



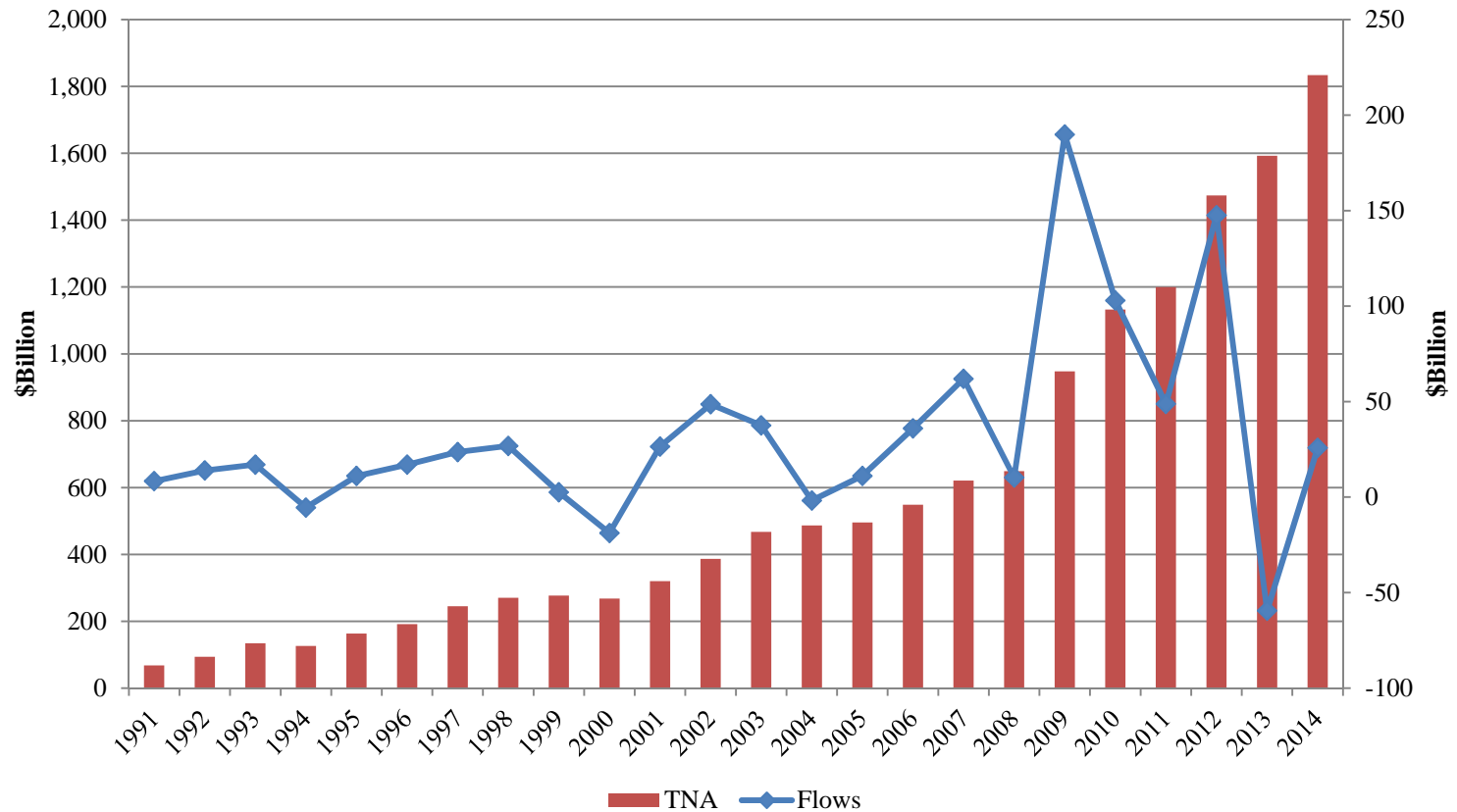
Investor Flows and Fragility in Corporate Bond Funds

Itay Goldstein, Wharton

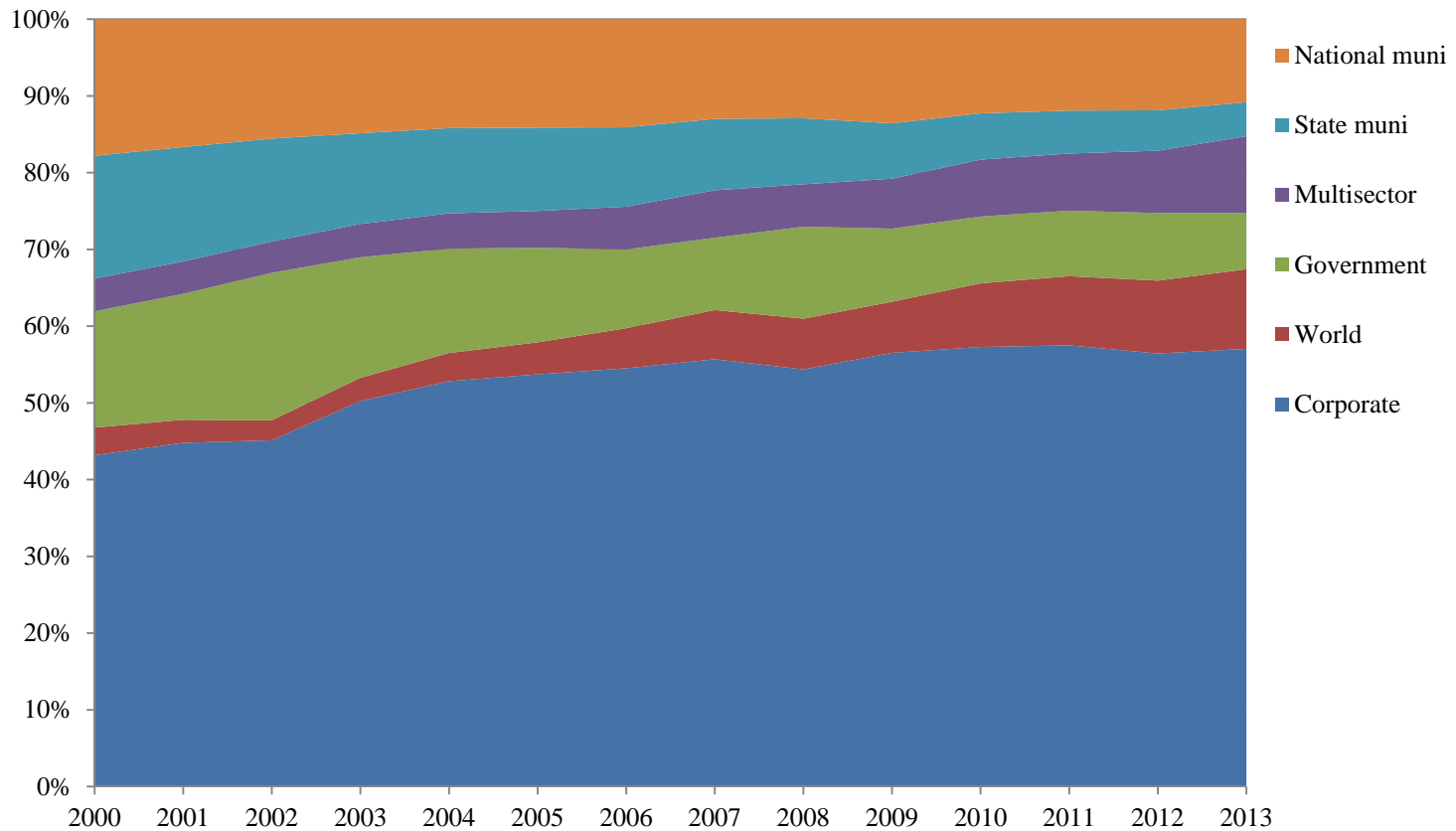
Hao Jiang, Michigan State

David Ng, Cornell

Total Net Assets and Dollar Flows of Active Corporate Bond Funds



Share of Corporate Bond Funds in Bond Funds





Concern for Fragility

- Massive inflows into corporate bond funds come 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
- Recent paper by Feroli, Kashyap, Schoenholtz, and Shin (2014) raises concerns for fragility and outflows in case of tightening of monetary policy
- Need more research on patterns of flows in corporate bond funds



Flow-Performance Relationship in Corporate Bond Funds

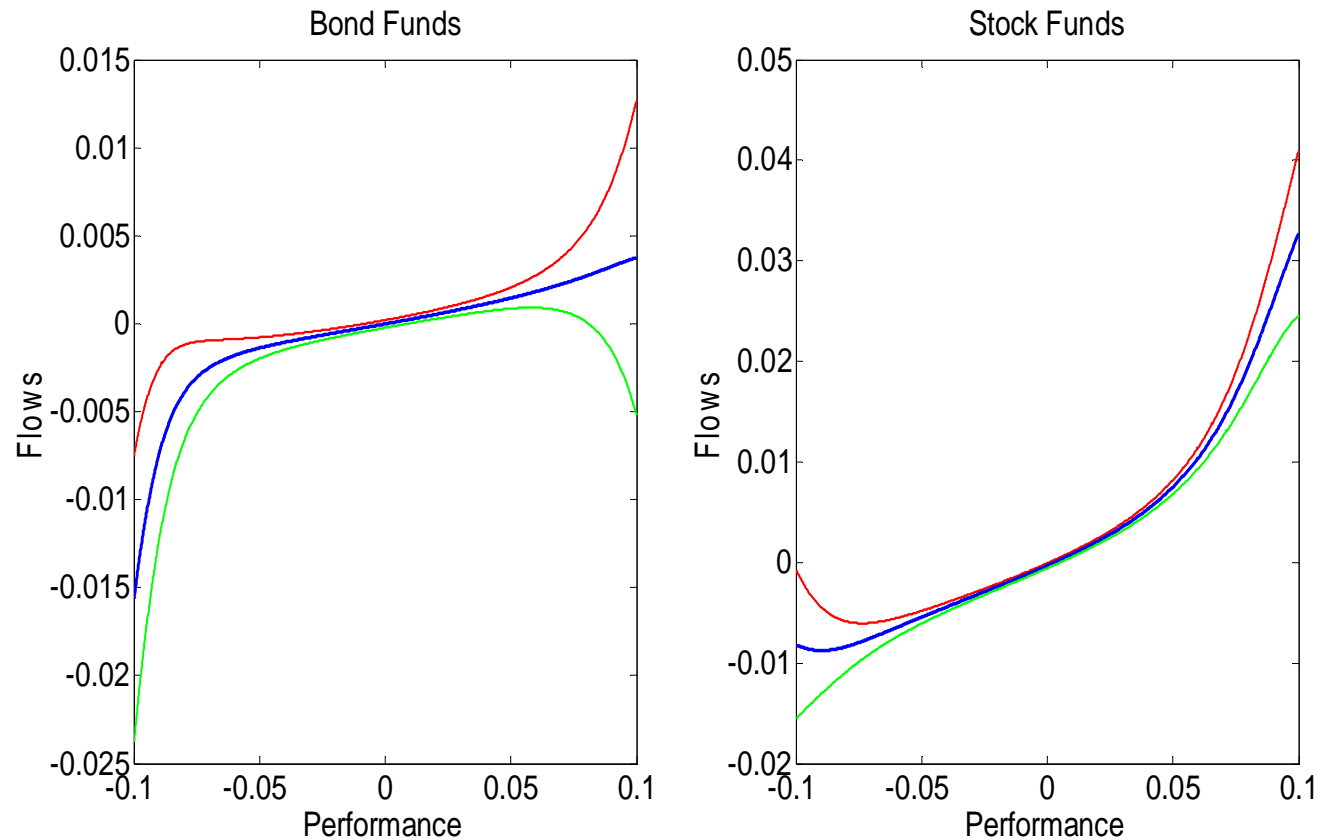
- Christoffersen, Musto, and Wermers (2014) survey vast literature on equity funds.
 - Chevalier and Ellison (1997), Sirri and Tufano (1998), Huang, Wei, and Yan (2007), Lynch and Musto (2003), Berk and Green (2004), Pastor and Stambaugh (2014)
 - Little research on flows in bond mutual funds
- Our paper fills the gap
 - We study flows in 1,660 actively-managed corporate bond funds from 1992-2014
 - We compare the pattern with that of equity funds
 - We link pattern to liquidity



Flow-Performance Relationship in Corporate Bond Funds

- A well-known pattern in equity funds is the convexity of flow to performance relationship
 - Outflows are not so sensitive to bad performance as inflows are sensitive to good performance
- We find that corporate bond funds are different: there is no convexity in flow-performance relation.
 - Outflows are at least as sensitive to bad performance as inflows are sensitive to good performance (relation is linear or concave)
 - Pattern strengthens with illiquidity

Flow Performance Relation of Corporate Bond Funds vs. Equity Funds

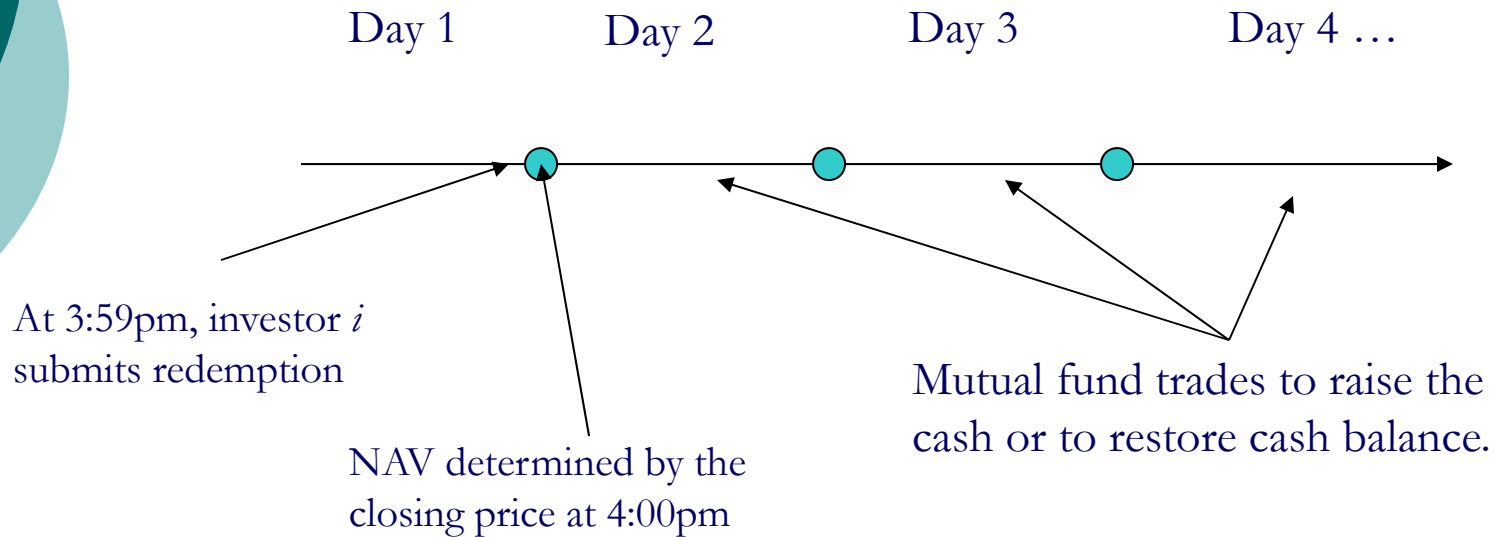




Potential Underlying Cause: First Mover Advantage

- Fund outflows lead to costly trades, damaging future returns. Cost of liquidation higher for illiquid funds.
- Since mutual funds conduct the trades after the day of redemption, most costs are borne by remaining shareholders.
- Strategic complementarity (i.e. first mover advantage): if expect other investors to withdraw money, then withdraw money first.
- Empirically, for more illiquid equity funds, past negative performance leads to higher outflows: Chen, Goldstein and Jiang (JFE, 2010).
- Pattern extends to corporate bond funds which are more illiquid than equity funds.

Complementarities in Mutual Funds Redemptions



- Source for complementarities:
 - Redemptions impose costs on remaining investors:
 - Costs include: commissions, bid-ask spread, price impact, forced deviation from desired portfolio, liquidity-based trading.



Corporate Bonds Are Illiquid

- Corporate bonds trade infrequently
 - Corporate bonds trade OTC; individual bond issues do not trade on 48% of days in their sample
 - Corporate bonds account for only ~ 2.5 to 3.7% of trading volume in U.S. bonds.
 - U.S. Treasuries account for 69% of volume.
- More difficult to get up-to-date price for corporate bonds
- Price impact and other illiquidity costs are high

Corporate bonds can generate stronger complementarities



Hypotheses Associated with Strategic Complementarities

- **I:** Corporate bond funds should exhibit a more concave flow-to-performance relationship than equity funds.
- **II:** During periods of higher illiquidity, corporate bond funds exhibit greater sensitivity of outflows to low past performance.
- **III:** Corporate bond funds with more illiquid assets exhibit greater sensitivity of outflows to low past performance.
- **IV:** The effect of illiquidity on the sensitivity of outflows to bad performance is weaker in funds that are held mostly by institutional investors.



Constructing flows

- CRSP survivorship bias free mutual fund data set from 1991 to 2014
- Each fund share class-month is one observation
- Back out net flows from the total net asset of each fund share-class.

$$Flow_{k,t} = \frac{TNA_{k,t} - TNA_{k,t-1}(1 + R_{k,t})}{TNA_{k,t-1}}$$

- where $R_{k,t}$ is the return of fund k during quarter t , and $TNA_{k,t}$ is the total net asset value at the end of quarter t . Fund flows are winsorized at the 1% and 99% percentiles.



Constructing alphas

- Use aggregate market (stock and bond) returns as benchmark.
- The two factors are CRSP VW for stocks and Vanguard Total Bond Index Fund Return for Bonds
- Compute past alpha by regressing excess bond fund returns on the two market excess returns from a time-series regression from month $t-12$ to $t-1$



Analyzing Flow-Performance Relationship

$$Flows_{i,t} = \beta_1 Alpha_{i,t-12,t-1} + \beta_2 Alpha_{i,t-12,t-1} * 1(Alpha_{i,t-12,t-1} < 0) + \sum_j \beta_j controls_{i,j,t} + \varepsilon_{i,t}$$

- Regress fund flows in month t on past fund alphas from month t-12 to month t-1
- Panel data regression
- Month fixed effect, fund share-class clustered SE
- Focus on interaction term to detect convexity vs. concavity

Flow-Performance Relations: Corporate Bond Funds versus Stock Funds. Table 2

	(1) Corporate Bond Funds	(2) Stock Funds
Alpha	0.238*** (2.71)	0.994*** (34.23)
Alpha× (Alpha<0)	0.621*** (4.34)	-0.575*** (-14.70)
Alpha<0	-0.00979*** (-18.45)	-0.00723*** (-25.06)
Lagged Flow	0.152*** (21.47)	0.118*** (29.90)
Log(TNA)	0.000728*** (5.74)	0.000459*** (5.46)
Log(Age)	-0.0157*** (-32.08)	-0.0183*** (-70.95)
Expense	-0.200*** (-2.59)	-0.0522 (-0.77)
Rear Load	-0.00280*** (-3.68)	-0.134*** (-5.51)
Observations	307,242	1,578,506
Adj. R2	0.0646	0.0583

Concavity Across Subsamples. Table 3

	(1)	(2)	(3)	(4)	(5)
	Young	Old	Low Flows	High Flows	Fund Fixed Effects
Alpha	0.411*** (2.58)	0.0630 (0.72)	0.0193 (0.15)	0.299*** (2.94)	0.166* (1.85)
Alpha × (Alpha < 0)	1.046*** (4.23)	0.534*** (4.04)	0.860*** (4.14)	0.531*** (3.68)	0.658*** (4.51)
(Alpha < 0)	-0.0118*** (-12.87)	-0.00717*** (-13.51)	-0.00977*** (-14.97)	-0.0104*** (-14.20)	-0.00971*** (-17.11)
Lagged Flow	0.153*** (17.53)	0.136*** (14.20)	0.123*** (15.02)	0.177*** (19.53)	0.0951*** (13.33)
Log(TNA)	0.000222 (1.21)	0.00120*** (7.22)	0.000317** (2.18)	0.00121*** (6.74)	0.00506*** (13.26)
Log(Age)	-0.0208*** (-19.37)	-0.00788*** (-11.73)	-0.0148*** (-27.84)	-0.0168*** (-26.24)	-0.0349*** (-26.39)
Expense	0.232* (1.93)	-0.578*** (-6.46)	-0.511*** (-6.13)	0.129 (1.26)	1.639*** (7.11)
Rear Load	-0.00299** (-2.41)	-0.00193** (-2.38)	-0.00322*** (-4.00)	-0.00238** (-2.33)	0.00202** (2.05)
Observations	145,739	161,503	163,258	143,984	307,242
Adj. R²	0.0566	0.0507	0.0503	0.0695	0.101

Robustness (1): Four other measures of fund performance

Based on

1. alpha from a one-factor model
 2. alpha based on predetermined fund betas
 3. style-adjusted fund returns
 4. fund returns in excess of the risk-free rate
- Corporate bond fund flow-performance relation is never convex. It is either concave or linear.
 - Equity funds consistently exhibit convex flow-performance relations in all specifications.



Hypotheses Associated with Strategic Complementarities

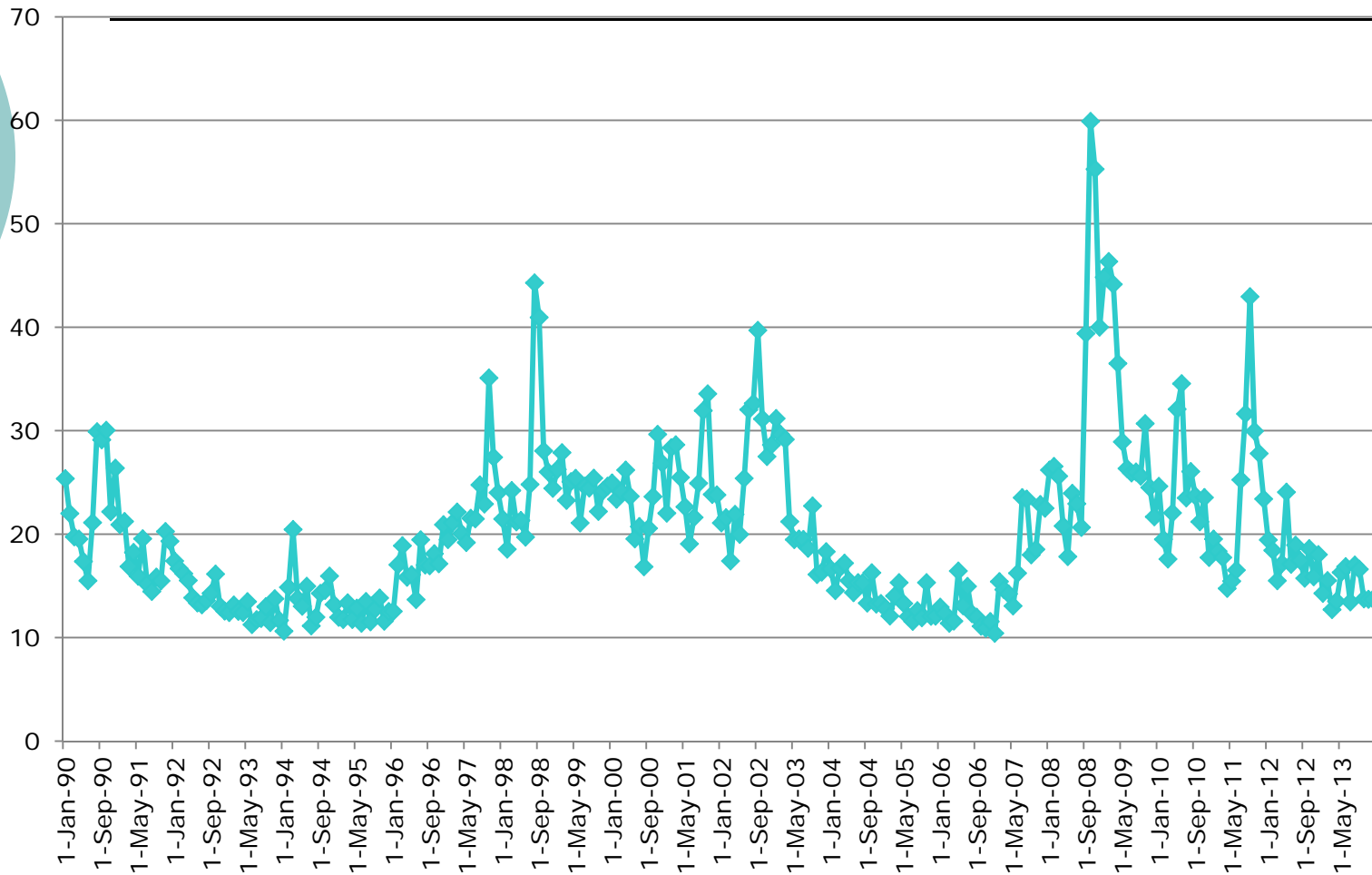
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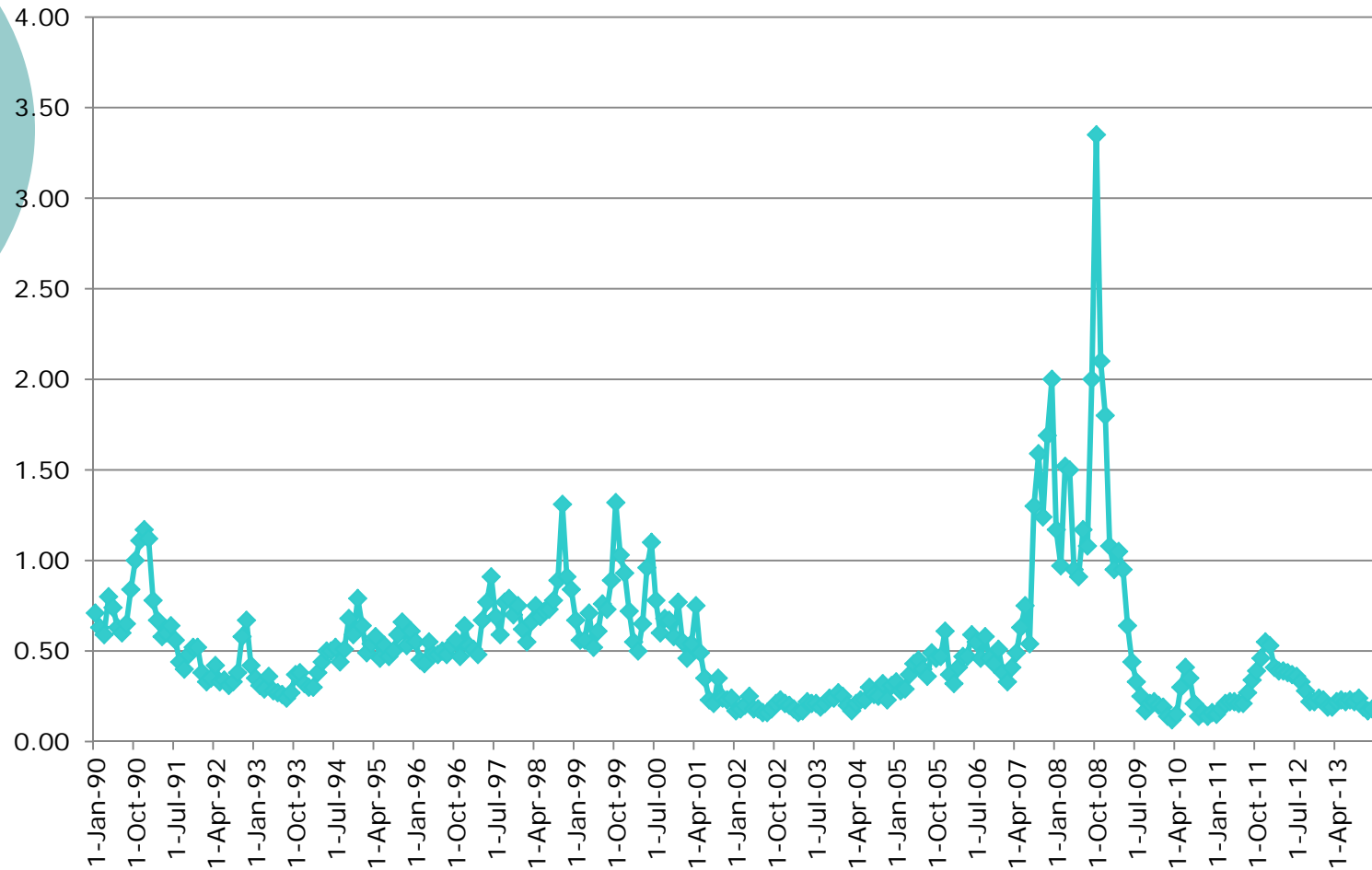
Aggregate Illiquidity and Flows in Corporate Bond Mutual Funds

- Aggregate illiquidity is measured by:
 - VIX
 - the TED spread
 - Dick-Nielsen, Feldhutter and Lando (2012)'s illiquidity measure based on corporate bond TRACE data
 - Implied Volatilities on T-Bonds (MOVE)
- Show that sensitivity of outflow to negative performance is greater when aggregate illiquidity is higher.

Liquid versus Illiquid Periods (VIX)



Liquid versus Illiquid Periods (TED)



Flow-Performance Relations of Underperforming Corporate Bond Funds during Illiquid Periods. (For Alpha < 0) Table 4

	(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

fund clustered SE

No fixed effect for month



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Cash holdings as bond fund liquidity

- When faced with large, abrupt net redemptions, cash provides fund managers with the most reliable source of liquidity.
- Endogeneity issue:
 - Level of cash holdings can reflect fund managers' anticipation of the fund's foreseeable liquidity needs, and could be endogenous.
 - This biases the results against finding evidence for the hypothesis.

Asset Liquidity and Flow-Performance Relation. Table 5A

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. R²	0.0500	0.0498	0.0473	0.0732	0.0750



Illiquidity proxies

- Cash
- Cash + government Bond
- Cash from NSAR filings of bonds
 - Collect SEC filing of N-SAR
 - Cash, short term debt, short term repo agreement.
Follow Chernenko and Sunderam (2015)



Two illiquid bond holding measures

- Approximate bid ask spread
- Illiquid bond holdings 1:
 - Roll (1984) measures the serial correlation of intraday bond returns
 - Bond price bounces back and forth between bid and ask; higher % bid-ask → more negative correlation
- Illiquid bond holdings 2:
 - Interquartile range of intraday bond prices
- Aggregate bond-level into fund-level

Interpreting Lower Cash Holdings

	Cash Holdings			Cash and Government Bond Holdings			NSAR Cash Holdings		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Alpha	0.420*** (5.98)	0.471*** (3.01)	0.279* (1.88)	0.415*** (5.75)	0.479*** (2.98)	0.276* (1.85)	0.478*** (5.61)	0.505*** (4.22)	0.337*** (3.11)
Alpha×IlliqFund	0.582** (2.28)	1.209*** (3.76)	0.840*** (2.91)	0.417* (1.67)	1.040*** (3.44)	0.658** (2.36)	0.471** (2.43)	1.035*** (3.80)	0.818*** (2.73)
Alpha×R²	0.543*** (2.61)		0.730*** (3.13)	0.643*** (2.95)		0.817*** (3.40)	0.538 (1.52)		0.516 (1.15)
Alpha×PastFlow		-0.440*** (-3.15)	-0.454*** (-3.07)		-0.434*** (-3.10)	-0.449*** (-3.04)		-0.331*** (-3.08)	-0.329*** (-2.81)
IlliqFund	7.72e-05 (0.10)	0.000848 (1.03)	0.000561 (0.70)	0.00181** (2.42)	0.00209*** (2.64)	0.00218*** (2.82)	0.00152 (1.27)	0.00232* (1.84)	0.00215* (1.70)
R²	0.0174*** (8.57)		0.0178*** (8.85)	0.0181*** (8.96)		0.0186*** (9.25)	0.0199*** (6.43)		0.0198*** (6.23)
Lagged Flow	0.131*** (12.63)	0.130*** (12.60)	0.129*** (12.51)	0.131*** (12.64)	0.131*** (12.62)	0.129*** (12.53)	0.120*** (7.19)	0.120*** (7.22)	0.119*** (7.16)
Log(TNA)	0.000632*** (3.69)	0.000520*** (3.03)	0.000602*** (3.52)	0.000638*** (3.72)	0.000520*** (3.03)	0.000610*** (3.56)	0.000549** (2.07)	0.000507* (1.90)	0.000537** (2.04)
Log(Age)	-0.0137*** (-20.68)	-0.0128*** (-18.44)	-0.0130*** (-18.81)	-0.0137*** (-20.68)	-0.0128*** (-18.44)	-0.0130*** (-18.84)	-0.0138*** (-14.56)	-0.0133*** (-13.99)	-0.0133*** (-14.09)
Expense	-0.495*** (-4.58)	-0.516*** (-4.83)	-0.494*** (-4.62)	-0.499*** (-4.60)	-0.521*** (-4.86)	-0.497*** (-4.64)	-0.563*** (-3.31)	-0.559*** (-3.29)	-0.563*** (-3.34)
Rear Load	-0.00412*** (-4.18)	-0.00411*** (-4.22)	-0.00389*** (-4.00)	-0.00408*** (-4.14)	-0.00408*** (-4.17)	-0.00385*** (-3.95)	-0.00195 (-1.29)	-0.00184 (-1.21)	-0.00171 (-1.14)
Observations	104,198	104,198	104,198	104,198	104,198	104,198	48,537	48,537	48,537
Adj. R²	0.0509	0.0509	0.0523	0.0509	0.0507	0.0522	0.0474	0.0467	0.0481



Is outflow sensitivity high for illiquid funds during illiquid times?

- Three way interactions

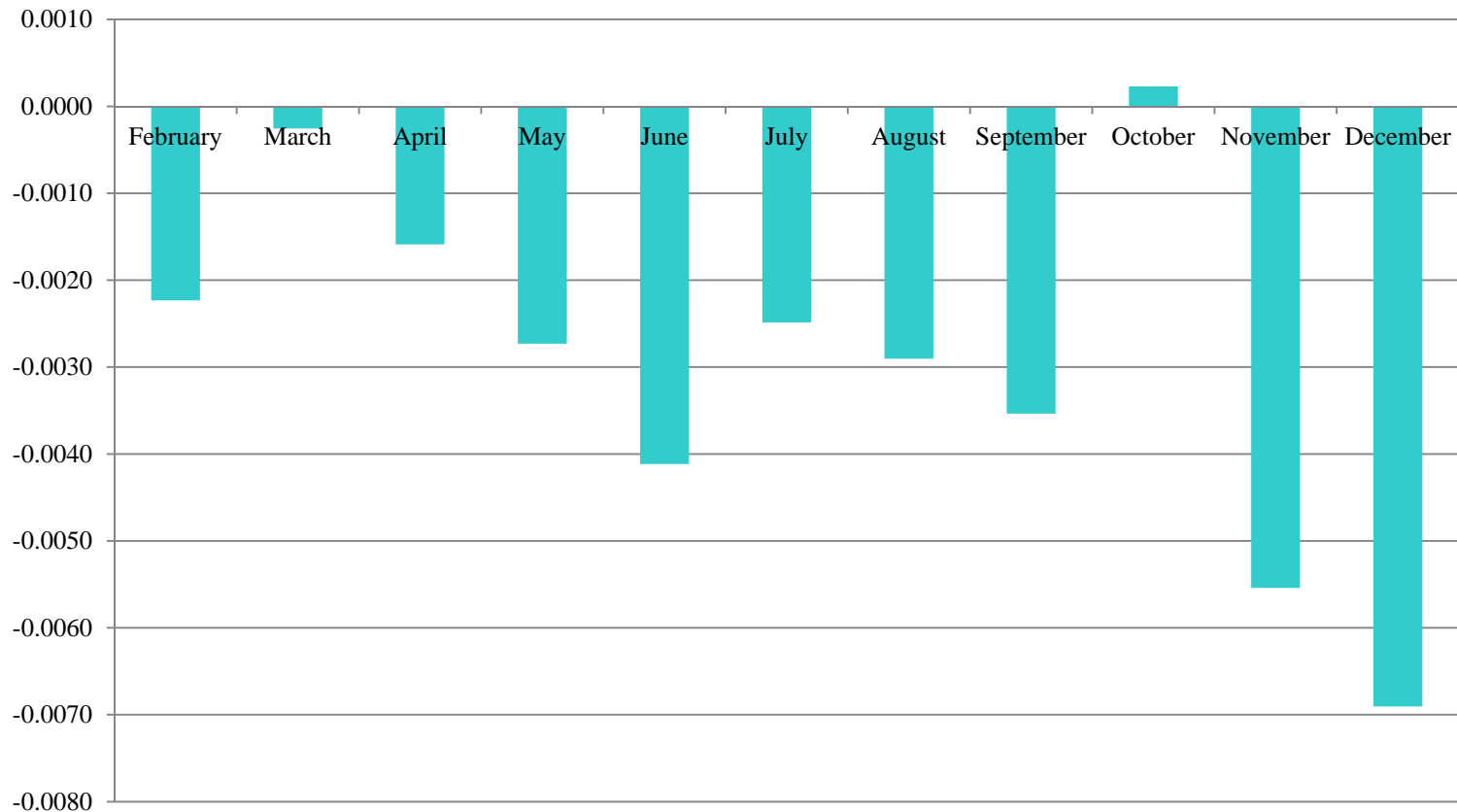
$$Flow_{i,t} = \alpha + \beta_1 Alpha_{i,t-12 \rightarrow t-1} + \beta_2 Alpha_{i,t-12 \rightarrow t-1} \times IlliqPeriod_t \times IlliqFund_{i,t} + \beta_3 Alpha_{i,t-12 \rightarrow t-1} \times IlliqFund_{i,t} + \gamma \times Controls_{i,t} + \varepsilon_{i,t},$$
$$\forall Alpha_{i,t-12 \rightarrow t-1} < 0$$

- Where $Flow_{i,t}$ is fund i 's net flow in month t ; $Alpha_{i,t-12 \rightarrow t-1}$ is fund i 's alpha in the past one year, $IlliqFund_{i,t}$ is an indicator variable that equals to one if the fund has cash and government bond holdings below the average fund in the same style and zero otherwise

Flow Performance for Illiquid Assets during Illiquid Periods. Table 6

Alpha<0	(1) VIX	(2) TED	(3) DFL	(4) MOVE
Alpha	0.345 (1.22)	-0.394 (-1.03)	0.00548 (0.01)	-0.0873 (-0.22)
Alpha×IlliqPeriod×IlliqFund	2.705*** (6.38)	1.410** (2.51)	2.191*** (4.00)	1.682*** (3.19)
Alpha×IlliqPeriod	0.159 (0.52)	0.921** (2.35)	0.517 (1.23)	0.556 (1.33)
Alpha×IlliqFund	-1.765*** (-5.12)	-0.564 (-1.37)	-1.377*** (-2.87)	-1.020** (-2.29)
IlliqPeriod×IlliqFund	0.00339** (2.09)	-0.000202 (-0.13)	0.00292* (1.67)	0.00187 (1.20)
IlliqPeriod	0.00689*** (5.65)	0.00710*** (5.97)	0.00625*** (4.65)	0.00353*** (2.91)
IlliqFund	-0.00213*** (-2.60)	-0.000331 (-0.39)	-0.00220** (-2.30)	-0.00162* (-1.81)
Lagged Flow	0.138*** (12.99)	0.138*** (13.01)	0.150*** (14.12)	0.139*** (13.05)
Log(TNA)	0.000607*** (3.51)	0.000582*** (3.37)	0.000555*** (2.99)	0.000558*** (3.24)
Log(Age)	-0.0132*** (-19.59)	-0.0130*** (-19.34)	-0.0125*** (-17.17)	-0.0129*** (-19.27)
Expense	-0.497*** (-4.43)	-0.506*** (-4.52)	-0.371*** (-3.05)	-0.526*** (-4.71)
Rear Load	-0.00570*** (-5.71)	-0.00580*** (-5.79)	-0.00667*** (-6.22)	-0.00552*** (-5.53)
Observations	108,745	108,745	94,640	108,745
Adj. R ²	0.0411	0.0406	0.0431	0.0400

Seasonality of Monthly Flows for Underperforming Corporate Bond Funds. Figure 4



Tax loss selling and Outflows from Illiquid Funds.

Table 7

Alpha	<u>Low Cash</u>		<u>Low (Cash + Government Bonds)</u>	
	<u>Alpha <0</u>	<u>Alpha >=0</u>	<u>Alpha <0</u>	<u>Alpha >=0</u>
	0.357*** (5.56)	0.502*** (3.25)	0.400*** (6.08)	0.516*** (3.21)
Alpha×IlliqFund×YearEnd	1.001*** (2.76)	-0.139 (-0.63)	1.386*** (3.64)	-0.152 (-0.63)
Alpha×IlliqFund	-0.383* (-1.90)	-0.106 (-0.63)	-0.637*** (-3.26)	-0.144 (-0.79)
IlliqFund×YearEnd	0.000206 (0.15)	0.000722 (0.45)	0.000568 (0.42)	0.00200 (1.16)
Alpha×YearEnd	0.0955 (0.87)	-0.292 (-1.59)	0.0178 (0.17)	-0.288 (-1.41)
YearEnd	-0.00325*** (-3.41)	-0.000545 (-0.47)	-0.00309*** (-3.24)	-0.00136 (-0.99)
IlliqFund	-0.00340*** (-4.50)	-0.00407*** (-4.63)	-0.00129* (-1.71)	-0.00315*** (-3.34)
Lagged Flow	0.139*** (13.14)	0.203*** (19.07)	0.140*** (13.18)	0.203*** (19.11)
Log(TNA)	0.000623*** (3.58)	0.000202 (1.03)	0.000598*** (3.44)	0.000183 (0.93)
Log(Age)	-0.0130*** (-19.27)	-0.0154*** (-22.33)	-0.0130*** (-19.15)	-0.0154*** (-22.12)
Expense	-0.486*** (-4.36)	-0.772*** (-6.94)	-0.493*** (-4.40)	-0.773*** (-6.90)
Rear Load	-0.00549*** (-5.48)	-0.00426*** (-4.09)	-0.00556*** (-5.53)	-0.00442*** (-4.23)
Observations	108,745	105,288	108,745	105,288
Adj. R²	0.0400	0.0696	0.0398	0.0693



Evidence of first mover advantage

- Quantify the gains of running for exits by estimating the **impact of outflows on fund returns**, similar in spirit to Amihud (2002) which gauges the effect of investor order flows on stock returns.

$$R_{i,t} = \alpha + \beta_1 Flow_{i,t} + \beta_2 Flow_{i,t} \times IlliqPeriod_t \times IlliqFund_{i,t} + \beta_3 Flow_{i,t} \times IlliqPeriod_t + \beta_4 Flow_{i,t} \times IlliqFund_{i,t} + \gamma \times Controls_{i,t} + \varepsilon_{i,t}, \forall \text{Alpha}_{i,t-12 \rightarrow t-1} < 0$$

- where $R_{i,t}$ and $Flow_{i,t}$ denote fund i 's net return and flow in month t , and $IlliqPeriod_t$ is an indicator variable equal to one if the particular illiquidity proxy (the VIX, TED spread, DFL, or MOVE index) is above the sample mean and zero otherwise.

Impact of Flows on Returns to Underperforming Funds. Table 8

Alpha<0	(1) VIX	(2) TED	(3) DFL	(4) MOVE
Flow	0.00559*** (6.01)	0.00774*** (4.95)	0.00532*** (5.72)	0.00535*** (5.30)
Flow×IlliqPeriod×IlliqFund	0.0127*** (3.13)	0.0135*** (3.12)	0.0146*** (3.36)	0.00503 (1.24)
Flow×IlliqPeriod	0.0167*** (6.57)	0.0114*** (4.00)	0.0180*** (6.74)	0.0180*** (6.50)
Flow×IlliqFund	0.00310** (2.51)	0.00273 (1.49)	0.00249* (1.93)	0.00498*** (3.77)
IlliqPeriod×IlliqFund	-0.00175*** (-5.25)	-4.74e-05 (-0.16)	-0.00116*** (-3.46)	-0.000935*** (-3.28)
IlliqPeriod	-0.00238*** (-9.20)	-0.00213*** (-10.62)	-0.00370*** (-14.58)	-0.00419*** (-20.36)
IlliqFund	0.000897*** (8.25)	0.000475*** (4.76)	0.000817*** (7.06)	0.000726*** (6.93)
Past Alpha	0.657*** (7.52)	0.687*** (8.75)	0.638*** (7.02)	0.641*** (7.31)
Lagged Flow	0.00367*** (5.37)	0.00314*** (4.64)	0.00450*** (5.94)	0.00328*** (4.81)
Log(TNA)	0.000175*** (5.96)	0.000187*** (6.59)	0.000192*** (5.75)	0.000163*** (5.73)
Log(Age)	0.000239*** (2.59)	0.000157* (1.78)	0.000339*** (3.11)	0.000142 (1.62)
Expense	0.0273 (1.54)	0.0357** (2.10)	0.0564*** (2.80)	0.0175 (1.00)
Rear Load	-0.000264 (-1.56)	-0.000196 (-1.19)	-0.000938*** (-5.00)	-8.01e-05 (-0.48)
Observations	108,745	108,745	94,640	108,745
Adj. R ²	0.0467	0.0416	0.0519	0.0532



Hypotheses Associated with Strategic Complementarities

- **I:** Corporate bond funds should exhibit a more concave flow-to-performance relationship than equity funds .
- **II:** During periods of higher illiquidity, corporate bond funds exhibit greater sensitivity of outflows to low past performance.
- **III:** Corporate bond funds with more illiquid assets exhibit greater sensitivity of outflows to low past performance.
- **IV:** The effect of illiquidity on the sensitivity of outflows to bad performance is weaker in funds that are held mostly by institutional investors.



Institutional vs. Individual Investors

- Large institutional investors hold larger positions in the funds and so they are more likely to internalize the negative externalities generated by their outflows.
- They serve as a constraining force in reducing coordination problems that lead to runs on funds.
 - See full argument in Chen, Goldstein, and Jiang (2010).
- We find the effect of illiquidity on sensitivity of outflow to bad performance to be weaker in institutional-oriented funds.

Institutional Investors and the Impact of Liquidity on Outflows of Underperforming Corporate Bond Funds. Table 9A

<u>Alpha<0</u>	<u>Institutional-Oriented Funds</u>		<u>Retail-Oriented Funds</u>	
	(1)	(2)	(3)	(4)
Alpha	2.056*** (3.61)	2.042*** (3.58)	0.958** (2.28)	1.024** (2.44)
Alpha×LowCash	-0.906 (-1.17)	-0.898 (-1.17)	1.268*** (2.90)	1.236*** (2.83)
Low Cash	-0.00304 (-1.57)	-0.00301 (-1.56)	-0.000683 (-0.52)	-0.00100 (-0.76)
Lagged Flow	0.108*** (5.35)	0.108*** (5.34)	0.106*** (4.86)	0.105*** (4.82)
Log(TNA)	0.000324 (0.89)	0.000391 (1.03)	0.000489 (1.40)	0.000822** (2.22)
Log(Age)	-0.0163*** (-9.70)	-0.0164*** (-9.58)	-0.0132*** (-10.57)	-0.0124*** (-9.96)
Expense	0.0469 (0.14)	-0.0168 (-0.05)	-0.543*** (-3.02)	-0.331* (-1.81)
Rear Load	-0.00340 (-1.21)	-0.00352 (-1.25)	-0.00639*** (-4.11)	-0.0062*** (-3.99)
Inst		-0.00123 (-0.48)		0.00766*** (4.03)
Observations	19,331	19,331	37,367	37,367
Adj. R ²	0.0398	0.0398	0.0490	0.0500

Liquidity of Corporate Bond Markets. Table 9B

<u>Alpha<0</u>	<u>Institutional-Oriented</u>				<u>Retail-Oriented</u>			
	(1) VIX	(2) TED	(3) DFL	(4) MOVE	(5) VIX	(6) TED	(7) DFL	(8) MOVE
Alpha	1.207 (1.40)	0.680 (1.16)	0.817 (1.09)	0.724 (1.05)	0.473 (1.04)	0.527 (1.26)	0.682* (1.71)	0.588 (1.31)
Alpha×IlliqPeriod	0.478 (0.68)	1.715** (2.24)	0.801 (1.22)	1.298** (1.98)	1.996*** (3.38)	2.443*** (3.80)	1.704*** (3.09)	1.950*** (3.20)
IlliqPeriod	-0.0104 (-0.46)	-0.0287 (-1.36)	-0.0550* (-1.87)	-0.0185 (-0.32)	0.0180 (1.26)	0.0238*** (3.59)	0.0181 (1.26)	-0.0646* (-1.88)
Lagged Flow	0.108*** (5.35)	0.108*** (5.33)	0.116*** (5.43)	0.108*** (5.34)	0.106*** (4.86)	0.106*** (4.84)	0.126*** (6.01)	0.106*** (4.87)
Log(TNA)	0.000282 (0.78)	0.000240 (0.66)	0.000630 (1.60)	0.000254 (0.70)	0.000466 (1.33)	0.000466 (1.34)	0.000376 (1.02)	0.000462 (1.33)
Log(Age)	-0.0162*** (-9.61)	-0.0161*** (-9.57)	-0.0152*** (-8.74)	-0.0162*** (-9.61)	-0.0133*** (-10.54)	-0.0133*** (-10.57)	-0.0133*** (-10.11)	-0.0133*** (-10.56)
Expense	0.00547 (0.02)	-0.0268 (-0.08)	0.120 (0.34)	-0.0201 (-0.06)	-0.564*** (-3.15)	-0.555*** (-3.10)	-0.483** (-2.48)	-0.560*** (-3.14)
Rear Load	-0.00346 (-1.23)	-0.00315 (-1.12)	-0.00318 (-1.08)	-0.00335 (-1.19)	-0.00659*** (-4.19)	-0.0065*** (-4.17)	-0.0069*** (-4.22)	-0.00662*** (-4.21)
Observations	19,331	19,331	16,514	19,331	37,367	37,367	32,600	37,367
Adj. R²	0.0397	0.0401	0.0407	0.0399	0.0489	0.0492	0.0529	0.0489



Is it Illiquidity or Payoff Structure

- The difference between equity funds and corporate bond funds could be coming from different payoff structure.
- We look at Treasury bond funds:
 - Similar payoff structure to other bond funds
 - But hold much more liquid assets
 - Treasuries do not suffer from the problem of corporate bonds mentioned above
- Treasury bond funds exhibit a convex flow-performance relation just like equity funds.

Flow-Performance Relations for Treasury and Muni Bond Funds. Table 10

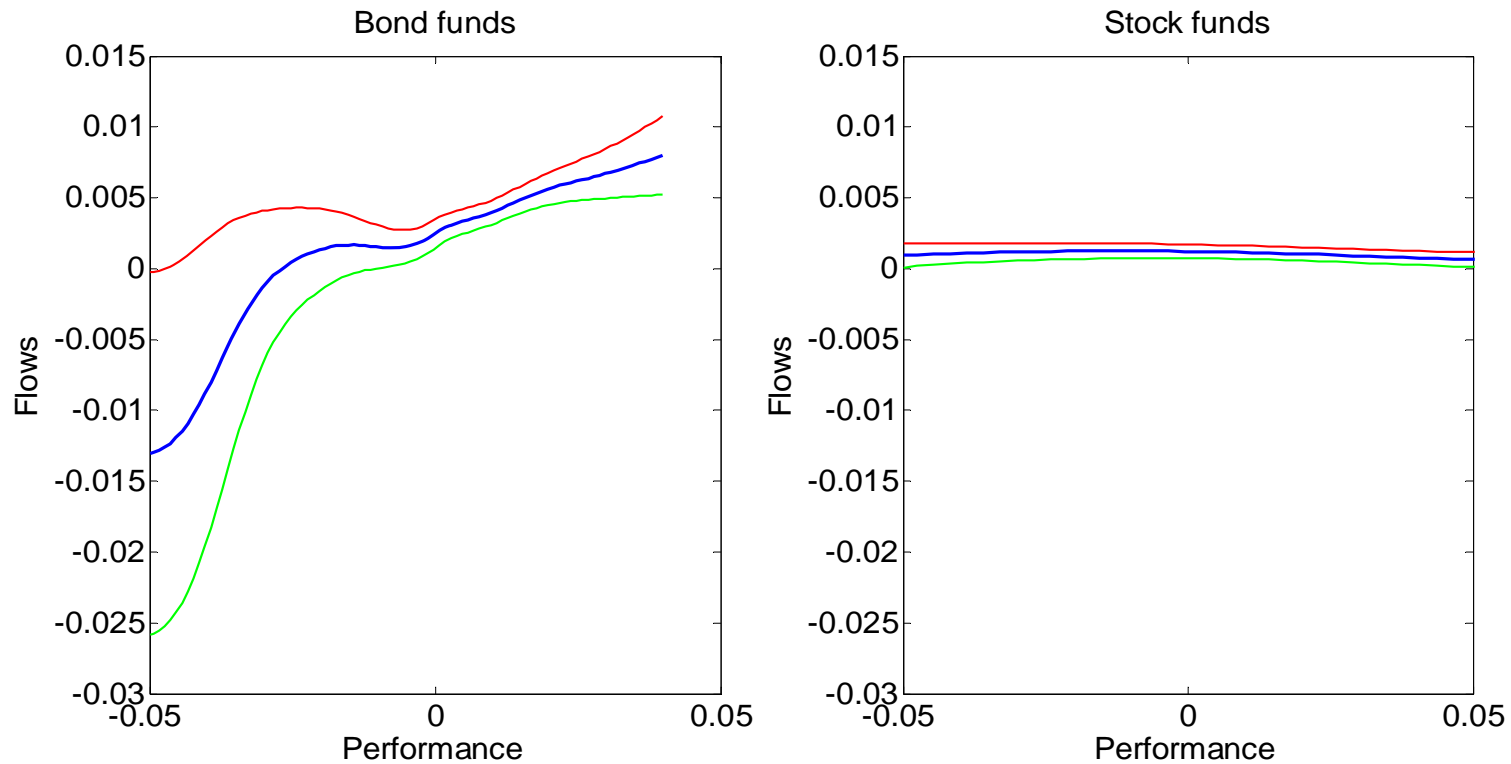
	(1)	(2)
	<u>Treasury Bond Funds</u>	<u>Muni Bond Funds</u>
Alpha	2.432*** (3.65)	0.186** (2.05)
Alpha× (Alpha<0)	-2.062** (-2.24)	0.711*** (4.75)
Alpha<0	-0.00509*** (-3.97)	-0.00657*** (-16.27)
Lagged Flow	0.109*** (6.20)	0.204*** (26.51)
Log(TNA)	0.000489* (1.78)	0.00117*** (10.75)
Log(Age)	-0.0171*** (-16.32)	-0.0138*** (-35.89)
Expense	-0.282* (-1.65)	-0.373*** (-5.44)
Rear Load	-0.00442** (-2.40)	-0.000973* (-1.87)
Observations	79,594	288,373
Adj. R²	0.0825	0.126



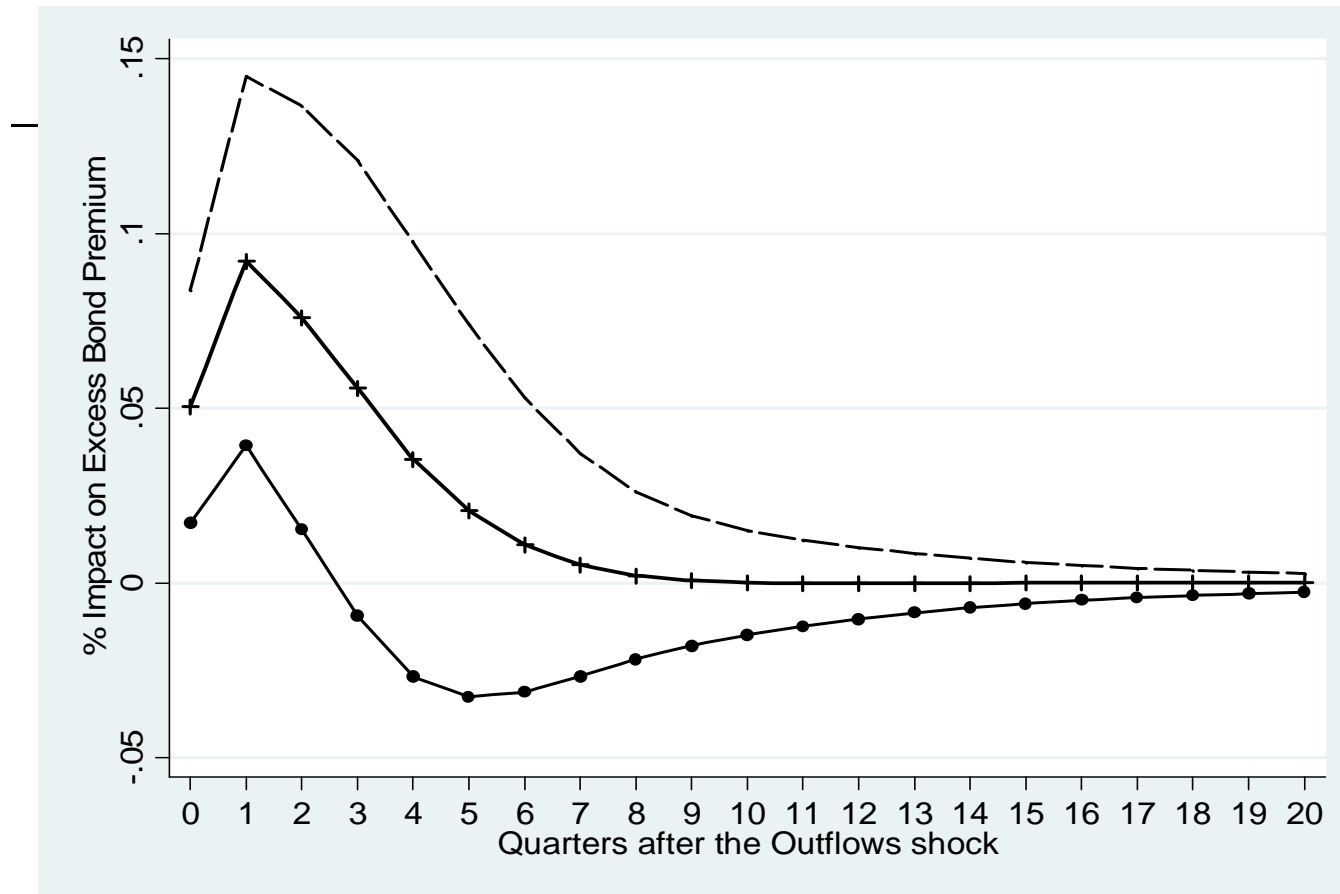
Economic impact of Corporate Bond Fund Flows

- Do outflows in bond funds have significant implications on market prices and the real economy?
- Exploratory evidence
 - Evaluate how corporate bond fund flows are related to Gilchrist and Zakrajsek (2012)'s excess bond premium.
 - Conduct a bivariate VAR with quarterly corporate bond fund outflows and excess bond premium on a quarterly basis, and estimate the response of EBP to shocks to the corporate bond fund outflow.
 - Estimate the effect of corporate bond fund outflows on real-economy variables.
 - Sample period is from 1991Q1 to 2010Q3 with two lags of the endogenous variables.

Does redemption sensitivity disappear in aggregation?

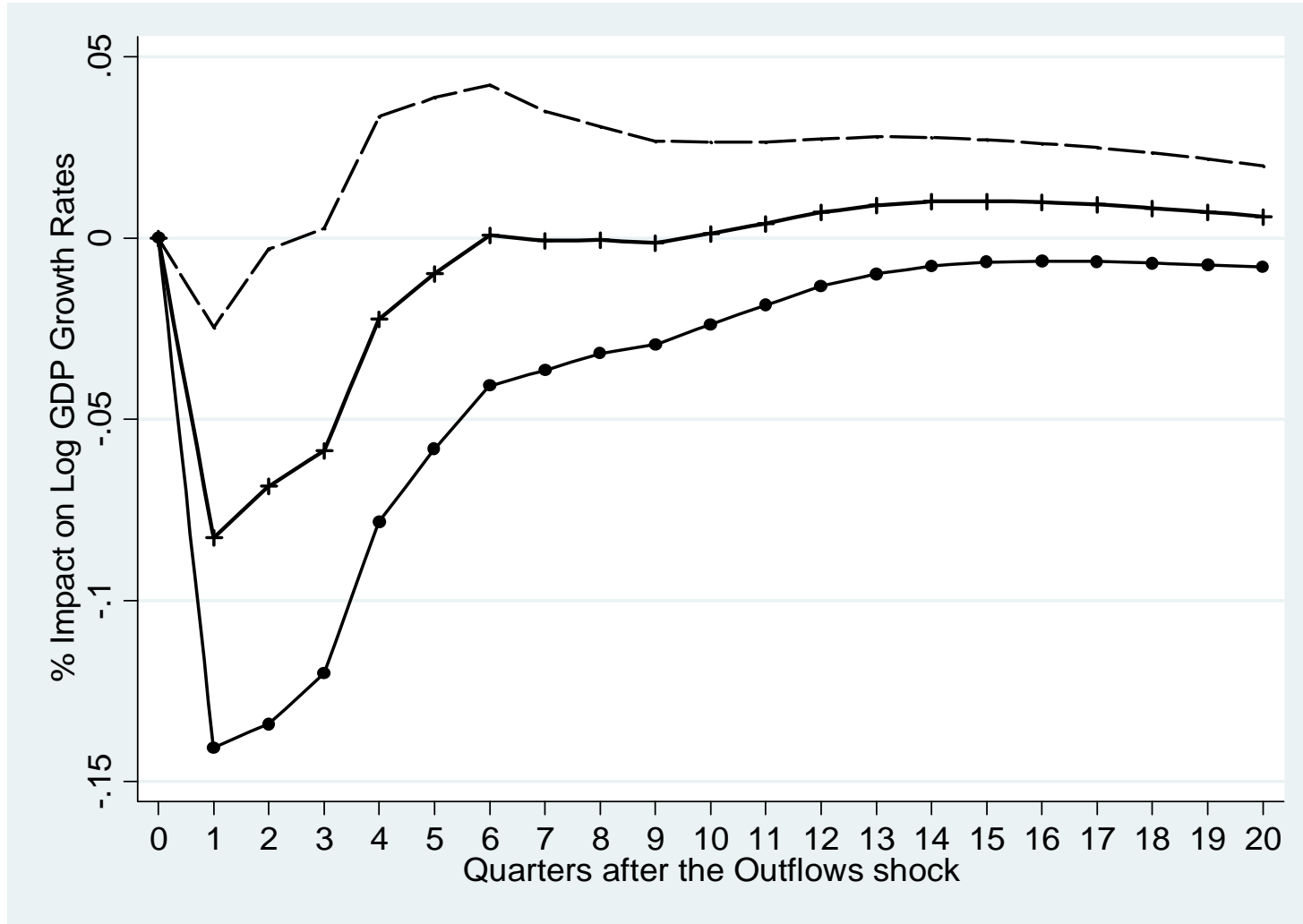


Impact of Corporate Bond Fund Outflows on Excess Bond Premium

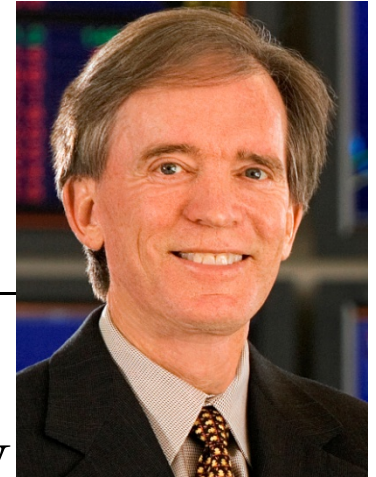


Following 1% increase in corporate bond fund outflows during a quarter, the excess bond premium rises during the contemporaneous quarter, and jumps up further by 9.2 and 7.6 basis points in next two quarters.

Impact of Corporate Bond Fund Outflows on GDP growth

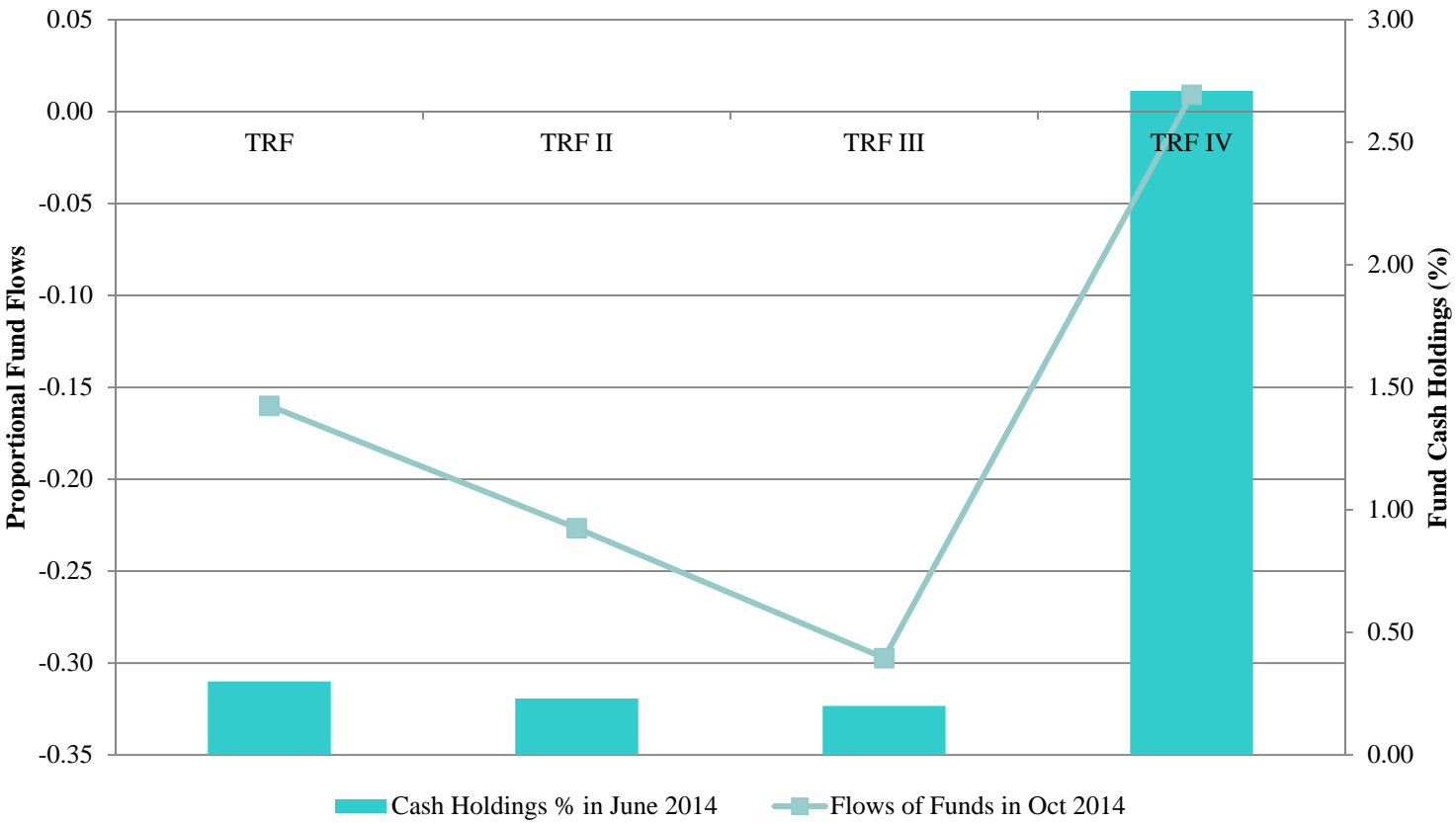


Case Study: Departure of Bill Gross



- Bill Gross, a.k.a. “Bond King”, founded PIMCO
- Managed 4 PIMCO total return funds: I, II, III, IV
- In 2011, Gross founded Total Return Fund IV, which relies less on derivative and leverage, and forgoes “high-yield debt, borrowing to create leverage, and investing in options.”
- Due to its mandate, Total Return Fund IV has much higher cash holdings (2.5%) than the first three funds (< 0.5%).
- On September 26, 2014, Bill Gross abruptly quit PIMCO and joined Janus. What happened to outflows?

Figure 8 Exiting Total Return Funds following the Departure of Bill Gross





Conclusion

- Literature finds convex relationship between flows and performance in equity funds. We provide a first look at corporate bond funds and document that corporate bond funds do not have convex flow-performance relationship.
- Sensitivity of outflows to bad performance in corporate bond funds is much stronger in times of aggregate illiquidity and among funds that hold more illiquid assets.
- Effect of illiquidity on the sensitivity of outflows to bad performance is driven mostly by retail-oriented funds and not by institutional-oriented funds.
- These findings are all consistent with the presence of payoff complementarities among corporate bond-fund investors driven by the illiquidity of their assets.



Implications

- Existence of first mover advantage generates fragility
- But, this does not necessarily call for regulatory intervention
- Funds can take various measures to alleviate problem
 - Holding cash buffer, changing formula for NAV upon redemption, putting restrictions on redemptions, etc.
- Regulators should be aware of patterns
 - Flows may generate externalities to markets and real economy, which funds do not take into account
 - Regulating some parts of the financial system can cause more investors to move to asset management and fragility can increase as a result

12. Flow-Performance Relations based on Alpha Controlling for Downside Beta

	(1)	(2)	(3)
	Full Sample	Full Sample	Alpha < 0
Alpha	0.333*** (10.29)	0.0686 (1.59)	0.557*** (9.38)
Alpha × (Alpha < 0)		0.477*** (6.45)	
Alpha < 0		-0.00463*** (-10.06)	
Lagged Flow	0.155*** (21.90)	0.154*** (21.86)	0.128*** (14.53)
Log(TNA)	0.000820*** (6.37)	0.000830*** (6.44)	0.000448*** (2.76)
Log(Age)	-0.0156*** (-31.73)	-0.0156*** (-31.88)	-0.0146*** (-24.66)
Expense	-0.376*** (-4.87)	-0.295*** (-3.80)	-0.226** (-2.40)
Rear Load	-0.00223*** (-2.93)	-0.00225*** (-2.95)	-0.00246*** (-2.61)
Observations	321,171	321,171	151,443
Adj. R²	0.0604	0.0611	0.0510