



# Investor Flows and Fragility in Corporate Bond Funds

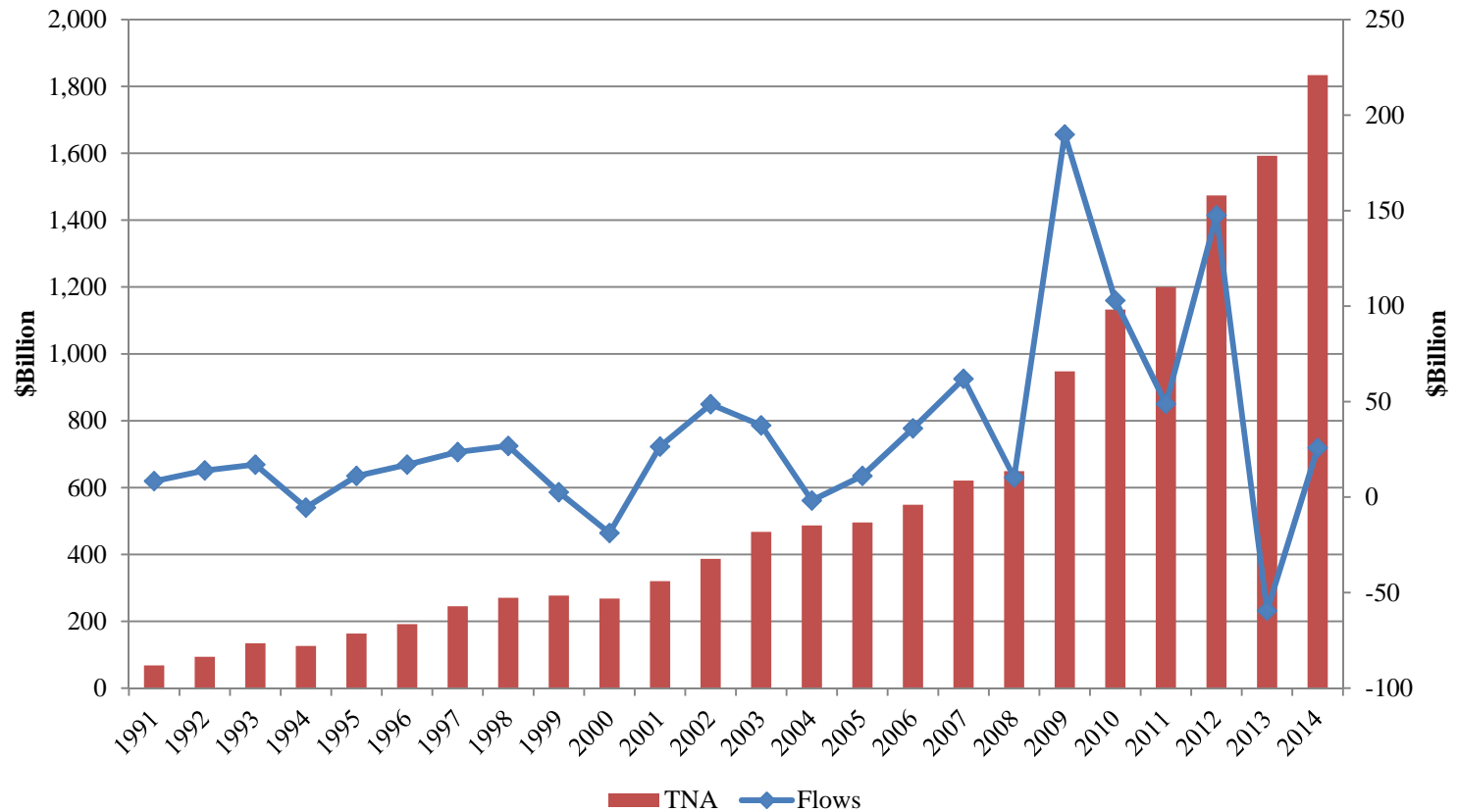
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Itay Goldstein, Wharton

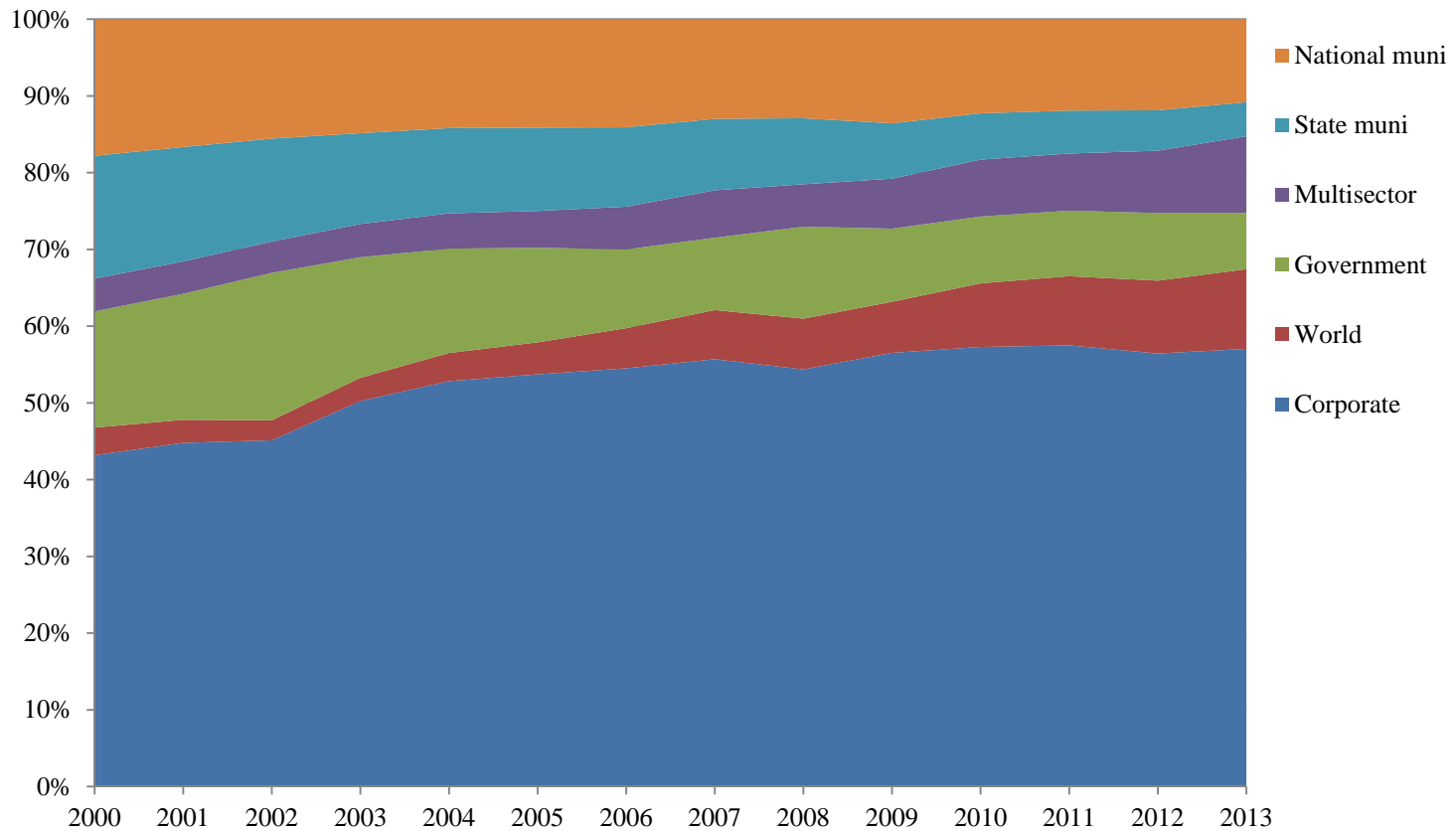
Hao Jiang, Michigan State

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

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- 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

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- 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

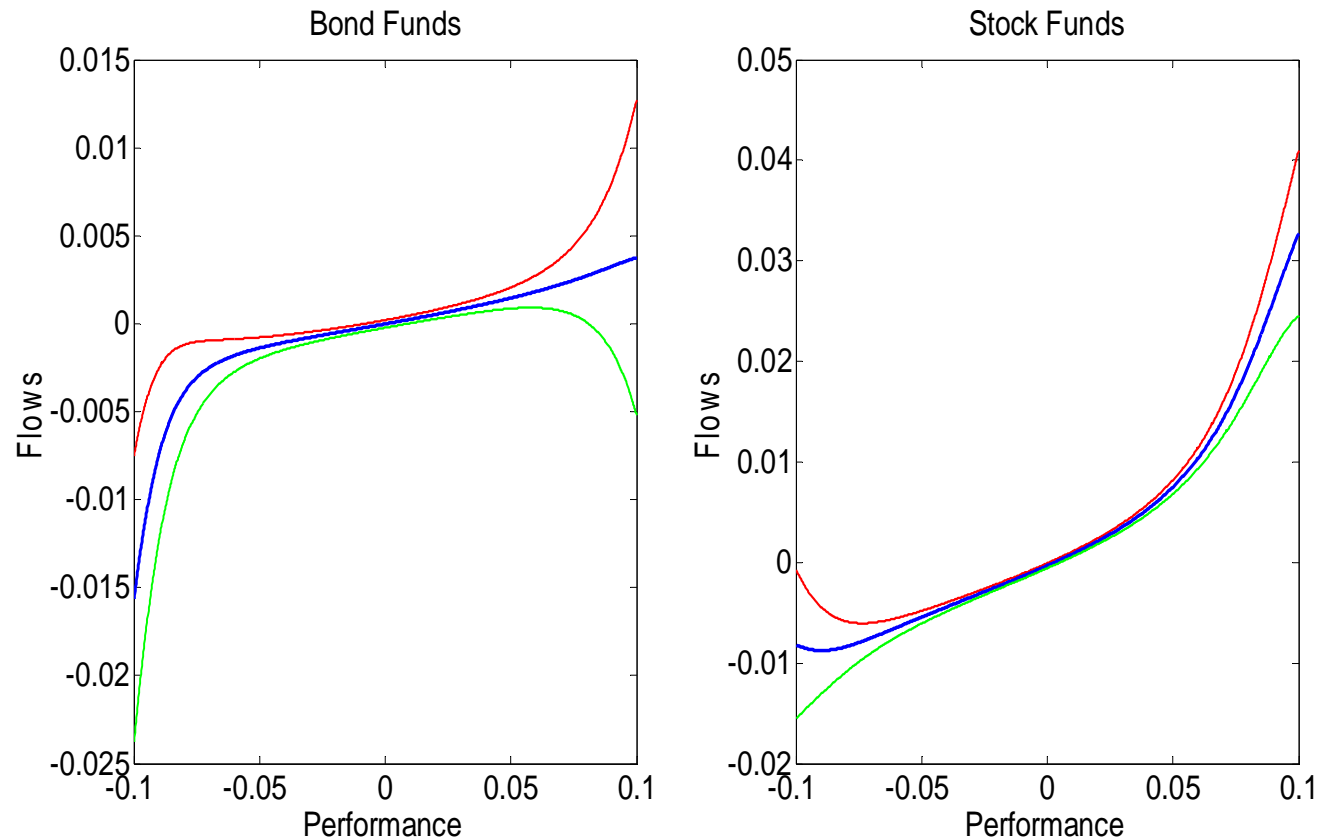


# Flow-Performance Relationship in Corporate Bond Funds

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- 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





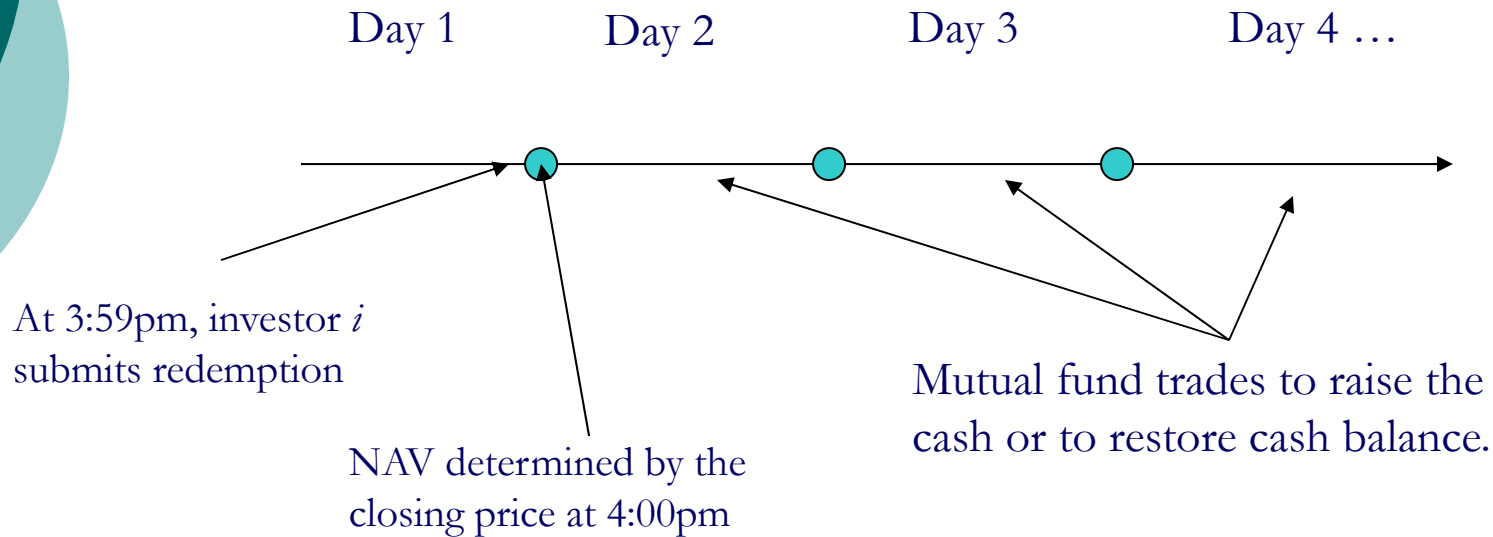
## Potential Underlying Cause: First Mover Advantage

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- 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.



# Hypotheses Associated with Strategic Complementarities

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- **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

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- 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

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- 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

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

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

# Concavity Across Subsamples. Table 3

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



# Aggregate Illiquidity and Flows in Corporate Bond Mutual Funds

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- 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.



## 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



# Illiquidity proxies

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- 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)



## Cash holdings as bond fund liquidity

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- 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.



# Two illiquid bond holding measures

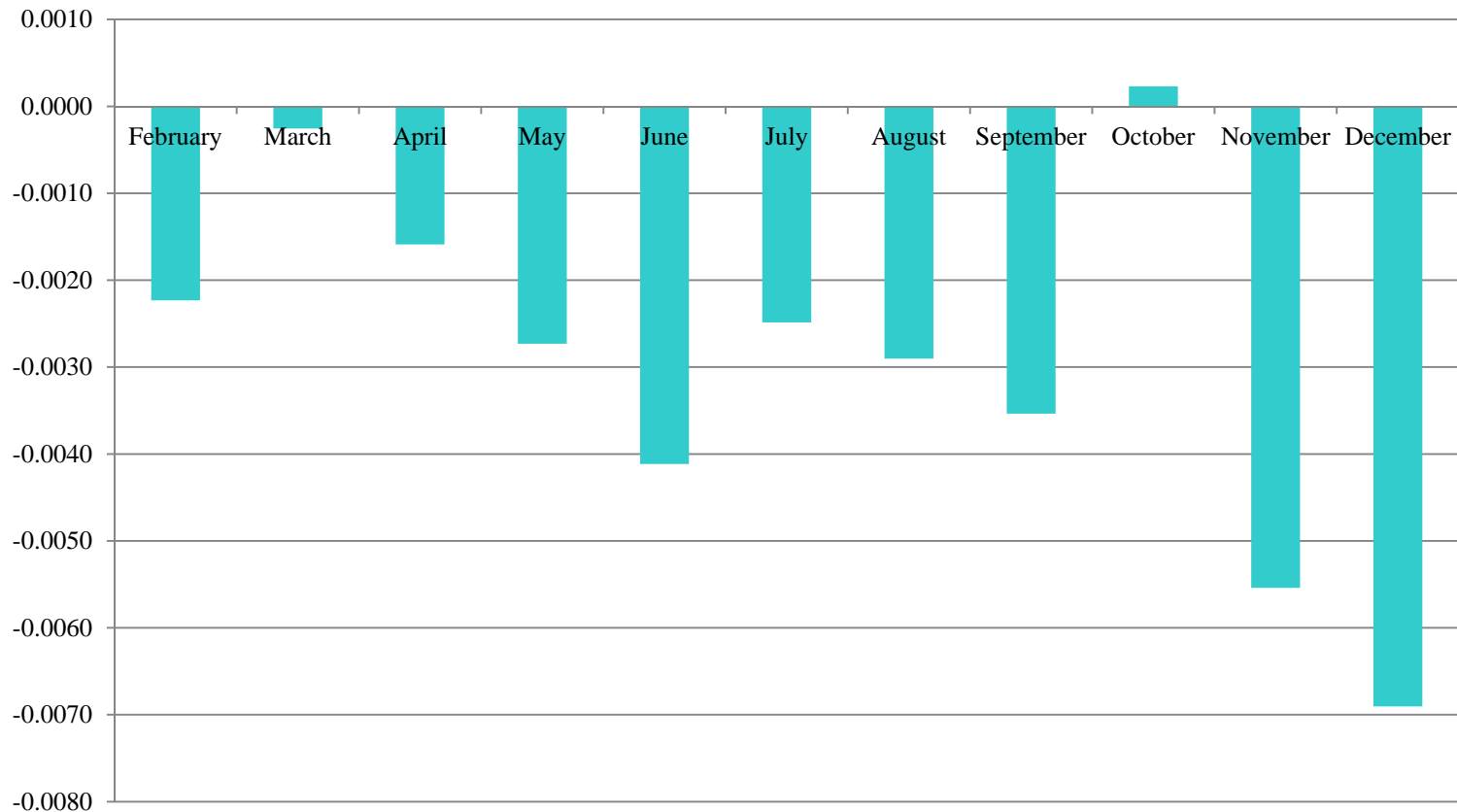
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- Approximate bid ask spread
- Illiquid bond holdings 1:
  - Roll (1984) measures the serial correlation of intraday bond returns
  - Bond price bounces back and forth between bid and ask; higher % bid-ask → more negative correlation
- Illiquid bond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

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

# 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 &lt;0</u>	<u>Alpha &gt;=0</u>	<u>Alpha &lt;0</u>	<u>Alpha &gt;=0</u>
	0.357*** (5.56)	0.502*** (3.25)	0.400*** (6.08)	0.516*** (3.21)
<b>Alpha×IlliqFund×YearEnd</b>	1.001*** (2.76)	-0.139 (-0.63)	1.386*** (3.64)	-0.152 (-0.63)
<b>Alpha×IlliqFund</b>	-0.383* (-1.90)	-0.106 (-0.63)	-0.637*** (-3.26)	-0.144 (-0.79)
<b>IlliqFund×YearEnd</b>	0.000206 (0.15)	0.000722 (0.45)	0.000568 (0.42)	0.00200 (1.16)
<b>Alpha×YearEnd</b>	0.0955 (0.87)	-0.292 (-1.59)	0.0178 (0.17)	-0.288 (-1.41)
<b>YearEnd</b>	-0.00325*** (-3.41)	-0.000545 (-0.47)	-0.00309*** (-3.24)	-0.00136 (-0.99)
<b>IlliqFund</b>	-0.00340*** (-4.50)	-0.00407*** (-4.63)	-0.00129* (-1.71)	-0.00315*** (-3.34)
<b>Lagged Flow</b>	0.139*** (13.14)	0.203*** (19.07)	0.140*** (13.18)	0.203*** (19.11)
<b>Log(TNA)</b>	0.000623*** (3.58)	0.000202 (1.03)	0.000598*** (3.44)	0.000183 (0.93)
<b>Log(Age)</b>	-0.0130*** (-19.27)	-0.0154*** (-22.33)	-0.0130*** (-19.15)	-0.0154*** (-22.12)
<b>Expense</b>	-0.486*** (-4.36)	-0.772*** (-6.94)	-0.493*** (-4.40)	-0.773*** (-6.90)
<b>Rear Load</b>	-0.00549*** (-5.48)	-0.00426*** (-4.09)	-0.00556*** (-5.53)	-0.00442*** (-4.23)
<b>Observations</b>	108,745	105,288	108,745	105,288
<b>Adj. R<sup>2</sup></b>	0.0400	0.0696	0.0398	0.0693



# Evidence of first mover advantage

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- 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)
<b>Flow×IlliqPeriod×IlliqFund</b>	<b>0.0127*** (3.13)</b>	<b>0.0135*** (3.12)</b>	<b>0.0146*** (3.36)</b>	<b>0.00503 (1.24)</b>
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 <sup>2</sup>	0.0467	0.0416	0.0519	0.0532



## Institutional vs. Individual Investors

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- 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.

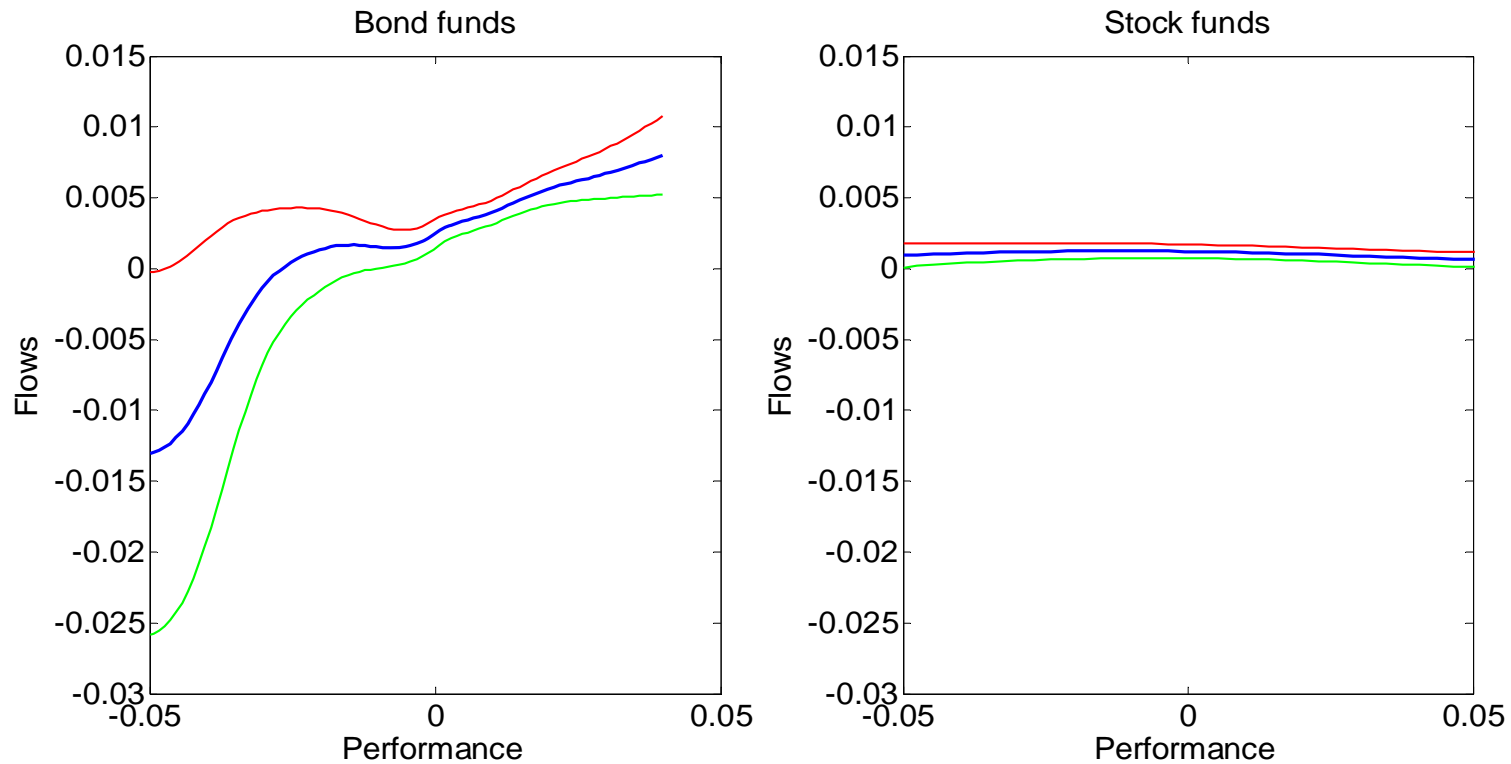
# Institutional Investors and the Impact of Liquidity on Outflows of Underperforming Corporate Bond Funds. Table 9A

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

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

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

# Does redemption sensitivity disappear in aggregation?



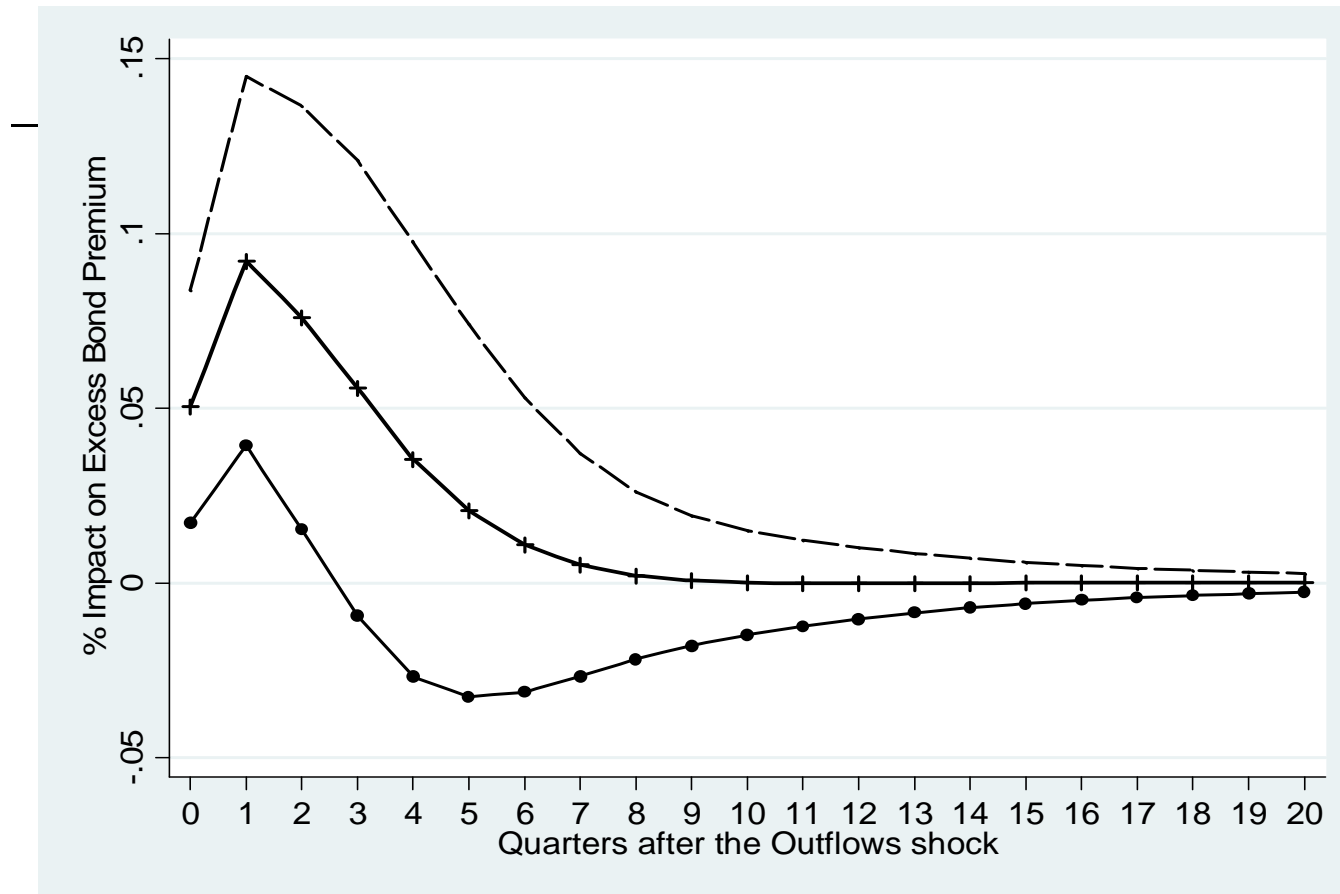


# Economic impact of Corporate Bond Fund Flows

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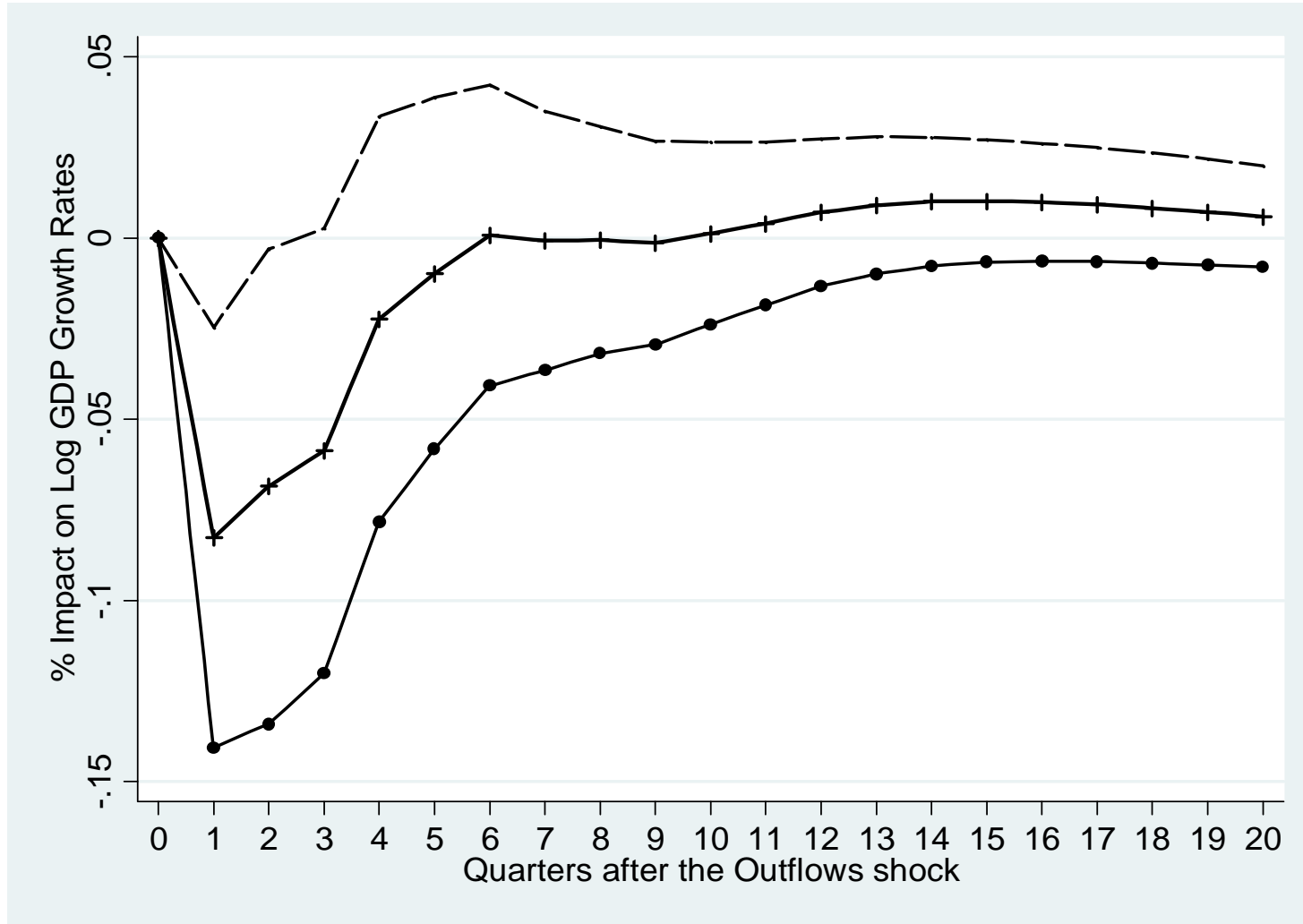
- Do outflows in bond funds have significant implications on market prices and the real economy?
- Exploratory evidence
  - Evaluate how corporate bond fund flows are related to Gilchrist and Zakrajsek (2012)'s excess bond premium.
  - Conduct a bivariate VAR with quarterly corporate bond fund outflows 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.

# 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







## Conclusion

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- 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

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- 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