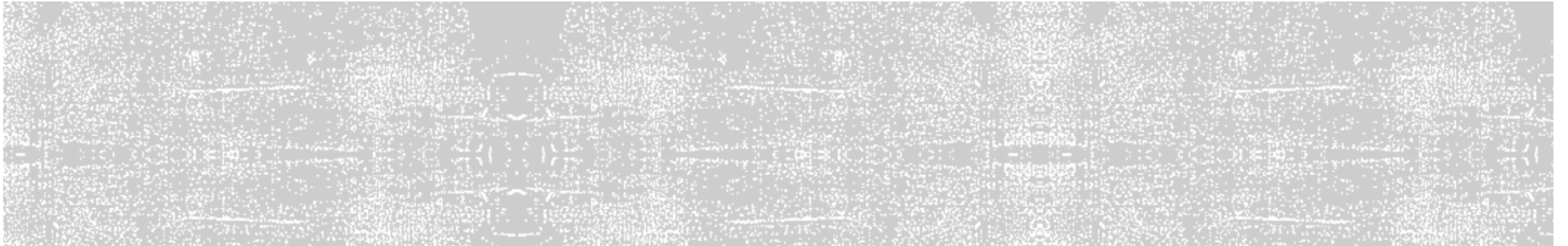
	(1) VIX	(2) TED	(3) DFL	(4) MOVE
Alpha	-0.131 (-0.77)	-0.121 (-1.11)	-0.746*** (-3.22)	-0.0909 (-0.73)
Alpha*IlliqPeriod	0.753*** (3.89)	0.749*** (5.37)	1.412*** (5.21)	0.639*** (4.58)
IlliqPeriod	0.00690*** (9.81)	0.00148** (2.44)	0.00745*** (8.11)	0.00252*** (4.19)
Lagged Flow	0.121*** (15.37)	0.123*** (15.47)	0.152*** (14.90)	0.123*** (15.50)
Log(TNA)	0.000552*** (3.78)	0.000558*** (3.82)	0.000533*** (2.98)	0.000544*** (3.75)
Log(Age)	-0.0134*** (-26.78)	-0.0136*** (-26.70)	-0.0124*** (-17.88)	-0.0135*** (-26.70)
Expense	-0.175** (-1.98)	-0.185** (-2.10)	-0.284** (-2.45)	-0.183** (-2.08)
Rear Load	-0.00294*** (-3.40)	-0.00285*** (-3.29)	-0.00611*** (-5.87)	-0.00291*** (-3.36)
Observations	171,006	171,006	100,215	171,006
Adj. R^2	0.0339	0.0330	0.0429	0.0329

ASSET LIQUIDITY AND FLOW-PERFORMANCE RELATION

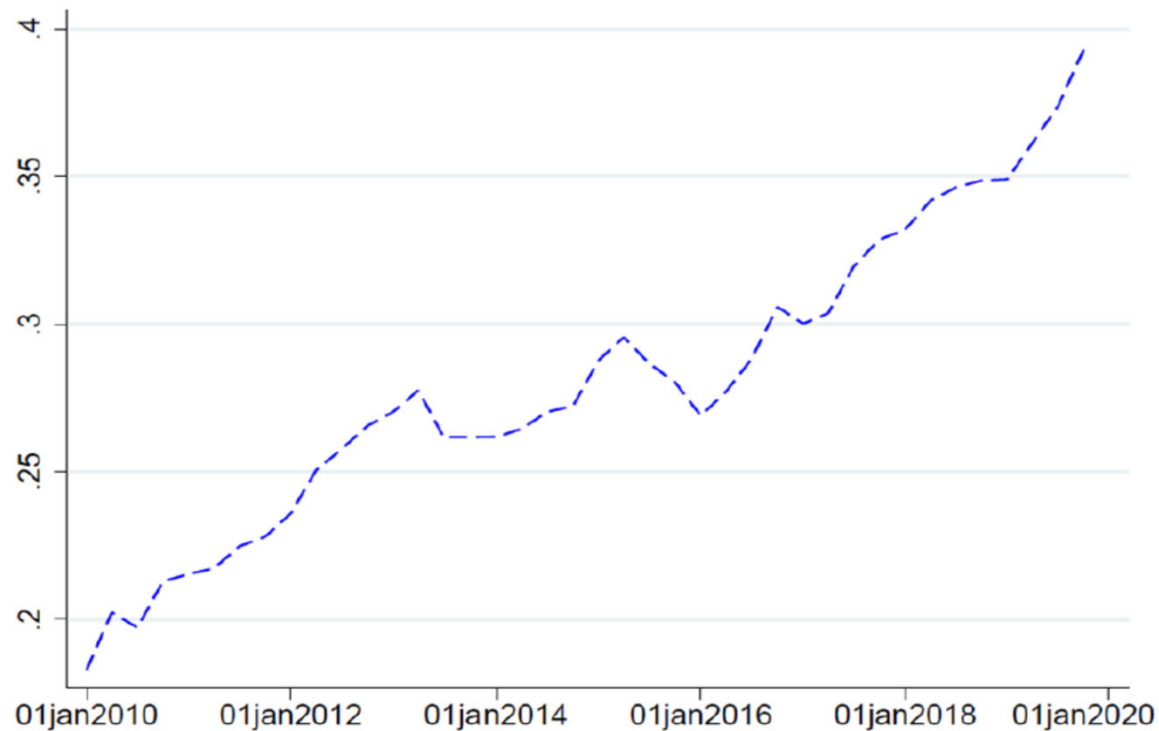
Alpha<0	Low Cash	Low (Cash + Government Bonds)	Low NSAR Cash	Illiquid Corporate Bond Holdings 1	Illiquid Corporate Bond Holdings 2
Alpha	0.554*** (6.42)	0.567*** (6.17)	0.631*** (6.09)	0.688*** (3.20)	0.662*** (3.16)
Alpha×IlliqFund	0.814*** (3.21)	0.647*** (2.74)	0.767*** (3.82)	1.305*** (3.02)	1.174*** (2.82)
IlliqFund	-0.000288 (-0.38)	0.00113 (1.51)	0.00211* (1.73)	0.00472*** (2.89)	0.00435*** (2.74)
Lagged Flow	0.131*** (12.50)	0.132*** (12.52)	0.121*** (7.15)	0.180*** (10.67)	0.179*** (11.11)
Log(TNA)	0.000561*** (3.18)	0.000555*** (3.15)	0.000470* (1.80)	0.000831*** (2.58)	0.000928*** (2.86)
Log(Age)	-0.0140*** (-20.26)	-0.0140*** (-20.22)	-0.0142*** (-14.61)	-0.0153*** (-12.59)	-0.0157*** (-12.95)
Expense	-0.443*** (-3.99)	-0.449*** (-4.02)	-0.521*** (-3.10)	-0.0281 (-0.14)	-0.0158 (-0.08)
Rear Load	-0.00485*** (-4.78)	-0.00482*** (-4.74)	-0.00221 (-1.45)	-0.00474** (-2.49)	-0.00482** (-2.50)
Observations	108,745	108,745	49,759	25,389	25,370
Adj. R ²	0.0500	0.0498	0.0473	0.0732	0.0750



THE COVID-19 EPISODE



THE GROWING IMPORTANCE OF INVESTMENT FUNDS IN THE CORPORATE BOND MARKET



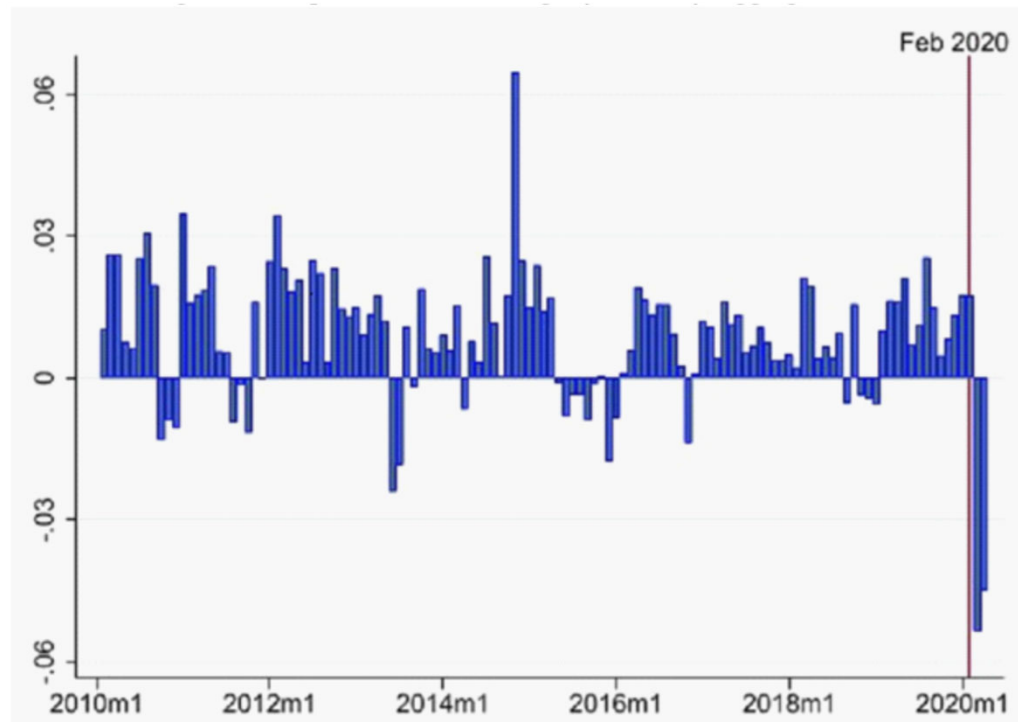
Aggregate Net Asset Value of Funds and ETFs divided by Size of Market (from Fed Flow of Funds Z.1)

SOURCES OF FRAGILITY

- Liquidity mismatch: holding illiquid assets, but providing high level of liquidity to their investors – can lead to “run” type behavior from their investors
 - Chen, Goldstein, and Jiang (2010); Goldstein, Jiang, and Ng (2017)
- Fire-sale vulnerability: forced asset sales have spillovers on peer funds that can lead to outflows
 - Falato, Hortacsu, Li, and Shin (2020)
- What happened in Covid-19 crisis? Did these fragilities play a role?
 - Analyzed in Falato, Goldstein, and Hortacsu (2021)

OUTFLOWS IN COVID-19 CRISIS IN PERSPECTIVE OF RECENT DECADE

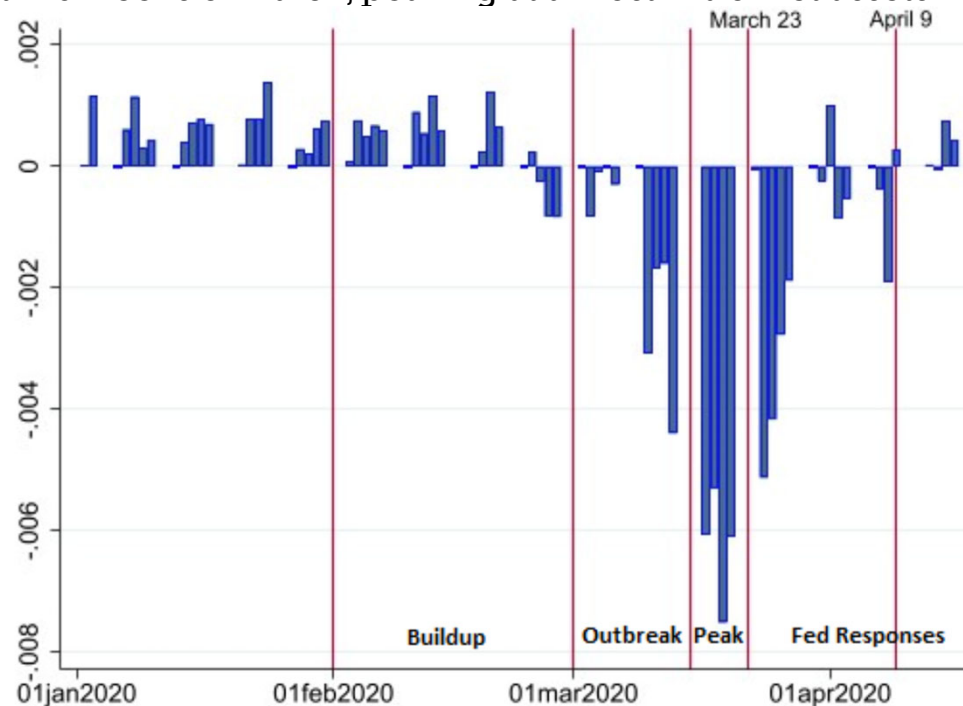
Mutual funds in corporate bond markets saw massive outflows during the COVID-19 crisis



Aggregate Net Fund Flows as a Fraction of Lagged Net Asset

EVOLUTION OF FLOWS OVER THE CRISIS

Daily outflows started in the last week of February and accelerated in the second and third weeks of March, peaking at almost 1% of net assets



Daily Aggregate Net Fund Flows (Fraction of Lagged Net Asset)

DECOMPOSING FLOWS BASED ON SOURCES OF FRAGILITY

Panel A: Cumulative Flows in the Crisis		
	Feb-Mar, 2020 (1)	Mar-Apr, 2020 (2)
Cumulative Flows	-10.2%	-6.7%
Cumulative Flows, Illiquid Funds (Roll)	-18.7%	-14.8%
Cumulative Flows, Fire-Sale Vulnerable Funds	-16.5%	-11.4%
Cumulative Flows, High Sector Exposure Funds	-21.4%	-16.6%
Share Explained (Fund Liquidity (Roll))	40.1%	27.6%
Share Explained (Fund Fire-Sale Vulnerability)	55.7%	37.3%
Share Explained (Fund Sector Exposure)	63.8%	55.4%
<hr/>		
<u>Aggregating Across Proxies: Fragility Factor</u>	Feb-Mar, 2020	Mar-Apr, 2020
Cumulative Flows	-23.2%	-17.7%
<hr/>		
<u>Historical Comparison: Taper Tantrum</u>	May-Jun, 2013	Jun-Jul, 2013
Cumulative Flows	-2.2%	-2.4%

OTHER OBSERVATIONS

- **ETFs showed much greater resilience** during crisis period than mutual funds
 - Payoff structure does not create as much liquidity transformation, and so less prone to fragility
- **Equity mutual funds also showed resilience**, according to Pastor and Vorsatz (2020)
 - They also provide lower liquidity transformation
- Stress in corporate bond markets had peculiar features, whereby **more liquid securities experienced greater dislocations**, as documented by Haddad, Moreira, and Muir (2021)
 - Evidence by Ma, Xiao, and Zeng (2021) ties this to mutual funds following a pecking order and selling liquid securities in response to flows
- Mutual fund **outflows interacted with constraints on dealers** to aggravate illiquidity in corporate bond market
 - Evidence and quantification in Kargar, Lester, Lindsay, Liu, Weil, and Zuniga (2021)

HOW THE STRESS ENDED AND LESSONS GOING FORWARD

- The Federal Reserve interventions were crucial for alleviating the stress
 - Quick reversal of outflows after two announcements (March 23: PMCCF and SMCCF to purchase investment-grade bonds; April 9: Extend facilities to \$850bn and to purchase high-yield bonds if they were IG as of March 22)
 - Sustained recovery of flows over the post-crisis period (through August 2020) for funds that held more bonds eligible for purchase by the Fed facilities
- Going forward, underlying vulnerabilities should be assessed and potentially addressed:
 - Improving liquidity of underlying corporate bond assets
 - Reducing liquidity available to investors
 - Swing pricing has only recently been introduced in the U.S. but has not been adopted yet
 - Evidence from other countries before the Covid episode suggests it has been quite effective: Jin, Kacperczyk, Kahraman, and Suntheim (2020)