Fire sales of mutual funds

解读者：Tu Xueyong

2023.11.21

What’s the fire sale?

- “Fire sale” generally refers to a situation where goods or assets are sold at significantly reduced prices（抛售、甩卖）.

- In this topic, we focus on the fire sale of mutual funds

Why study the fire sale of mutual funds?

- Mutual funds are important institutional investors, and their investment behavior is crucial for understanding financial market trades

- Fire sales often happen with risks and panic. It is importance for asset pricing and stability in financial market.

How to measure the fire sale?

- Net flows

$$Flow_{i,t} = (TNA_{i,t} - (1 + r_{i,t})TNA_{i,t-1})/TNA_{i,t-1},$$

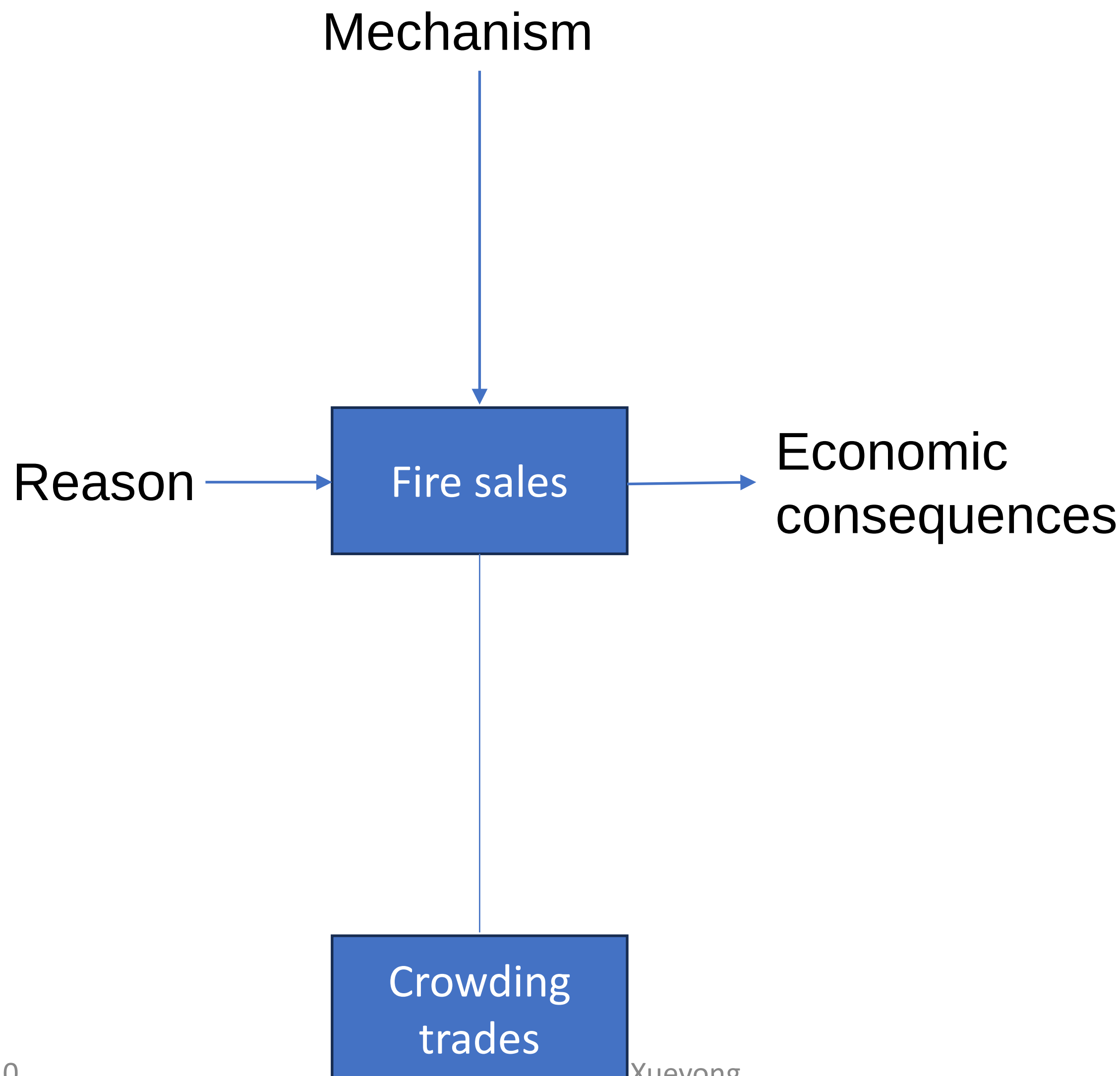
where $TNA_{i,t}$ is the total net assets under management of fund i in month t and $r_{i,t}$ is the fund's return (net of fees and expenses) over the period.

- Holdings

$$Flow\ Pressure_{b,t}^{j\neq i} = \frac{Flow\ Induced\ Buys_{b,t}^{j\neq i} - Flow\ Induced\ Sales_{b,t}^{j\neq i}}{Offering\ Value_b},$$

where $Flow\ Induced\ Buys_{b,t}^{j\neq i} = \sum_{j\neq i}(\max(0, \Delta Holdings_{j,b,t})|_{Flows_{j,t} > Percentile(90th)})$
and $Flow\ Induced\ Sales_{b,t}^{j\neq i} = \sum_{j\neq i}(\max(0, -\Delta Holdings_{j,b,t})|_{Flows_{j,t}, < Percentile(10th)})$.

Related directions on fire sales



Fire sale risk and expected stock returns

George O. Aragon a, Min S. Kim.

Journal of Financial Economics, 2023

1. Introduction-- Motivation

- Investor outflows from equity mutual funds can force fund managers to sell their stock holdings
  - At prices below fundamental values
  - Funds enter distress at the same time
- An interesting question is whether stocks earn a risk premium, ex-ante, from such mutual fund “fire sales”
- A possible channel is through a stock’s ownership links to mutual funds

1. Introduction-- Framework

Model of asset pricing with liquidity risk

$$E_t(r_{i,t+1}) = r_{f,t} + E_t(c_{i,t+1}) + \beta_{i,t}\lambda_t + \boxed{\beta_{i,t}^{f-}}\lambda_t^f,$$

↓

Fund's flow factor

PCA

↓

Fund's exposure to flows (β_k^-)

$$f_{k,q} = \alpha_k + \boxed{\beta_k^-} F_q^- + \beta_k^+ F_q^+ + e_{k,q},$$

↓

Stock's fire sale exposure (FSE)

$$FSE_{i,q} = \sum_{k=1}^{K} \beta_{k,q}^- \frac{shr_{i,k,q}}{\sum_{k=1}^{K} shr_{i,k,q}},$$

↓

Portfolio sort and Fama Macbeth

↓

Stocks with higher fire sale risk exposure earn higher returns

1. Introduction-- Contribution

- Contribute to existing evidence that the fire sales can negatively impact asset prices, **in the perspective of risk premiums**.
  - Equity markets (Coval and Stafford, 2007), bond markets (Manconi et al., 2012; Falato et al., 2021), international equity markets (Jotikasthira et al., 2012)
  - Nanda, Wu and Zhou (2019) use ownership by insurance companies as a proxy for fire sale risk in corporate bonds

- Contribute to recent research on how commonality in the holdings of institutional investors can impact asset prices, by the relationship of **mutual funds' fire sales and stocks returns**.
  - Foreign ownership linkages (Bartram et al. ,2015), Commonality in Liquidity (Koch, Ruenzi and Starks, 2016)

2. Methodology--Mutual fund flow betas

- Fund's flow factor
  - PCA is designed to statistically extract the factor from the quarterly net flows of U.S. equity mutual funds
  - The first PC is superior to asset-weighted average flows (value-weighted aggregate flows) in measuring commonality in flows

- Mutual fund flow betas

$$f_{k,q} = \alpha_k + \beta_k^- F_q^- + \beta_k^+ F_q^+ + e_{k,q},$$

where $f_{k,q}$ is fund *k*'s net flow in quarter *q*, $F_q^- \equiv \min\{F_q, 0\}$, $F_q^+ \equiv \max\{F_q, 0\}$, and F_q is the flow factor in quarter *q*. The loading β_k^- represents a fund's negative flow beta.

2. Methodology--Fire sale exposure

- Stock's fire sale exposure (FSE) as an ownership-weighted average of the negative flow betas of its mutual fund owners.

$$FSE_{i,q} = \sum_{k=1}^{K} \beta_{k,q}^{-} \frac{shr_{i,k,q}}{\sum_{k=1}^{K} shr_{i,k,q}},$$

- Where $shr_{i,k,q}$ is the number of shares of stock i that a fund k owns at the end of quarter q and K is the total number of mutual funds that hold shares of stock i.

- Stock's fire purchase exposure (FPE): β_k^{+} instead of β_k^{-}

3. Analysis and results

- Data

➢ CRSP stock files: obtain stock-level information

  - listed on NYSE/NASDAQ/AMEX
  - exclude stocks with prices less than $5

➢ Thomson-Reuters Mutual Fund Holdings database

  - open-end fund

➢ 1980Q2 to 2016Q4: use an expanding window to extract the timeseries of flow factor at the end of each quarter (36 quarters)

3. Analysis and results

- Fire Sale Risk Sorted Portfolios

Panel B: Returns on the *FSE* portfolios

FSE quintiles	VW	EW	DGTW VW	DGTW EW
1	0.084	0.112	-0.023	-0.012
2	0.094	0.112	-0.005	-0.005
3	0.100	0.114	0.002	0.001
4	0.126	0.125	0.008	0.002
5	0.149	0.144	0.019	0.014
High-Low	0.065	0.032	0.042	0.026
(t-statistics)	(4.175)	(3.489)	(4.141)	(3.964)

Panel C: Returns on the *FPE* portfolios

FPE quintiles	VW	EW	DGTW VW	DGTW EW
1	0.108	0.122	-0.006	-0.003
2	0.103	0.118	0.002	-0.003
3	0.105	0.121	-0.003	0.002
4	0.117	0.129	0.007	0.004
5	0.120	0.123	0.008	-0.002
High-Low	0.012	0.001	0.014	0.001
(t-statistics)	(0.507)	(0.082)	(0.320)	(0.875)

- FSE-based portfolio strategies are significantly profitable
- No evidence that FPE predicts higher stock returns

3. Analysis and results

- Fire Sale Risk Sorted Portfolios

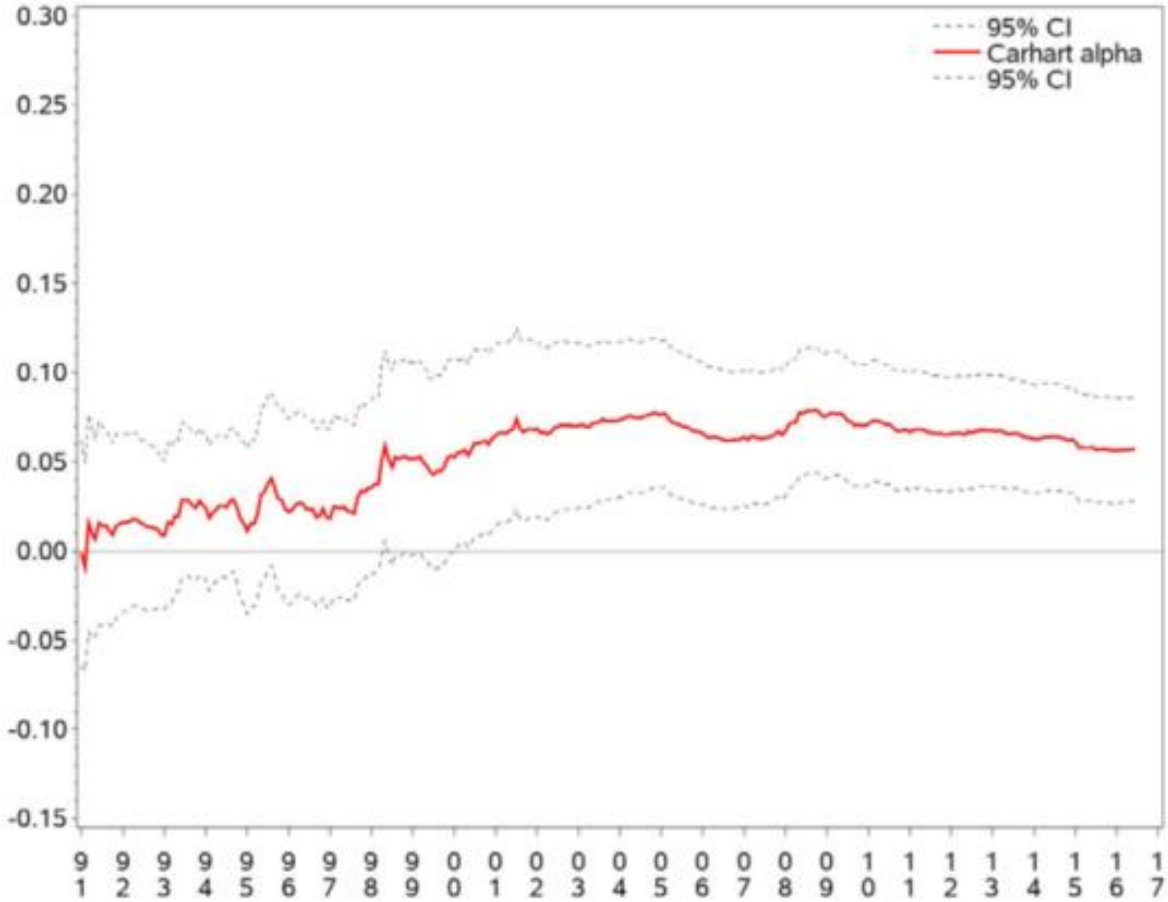
Panel A: Monthly value-weighted High-Low *FSE* quintile returns

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
alpha	0.057	0.056	0.057	0.054	0.053	0.052	0.054	0.054	0.054	0.054	0.049
	(3.457)	(3.424)	(3.390)	(3.214)	(2.912)	(2.979)	(2.810)	(3.117)	(2.842)	(3.288)	(2.532)
MKT	0.106	0.090	0.088	0.082	0.084	0.096	0.093	0.087	0.088	-0.003	-0.007
	(3.244)	(2.590)	(2.314)	(2.160)	(2.240)	(2.411)	(2.388)	(2.097)	(2.151)	(-0.085)	(-0.187)
HML		0.020	0.018	0.022	0.012	-0.025	-0.017	0.003	-0.001	0.028	-0.007
		(0.379)	(0.331)	(0.421)	(0.238)	(-0.440)	(-0.325)	(0.050)	(-0.014)	(0.470)	(-0.137)
SMB		0.112	0.112	0.113	0.114	0.127	0.127	0.118	0.118	0.086	0.088
		(1.834)	(1.848)	(1.897)	(1.894)	(2.027)	(1.989)	(1.885)	(1.865)	(1.368)	(1.422)
MOM			-0.006	-0.009	-0.013	-0.022	-0.017	-0.008	-0.010	0.015	0.004
			(-0.180)	(-0.282)	(-0.357)	(-0.693)	(-0.464)	(-0.237)	(-0.267)	(0.423)	(0.102)
LIQ				0.062	0.061	0.065	0.067	0.057	0.056	0.038	0.028
				(1.812)	(1.812)	(1.847)	(1.968)	(1.738)	(1.745)	(1.018)	(0.764)
BAB					0.016		-0.027		0.009		0.062
					(0.321)		(-0.452)		(0.168)		(1.024)
MFB						0.092	0.107				
						(1.693)	(1.694)				
COSKEW								0.059	0.056		
								(0.760)	(0.684)		
DOWNSIDE										0.130	0.150
										(3.354)	(3.245)
R^2	0.041	0.064	0.064	0.074	0.075	0.093	0.094	0.077	0.077	0.107	0.114
Adjusted R^2	0.038	0.055	0.053	0.060	0.058	0.076	0.074	0.060	0.057	0.090	0.095

➢ The alphas on the FSE spread portfolios are positive and significant across all models

3. Analysis and results

- Fire Sale Risk Sorted Portfolios



➢ The FSE alpha is larger and more significant in 1998 and afterwards.

3. Analysis and results

- Fama-MacBeth approach

	Future market-adjusted returns over 3 months (%)					
	(1)	(2)	(3)	(4)	(5)	(6)
FSE		0.021	0.019	0.018	0.010	0.009
		(2.362)	(2.211)	(2.082)	(0.940)	(0.831)
FSE × High ownership					0.042	0.043
					(2.932)	(2.958)
Book-to-market ratio	0.023	0.029	0.035	0.020	0.035	0.020
	(0.074)	(0.092)	(0.114)	(0.065)	(0.113)	(0.067)
Past one-year return (%)	0.006	0.006	0.009	0.009	0.009	0.009
	(1.101)	(1.304)	(2.292)	(2.484)	(2.037)	(2.501)
Log market cap	-0.113	-0.104	-0.105	-0.106	-0.103	-0.104
	(-0.888)	(-0.709)	(-0.791)	(-0.800)	(-0.919)	(-0.794)
Change in breadth	0.242	0.268	0.292	0.274	0.289	0.271
	(0.945)	(0.952)	(1.222)	(1.126)	(1.618)	(1.114)
Ownership (%)	0.000	-0.002	-0.005	-0.002	-0.016	-0.014
	(-0.014)	(-0.120)	(-0.301)	(-0.142)	(-1.103)	(-0.863)
Return two-month (%)	0.012	0.010	0.009	0.010	0.009	0.010
	(1.045)	(0.874)	(0.828)	(0.893)	(0.854)	(0.892)
Stock market beta		0.134	0.220	0.212	0.214	0.205
		(0.385)	(0.547)	(0.548)	(0.582)	(0.531)
Amihud illiquidity		0.062				
		(0.726)				

➢ A positive and significant relation between FSE and future stock returns

4. Additional tests

- Panel regressions with stock fixed effects
- Fire sale risk and mutual fund ownership(+)
- Alternative story: Fire sale risk or managerial skill? (former)
- FSE shocks around S&P 500 inclusion events (lower return)

5. Conclusions

- We construct a measure of a stock's exposure to fire sale risk (FSE)
- Investors demand a risk premium in anticipation of future fire sales
- The return premium associated with FSE cannot be fully explained by several other known contributors to expected stock returns

Fire-Sale Spillovers in Debt Markets

ANTONIO FALATO, ALI HORTAÇSU, DAN LI, and CHAEHEE SHIN

Journal of Finance, 2021

1. Introduction-- Motivation

- Theoretically
  - Distressed asset sales are particularly costly due to lack of supply liquidity.
  - Capital flows can force widespread trading in individual securities, affecting fund performance and eventually feeds back into capital flows (Coval and Stafford, 2007)
- No systematic attempt to test fire-sale spillovers empirically
- Postcrisis debate regarding threats to financial stability coming from nonbank financial institutions

1. Introduction-- Questions

- How the spillover effect of fire sales impact peer funds' performance and flows?
  - Fund's performance and flows are negatively affected by peer outflow-related asset sales
- How to deal with the endogeneity problem?
  - Three Experiments
- What's the implication for financial stability?
  - Systemicness and vulnerability are positively related with the volatility of fund and bond returns

1. Introduction-- Contribution

- Contribute to fire sales in finance, by first systematic study of the spillover effect of fire sales induced by peer fund flows.
  - Price impact of mutual fund sales on stock(Coval and Stafford, 2007; Khan et al., 2012; Jotikatshira et al., 2012; Chernenko and Sunderam, 2020)
  - Price pressure of insurance companies' fire-sale risk on bonds downgrades (Ellul et al., 2011; Feldhütter, 2012)

- Contribute to on vulnerability of financial institutions and stability in financial networks by fire-sale spillovers
  - focused on banks (Greenwood, Landier, and Thesmar,2015; Egan, Hortacsu, and Matvos, 2017)
  - fixed-income mutual funds focused on individual funds (Goldstein, Jiang, and Ng, 2017)

2. Data, Measurement, and Research Design

- Data

- Center for Research in Security Prices (CRSP) Survivorship-Bias-Free Mutual Fund Database
  - Monthly mutual fund flows and returns
  - Fund characteristics
  - Open-end fixed-income U.S. funds
- Thomson Reuter/Lipper eMAXX fixed-income database
  - Security-level fund holdings
- TRACE, Merrill Lynch database, Mergent Fixed Income Securities Database(FISD)
  - Bond characteristics
- 199801-201412

2. Data, Measurement, and Research Design

- Measuring Network Linkages among Funds

$$Peer\ Flow\ Pressure_{i,t} = \sum_{b=1}^{n} Flow\ Pressure_{b,t}^{j \neq i} * w_{i,b,t-1},$$

$$Flow\ Pressure_{b,t}^{j \neq i} = \frac{Flow\ Induced\ Buys_{b,t}^{j \neq i} - Flow\ Induced\ Sales_{b,t}^{j \neq i}}{Offering\ Value_b},$$

where $Flow\ Induced\ Buys_{b,t}^{j \neq i} = \sum_{j \neq i}(\max(0,\ \Delta Holdings_{j,b,t})|_{Flows_{j,t} > Percentile(90th)})$ and $Flow\ Induced\ Sales_{b,t}^{j \neq i} = \sum_{j \neq i}(\max(0,\ -\Delta Holdings_{j,b,t})|_{Flows_{j,t}, < Percentile(10th)})$.

$$Peer\ Buy\ Pressure_{i,t} = \sum_{b=1}^{n} \frac{Flow\ Induced\ Buys_{b,t}^{j \neq i}}{Offering\ Value_b} * w_{i,b,t-1},$$

$$Peer\ Sell\ Pressure_{i,t} = \sum_{b=1}^{n} \frac{Flow\ Induced\ Sales_{b,t}^{j \neq i}}{Offering\ Value_b} * w_{i,b,t-1}.$$

2. Data, Measurement, and Research Design

➢ Research Design and Identification Strategy

$$Y_{i,t} = \alpha + \beta \times Peer\ Flow\ Pressure_{i,t} + \gamma \times X_{i,t-1} + \eta_i + \lambda_t + \nu_{i,t},$$

- the outcome variables $Y_{i,t}$ for fund i in month t include the fund's **performance and net flows**

- Three "quasi-natural" experiments

$$Peer\ Treatment\ Pressure_{i,t} = \sum_{b=1}^{n} Treatment\ Pressure_{b,t}^{j \neq i} * w_{i,b,t-1},$$

$$Treatment\ Pressure_{b,t}^{j \neq i} = \frac{Treatment\ Induced\ Buys_{b,t}^{j \neq i} - Treatment\ Induced\ Sales_{b,t}^{j \neq i}}{Offering\ Value_b},$$

where $Treatment\ Induced\ Buys_{b,t}^{j \neq i} = \sum_{j \neq i} (\max(0, \Delta Holdings_{j,b,t})|_{Treatment_{j,t}=0})$
and $Treatment\ Induced\ Sales_{b,t}^{j \neq i} = \sum_{j \neq i} (\max(0, -\Delta Holdings_{j,b,t})|_{Treatment_{j,t}=1})$.

3. Motivating Evidence and Baseline Results

➢ Monthly Bond Price Changes

	Baseline		
	All Bonds (1)	Illiquid Bonds (2)	Illiquid Times (3)
Flow Pressure $Sd_{b,t}$	1.04***	3.25***	9.00***
	(0.11)	(0.37)	(0.90)
FE	Bond	Bond	Bond
N obs	429,449	83,156	47,724
N Bonds	10,880	4,698	3,008
R^2(%)	5.20	8.15	8.70
Sd LHS	4.99	9.33	9.38
IQR LHS	1.93	3.68	3.33

	Baseline		
	Asymmetry (1)	Time FE (2)	Matched Sample (3)
Buy Pressure $Sd_{b,t}$	0.75***	0.13	0.12
	(0.19)	(0.15)	(0.18)
Sell Pressure $Sd_{b,t}$	−1.71***	−1.05***	−0.78***
	(0.19)	(0.16)	(0.17)
FE	Bond	Time	Bond
N obs	429,449	429,449	429,449
R^2(%)	5.21	3.88	5.61

- Flow pressure positively affect bond price

3. Motivating Evidence and Baseline Results

➢ Fund Performance and Flows

	Monthly Return (pct)		
	All Funds (1)	Illiquid Funds (2)	Illiquid Times (3)
Peer Flow Pressure $\mathrm{Sd}_{i,t}$	0.35***	0.44***	1.22***
	(0.01)	(0.01)	(0.03)
Fund Controls	No	No	No
FE	Fund	Fund	Fund
N	330,429	58,323	40,908
$R^2(\%)$	1.95	4.21	8.79
Sd LHS	1.91	2.23	3.01
IQR LHS	1.58	1.99	2.82

	Monthly Flows (pct)		
	All Funds (1)	Illiquid Funds (2)	Illiquid Times (3)
Peer Flow Pressure $\mathrm{Sd}_{i,t}$	0.70***	0.99***	0.93***
	(0.03)	(0.11)	(0.10)
Fund Controls	No	No	No
FE	Fund	Fund	Fund
N	330,429	58,323	40,908
$R^2(\%)$	11.00	10.91	32.48
Sd LHS	8.55	9.51	9.16
IQR LHS	3.98	4.48	4.16

- Peer flow pressure positively affect fund performance and flows

3. Motivating Evidence and Baseline Results

$$Flow\ Pressure^{j\neq i}_{b,t} = \frac{Flow\ Induced\ Buys^{j\neq i}_{b,t} - Flow\ Induced\ Sales^{j\neq i}_{b,t}}{Offering\ Value_b},$$

where $Flow\ Induced\ Buys^{j\neq i}_{b,t} = \sum_{j\neq i}(\max(0, \Delta Holdings_{j,b,t})|_{Flows_{j,t}>Percentile(90th)})$ and $Flow\ Induced\ Sales^{j\neq i}_{b,t} = \sum_{j\neq i}(\max(0, -\Delta Holdings_{j,b,t})|_{Flows_{j,t}<Percentile(10th)})$.

- Second-Round Price Impact

	Baseline		
	All Bonds (1)	Illiquid Bonds (2)	Illiquid Times (3)
Peer Flow Pressure $Sd_{b,t}$	0.36***	0.63***	1.07***
	(0.01)	(0.03)	(0.07)
FE	Bond	Bond	Bond
N obs	429,449	83,156	47,724
N Bonds	10,880	4,698	3,008
R^2(%)	5.42	8.61	9.03
Sd LHS	4.99	9.33	9.38
IQR LHS	1.93	3.68	3.33

	Baseline		
	Asymmetry (1)	Time FE (2)	Matched Sample (3)
Peer Buy Pressure $Sd_{b,t}$	0.31***	0.15***	0.31***
	(0.02)	(0.02)	(0.02)
Peer Sell Pressure $Sd_{b,t}$	−0.29***	−0.24***	−0.29***
	(0.01)	(0.01)	(0.01)
FE	Bond	Time	Bond
N obs	429,449	429,449	429,449
R^2(%)	5.62	4.61	5.62

$$Peer\ Flow\ Pressure_{b,t} = \frac{Peer\ Flow\ Induced\ Buys_{b,t} - Peer\ Flow\ Induced\ Sales_{b,t}}{Offering\ Value_b},$$

$Peer\ Flow\ Induced\ Buys_{b,t} = \sum_j(\max(0, \Delta Holdings_{j,b,t})|_{Peer\ Flows\ Pressure_{j,t}>Percentile(90th)})$ and
$Peer\ Flow\ Induced\ Sales_{b,t} = \sum_j(\max(0, -\Delta Holdings_{j,b,t})|_{Peer\ Flows\ Pressure_{j,t}<Percentile(10th)})$.

- Sales by mutual funds whose peers are experiencing outflow pressure tend to harm bond valuations

4. Evidence from Three Experiments and Mechanism

- A standard endogeneity problem
  - Flows are endogenously related to fund characteristics, so the challenge is to distinguish peer funds' flow-driven trading driven by changes in fund flows due to changes in fundamentals or "shocks" that are common across funds that hold the same securities.

4. Evidence from Three Experiments and Mechanism

- The 2003 mutual fund trading scandal
  - $Treatment_{j,t}$ is a dummy equal to one after a fund is involved in the mutual fund scandal of 2003 ("Spitzer 2003") and zero otherwise.

- Morningstar five-star ratings
  - $Treatment_{j,t}$ is a dummy that takes a value of one for funds that are right below their respective rating category threshold and zero for funds that are right above it.

- The collapse of the convertible bond market in 2005
  - $Treatment_{j,t}$ indicator variable by interacting an indicator for the time period after 2005, with a dummy that is equal to one for **funds whose Lipper asset class is convertible bonds**, the "exposure" variable.

4. Evidence from Three Experiments

Panel A: Baseline								
	Bond Price Impact		Fund Performance		Fund Flows		Second-Round Price Impact*	
	All (1)	Top-Bottom (2)	Ret (3)	Large Und. (4)	% Flows (5)	Large Outfl. (6)	All (7)	Top-Bottom (8)
Treatment Pressure $Sd_{b,t}$	2.06***	3.48***						
	(0.41)	(0.52)						
Peer Treatment Pressure $Sd_{i,t}$			0.26 ***	-0.95***	0.77 ***	-0.75***	0.31 ***	0.29***
			(0.03)	(0.29)	(0.07)	(0.18)	(0.03)	(0.04)
FE	Bond	Bond	Fund	Fund	Fund	Fund	Bond	Bond
N obs.	91,505	49,122	41,640	41,640	41,640	41,640	91,505	15,989
Sd LHS	4.99		1.91		8.55		4.99	
IQR LHS	1.93		1.58		3.98		1.93	

- We find strong evidence of fire-sale feedback effects in debt markets

4. Implications for Financial Stability

$$\mathbf{W}_{i,t}^{j} = \sum_{b} \boldsymbol{I}_{b,t}^{j} * w_{b,t-1}$$

where $I_{b,t}^{j}$ is an indicator variable equal to one for securities held by fund *j* at time *t*

$$B \equiv \begin{bmatrix} . & \hat{\beta w}_{12} & . & . & \hat{\beta} w_{1N}. \\ \hat{\beta w}_{21} & . & . & . & . \\ . & . & . & . & . \\ . & . & . & . & \hat{\beta} w_{1,N-1} \\ \hat{\beta} w_{N1} & . & . & \hat{\beta} w_{N-1,1} & . \end{bmatrix}$$

$b_{i,j}$, gives the effect of a 100 bp increase in fund *j*'s pressure on *i*'s current flows

$$Vulnerability_i = \frac{1}{n}\sum_{s=1}^{\infty}\sum_{j=1}^{n} a^s b_{ij}^s$$

$$Systemicness_i = \frac{1}{n}\sum_{s=1}^{\infty}\sum_{j=1}^{n} a^s b_{ji}^s$$

a=0.9

- The vulnerability measure captures own-fund exposure to peer fire sales
- The systemicness measures captures the degree of other funds' exposure to a fund's own fire sales

4. Implications for Financial Stability

Panel A: Implications for the Volatility of Mutual Fund Sector Returns (pp)		
N = 192	Quarterly Vol. (1)	Annual Vol. (2)
[1] Systemicness_t	0.99***	1.03***
	(0.40)	(0.24)
R^2	1.60	6.03
[2] Vulnerability_t	1.03**	1.06***
	(0.40)	(0.24)
R^2	2.20	6.87
[3] Systemicness_t*Crisis	1.85***	1.81***
	(0.66)	(0.27)
R^2	18.89	45.20
[4] Vulnerability_t*Crisis	1.83***	1.79***
	(0.66)	(0.27)
R^2	18.93	47.89

Panel C: Implications for the Volatility & Comovement of Bond Returns (pp)		
N = 423,668	Quarterly Vol.	Quarterly β^{Bond}_{MKT}
[5] $\text{Systemicness}_{b,t}$	1.74***	2.78***
	(0.03)	(0.22)
R^2	14.90	10.43
[6] $\text{Vulnerability}_{b,t}$	1.25***	2.22***
	(0.03)	(0.21)
R^2	14.60	10.39

- Systemicness and vulnerability are positively related with the volatility of fund and bond returns

5. Conclusion

- To better understand the sources of run-like fragility that emanate from the asset management sector, we use a novel approach to measure **network linkages across funds**.

- We show that powerful **spillover effects** arise among funds that hold the same assets, with fire sales hurting peer funds’ performance and flows, leading to further asset sales that have a negative bond price impact.

Summary

- The reason of fire sales
- The formation of fire sales
- The effect of fire sales
- Other common trading behaviors of mutual funds