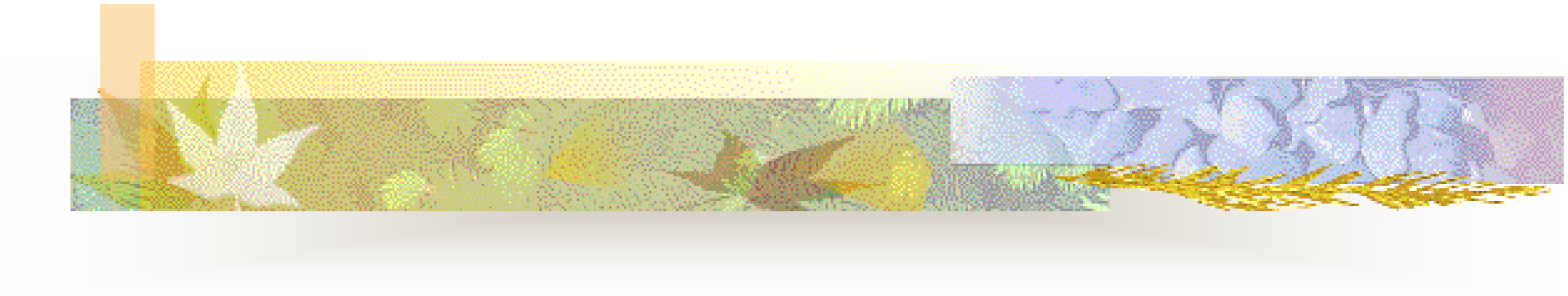
# Runs on Money Market Mutual Funds



Lawrence Schmidt
UC San Diego

Allan Timmermann
UC San Diego

Russ Wermers
University of Maryland

# Motivation

- During the days following Lehman bankruptcy (Sep 14, 2008): large-scale run on prime money market mutual funds
- Money market funds have many bank-like features, but no explicit protections of investor capital (e.g., FDIC insurance)
- Two (not mutually exclusive) mechanisms can lead to runs:
  - Deterioration in fundamentals / bad future returns
  - Externalities (payoff complementarities) induced by the behavior of other investors. Runs become self-fulfilling prophecies
- Our goal: can we use the data from the crisis to try and distinguish between them? Several advantages to this market
  - High frequency panel data are available
  - We know a lot about investors, funds, and portfolio holdings
- Regulatory implications as well

# Relevance of Money Market Mutual Funds As "Shadow Banks"

- At the end of 2009:
  - 705 money funds
    - 303 "prime funds"
    - 1,849 shareclasses total; 794 shareclasses in "prime funds"
  - $3.3 trillion in assets under management
    - $1.1 trillion government funds
    - $1.8 trillion non-government funds
    - $0.4 trillion tax-exempt funds
  - About 35% is held by retail investors (over $1 trillion)
  - By comparison, M1=$1.8 trillion

# Table 4: Portfolio Holdings of Prime Money Funds (%)

| Year | Total net assets *Millions of dollars* | U.S. Treasury bills | Other Treasury securities | U.S. government agency issues | Repurchase agreements | Certificates of deposit | Eurodollar CDs | Commercial paper | Bank notes[1] | Corporate notes[2] | Other assets[3] | Average maturity *Days* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1984 | $157,951 | 5.9% | 0.8% | 4.1% | 3.3% | 13.6% | 12.0% | 47.2% | – | – | 13.1% | 42 |
| 1985 | 151,849 | 4.6 | 1.0 | 6.1 | 3.1 | 10.0 | 10.2 | 55.4 | – | – | 9.5 | 42 |
| 1986 | 164,610 | 3.6 | 1.6 | 3.6 | 4.4 | 10.0 | 11.6 | 56.0 | – | – | 9.3 | 42 |
| 1987 | 187,087 | 1.0 | 0.9 | 6.5 | 4.8 | 16.2 | 8.9 | 52.3 | – | – | 9.4 | 34 |
| 1988 | 210,897 | 1.0 | 0.2 | 2.8 | 2.8 | 15.2 | 14.1 | 54.6 | – | – | 9.4 | 32 |
| 1989 | 283,939 | 1.3 | 0.8 | 2.0 | 2.8 | 14.4 | 9.3 | 62.3 | – | – | 7.1 | 43 |
| 1990 | 305,189 | 4.4 | 2.2 | 4.7 | 2.9 | 6.9 | 8.9 | 65.5 | – | – | 4.7 | 48 |
| 1991 | 314,346 | 5.7 | 2.9 | 4.2 | 3.7 | 10.6 | 6.9 | 60.1 | – | – | 5.8 | 56 |
| 1992 | 300,310 | 2.7 | 2.5 | 7.5 | 4.9 | 10.4 | 6.9 | 57.7 | – | – | 7.4 | 59 |
| 1993 | 312,701 | 2.6 | 2.4 | 11.9 | 5.9 | 8.0 | 3.2 | 52.6 | – | – | 13.3 | 58 |
| 1994 | 352,972 | 2.4 | 1.3 | 11.4 | 5.6 | 6.4 | 4.5 | 53.4 | 2.4% | – | 12.7 | 38 |
| 1995 | 449,829 | 1.4 | 0.9 | 9.2 | 6.2 | 8.9 | 4.5 | 52.5 | 3.7 | – | 12.7 | 60 |
| 1996 | 543,134 | 0.7 | 1.8 | 8.9 | 5.1 | 12.7 | 4.3 | 50.7 | 2.3 | – | 13.5 | 56 |
| 1997 | 650,111 | 0.5 | 0.7 | 5.4 | 5.3 | 14.7 | 3.7 | 51.8 | 3.2 | – | 14.8 | 57 |
| 1998 | 857,340 | 0.6 | 0.8 | 9.5 | 4.6 | 12.9 | 3.6 | 48.5 | 3.9 | 5.8% | 9.7 | 58 |
| 1999 | 1,082,906 | 0.5 | 0.3 | 6.8 | 4.8 | 12.8 | 3.9 | 49.0 | 3.1 | 8.4 | 10.4 | 49 |
| 2000 | 1,256,715 | 0.5 | 0.1 | 6.2 | 4.3 | 11.6 | 6.5 | 50.3 | 3.6 | 10.4 | 6.6 | 53 |
| 2001 | 1,578,652 | 0.6 | 0.3 | 12.4 | 6.3 | 14.8 | 7.2 | 41.3 | 1.5 | 10.9 | 4.6 | 58 |
| 2002 | 1,549,498 | 1.5 | 0.3 | 12.1 | 8.3 | 13.7 | 6.9 | 39.7 | 1.4 | 11.9 | 4.3 | 54 |
| 2003 | 1,354,908 | 1.5 | 0.4 | 15.2 | 8.4 | 11.5 | 5.1 | 35.2 | 2.0 | 16.1 | 4.8 | 59 |
| 2004 | 1,223,488 | 0.5 | 0.1 | 12.2 | 8.8 | 13.9 | 5.7 | 33.5 | 2.6 | 17.7 | 5.0 | 41 |
| 2005 | 1,306,698 | 0.8 | 0.1 | 4.2 | 12.4 | 14.3 | 5.9 | 38.1 | 2.3 | 17.7 | 4.2 | 38 |
| 2006 | 1,563,423 | 0.2 | 0.2 | 3.1 | 10.6 | 13.7 | 4.3 | 39.1 | 2.2 | 21.3 | 5.3 | 49 |
| 2007 | 1,884,132 | 1.0 | 0.2 | 3.3 | 11.9 | 14.9 | 5.4 | 36.4 | 3.9 | 16.5 | 6.4 | 44 |
| 2008 | 1,873,040 | 2.0 | 0.5 | 13.2 | 8.7 | 21.2 | 4.7 | 33.7 | 3.1 | 9.2 | 3.8 | 47 |
| 2009 | 1,854,287 | 2.7 | 1.2 | 10.0 | 8.6 | 30.8 | 5.3 | 27.6 | 2.8 | 6.2 | 4.7 | 50 |

# The Public Perception of Money Funds

- Small investors use as a substitute for a checking account to obtain higher yield
- Most investors believe that money funds have at least some implicit backing by the fund complex
  - Some may even believe that they are backed by the Federal Reserve
- Virtually all US money market funds have a fixed NAV of $1 per share
- Introduces risk of runs since portfolio market value can diverge from NAV (price per share)

# The Events of September 2008

- 9/15/2008: Lehman Brothers declared bankruptcy
- 9/16/2008: Reserve Primary Fund held 1% Lehman securities
  - Allegations by Ameriprise that institutional investors were “tipped off” before other investors
  - Reserve allowed redemptions at $1 per share prior to 3 pm; closing 4 pm NAV = $0.97 per share (now Lehman securities have 3% impact)
  - Fund went from $62.6 billion on 9/12 to $23 billion on 9/16 (Actually, later found to be $54 billion, as State Street suspended redemptions)

# The Events of September 2008

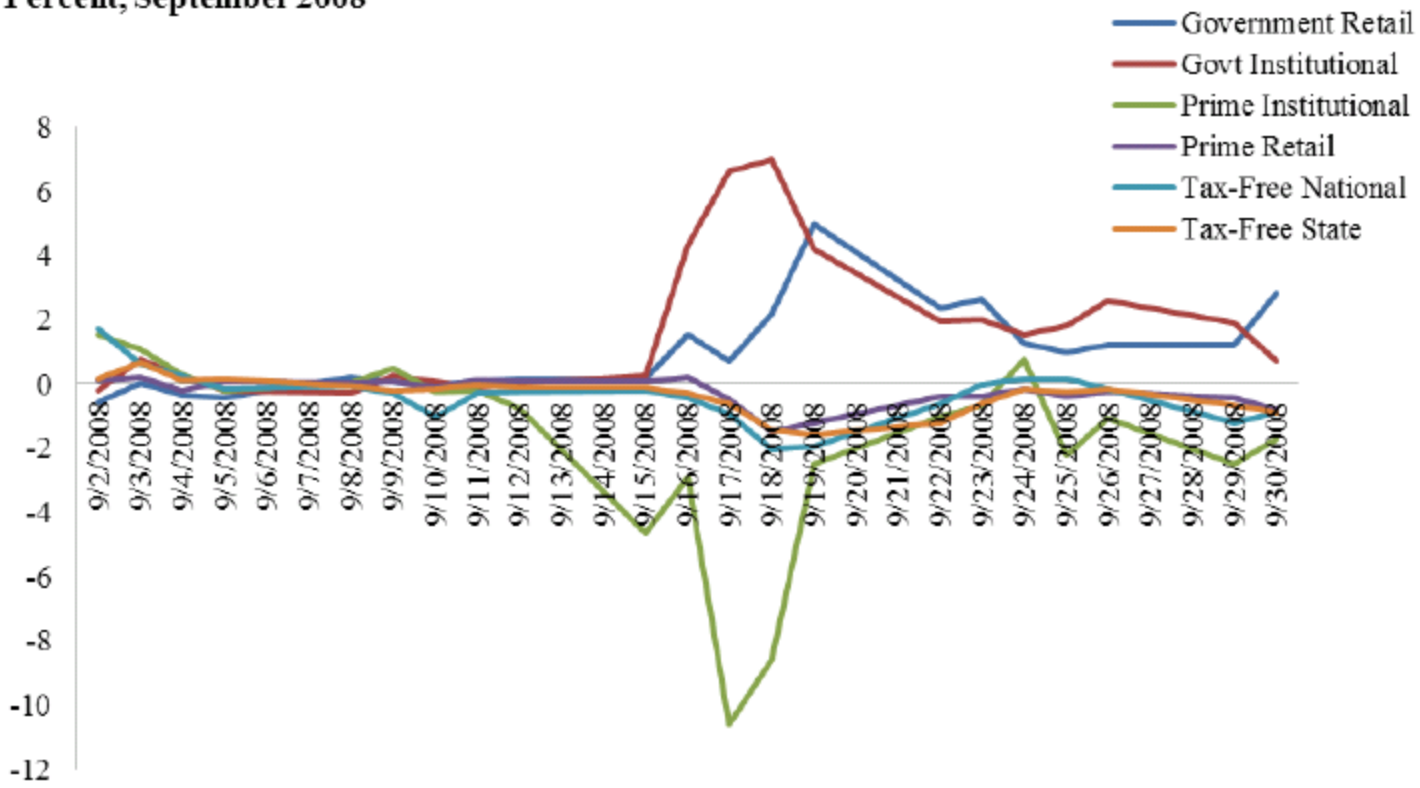
- 9/19/2008: Treasury announces that it will guarantee certain money fund assets
  - Sets up voluntary insurance program for money funds with a NAV of at least $0.995 as of 9/19/2008
  - Insurance is triggered when NAV falls below $0.995
- 9/19/2008: Fed announced “The Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility”
  - Fed funding of banks buying asset-backed CP from money funds

- October 7, 2008: Fed announced “The Commercial Paper Funding Facility”
  - Provide credit to a special purpose vehicle that would purchase three-month commercial paper from U.S. issuers
- October 21, 2008: the Federal Reserve announced “The Money Market Investor Funding Facility”
  - Provide credit to a special purpose vehicle to purchase money market instruments

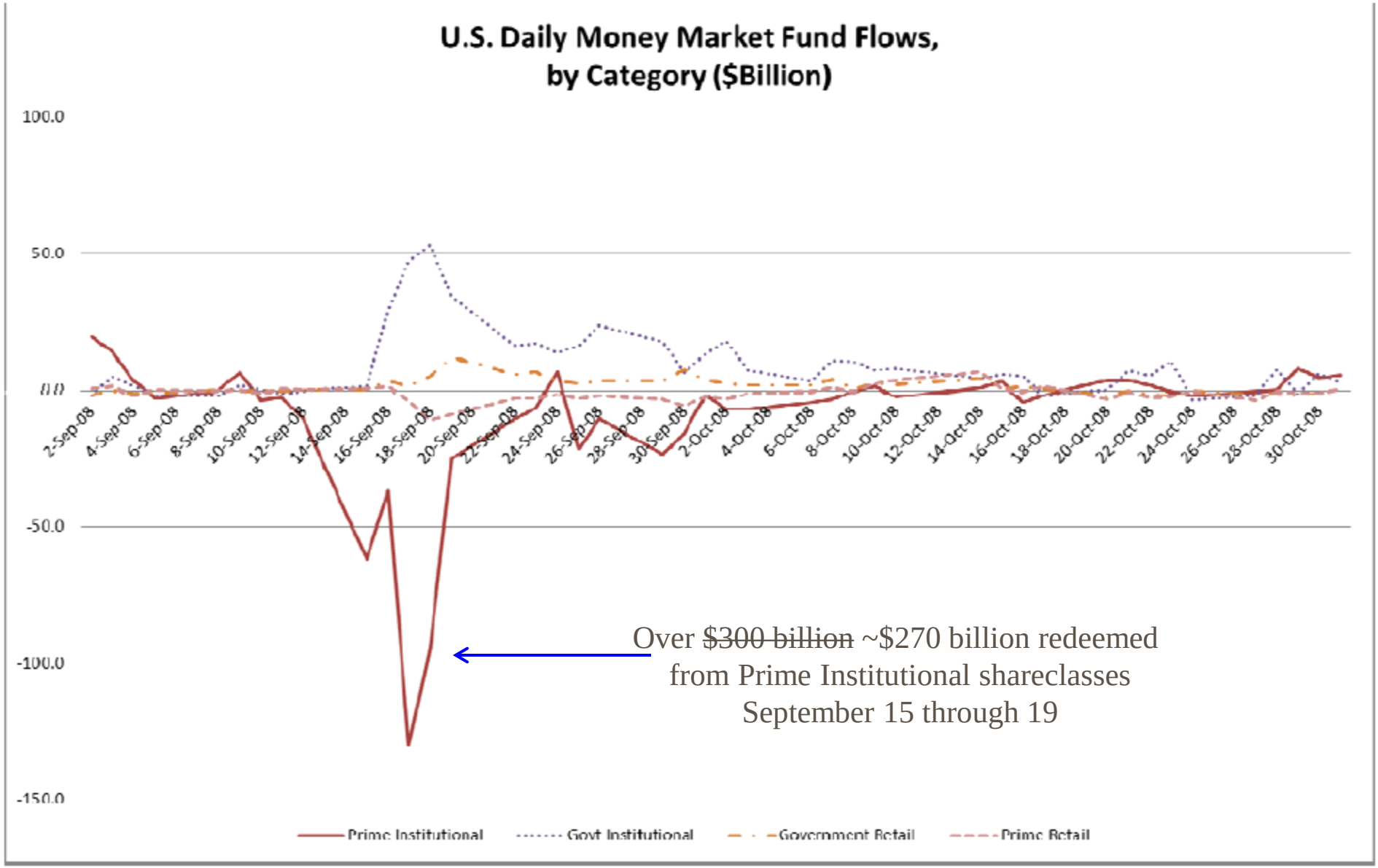
- October (?) 2008: SEC allowed funds that had "broken the buck" to price assets at amortized cost when commercial paper became too illiquid to price accurately

## Change in Daily Assets of Money Market Funds

**Percent, September 2008**




*Source: iMoneyNet*


U.S. Daily Money Market Fund Flows,
by Category ($Billion)
100.0
50.0
0.0
-50.0
-100.0
-150.0
2-Sep-08
4-Sep-08
6-Sep-08
8-Sep-08
10-Sep-08
12-Sep-08
14-Sep-08
16-Sep-08
18-Sep-08
20-Sep-08
22-Sep-08
24-Sep-08
26-Sep-08
28-Sep-08
30-Sep-08
2-Oct-08
4-Oct-08
6-Oct-08
8-Oct-08
10-Oct-08
12-Oct-08
14-Oct-08
16-Oct-08
18-Oct-08
20-Oct-08
22-Oct-08
24-Oct-08
26-Oct-08
28-Oct-08
30-Oct-08
Prime Institutional
Govt Institutional
Government Retail
Prime Retail
Over ~~$300 billion~~ ~$270 billion redeemed
from Prime Institutional shareclasses
September 15 through 19

# New SEC Rules on Money Funds (Phased in during 2010)

- Improved Liquidity:
  - 10% of portfolio must be easily convertible to cash within one day; 30% within one week
- Higher Credit Quality:
  - Maximum of 3% of portfolio in “Second Tier” securities (down from 5% previously)
    - Max of 0.5% in single issuer
    - Less than 45 days maturity required for Second Tier Securities
    - Weighted-avg maturity of all securities less than 60 days (down from 90 days)

# New SEC Rules on Money Funds (Phased in during 2010)

- "Know your investor"
  - Requires funds to forecast the risk of large redemptions based on clientele
- Periodic "stress tests" required (analysis of risk)
- Funds required to analyze credit risk of each security purchased beyond simple outside ratings by, e.g., Moodys
- Collateral for repos must be cash or govt securities
- Funds must disclose portfolios monthly on website; must post "shadow-NAV" (estimated market value) monthly, 60 days after the month-end

# Past Research on Bank Runs

- Diamond and Dybvig (1983)
  - Self-fulfilling bank run is equilibrium, even if assets are solvent without the run
- Postlewaite and Vives (1987)
  - Extend DD to show that a run can occur in a given bank even if there is no information on the probability of that bank's failure
- Goldstein and Pauzner (2005) and Jacklin and Bhattacharya (1988)
  - Model information-based bank runs

# Literature (cont)

- Also relevant:
  - Models for currency attacks / regime change (global games)
  - liquidity spirals, interactions between “market liquidity” and “funding liquidity”: Brunnermeier and Pedersen (2009)
- Many models feature multiple equilibria
- Even when equilibria are unique, small changes in fundamentals can lead to large changes in outcomes
- Angeletos, Hellwig, and Pavan (2007): Dynamics/learning make the set of possible outcomes extremely rich
- Implication: runs need not be spread equally among firms
  - Thus, regulation might be optimally focused on certain firms

# Contributions of this Study

- Empirical study of the money fund "panic" of September 2008
  - Which funds and which investors had correlated outflows?
    - Deep pocket vs. shallow pocket complexes
    - Liquid vs. illiquid funds
    - Institutional vs. retail investors
  - Was this a pure DD panic, or were the redemptions based on information about solvency?

# Money Fund Data

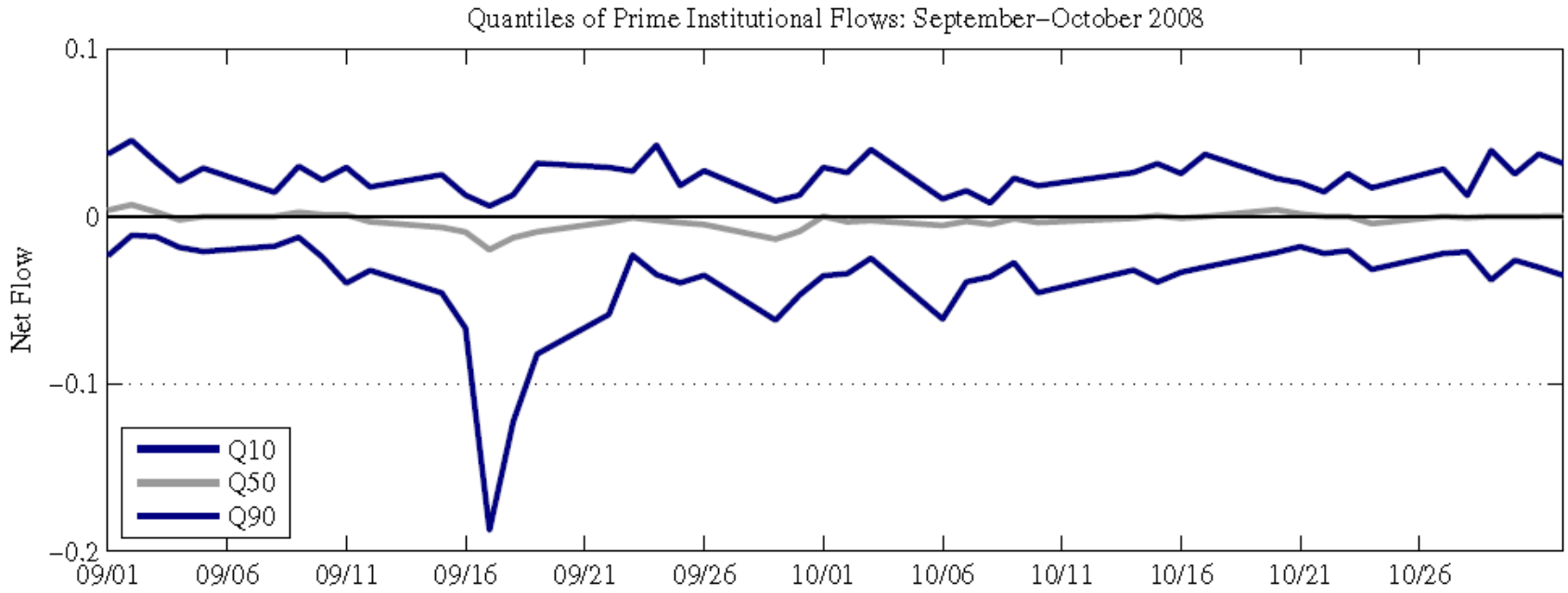
- Extensive panel dataset of the vast majority of money market mutual funds
  - Data from iMoneyNet
    - Daily total net assets (TNA) of individual share classes
      - Money funds that predominantly cater to institutional investors
      - Money funds that predominantly cater to retail investors
    - Some holdings statistics:
      - % Maturing within 7 days
      - % Treasury
      - % Commercial paper
      - % “First Tier,” “Second Tier” holdings
        - First Tier = highest short-term credit quality possible
        - Second Tier = second highest credit quality possible

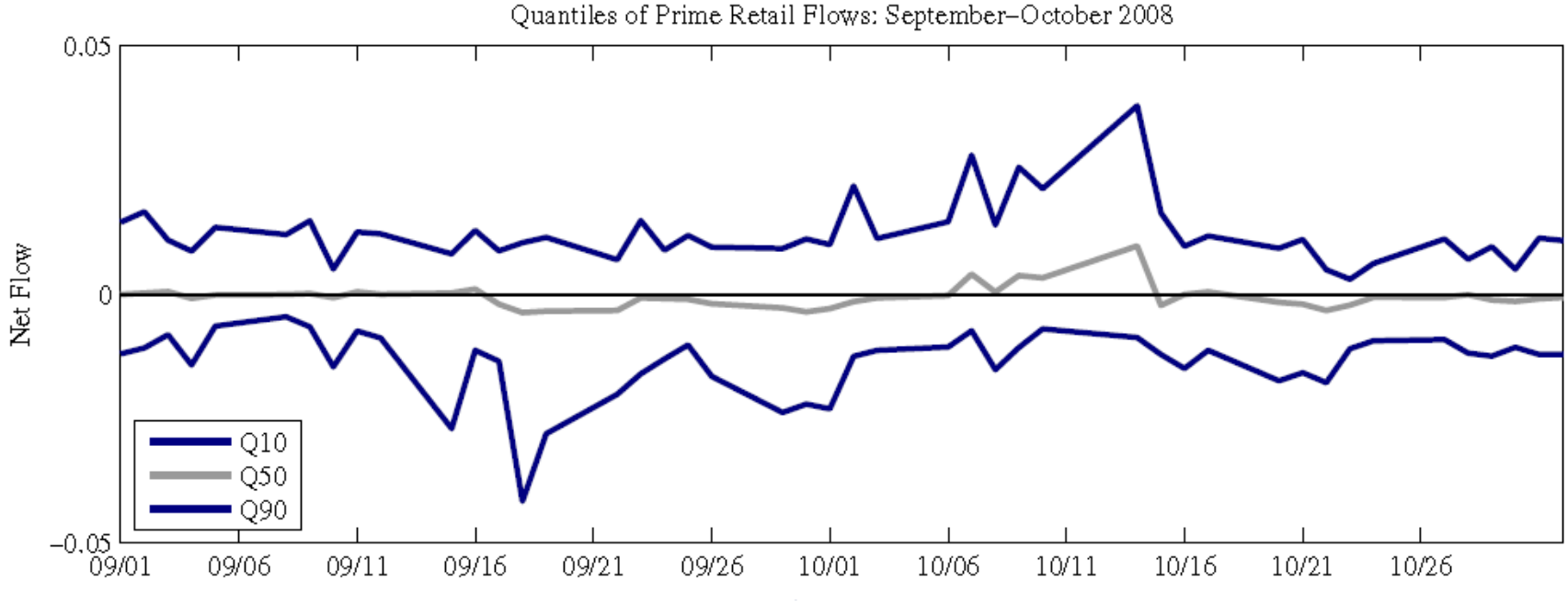
# Methods

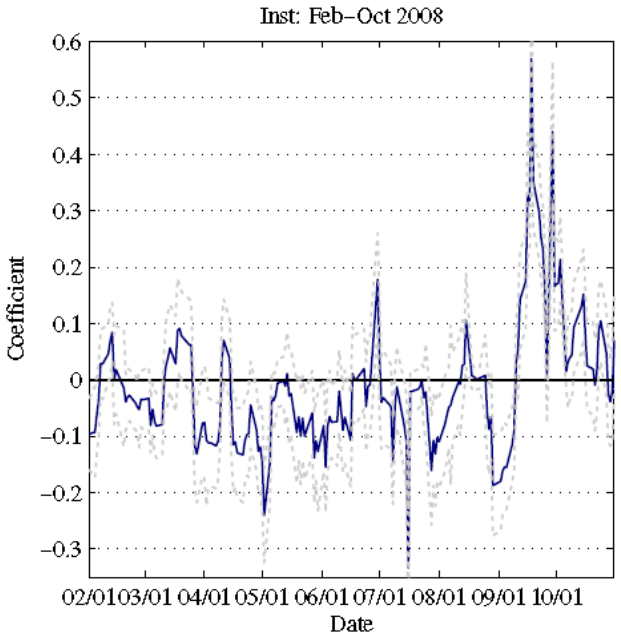
- We envision a four-pronged approach
  - Aggregate level: look at dynamics of flows between Prime Institutional and Prime Retail funds, before and during crisis
  - Cross-sectional event study analysis: how did the relationship between cumulative flows and fund-level variables evolve over the crisis?
  - Panel analysis: Are the dynamics of fund-level flows likely panic-driven or linked to fundamentals?
  - Out-of-sample exercise: Could we have identified the funds with biggest outflows using pre-crisis data?

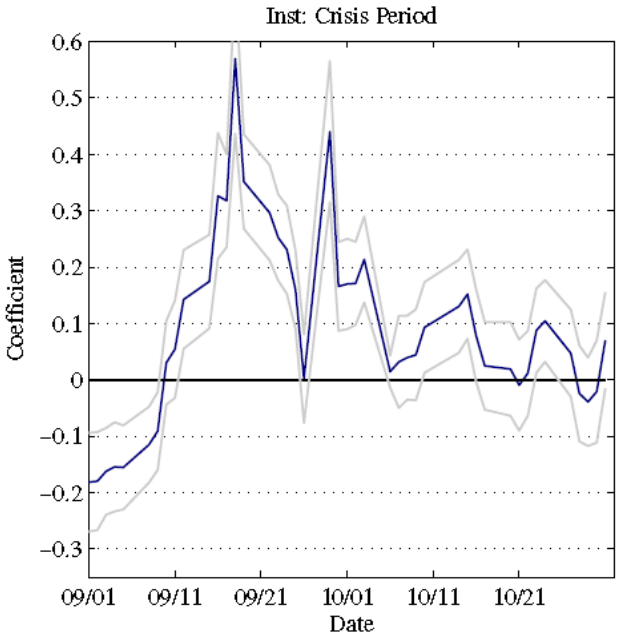
# Methods (cont'd)

- Today, I'll focus on #2 and #3 [cross-sectional event study, with a breakdown into fundamentals vs. "panic" (unobservables)]
- Rather than focus on conditional expectations, I'll look at conditional quantiles. Why?
  - Potentially different welfare implications
  - Empirically relevant: Some funds almost wiped out, median fund lost a little, many had net inflows
  - Multiple equilibria → tail outcomes may be more informative
- Specifically, we'll analyze the $10^{th}$, $50^{th}$, and $90^{th}$ conditional quantiles of flow distributions


Quantiles of Prime Institutional Flows: September–October 2008
Net Flow
0.1
0
−0.1
−0.2
Q10
Q50
Q90
09/01
09/06
09/11
09/16
09/21
09/26
10/01
10/06
10/11
10/16
10/21
10/26

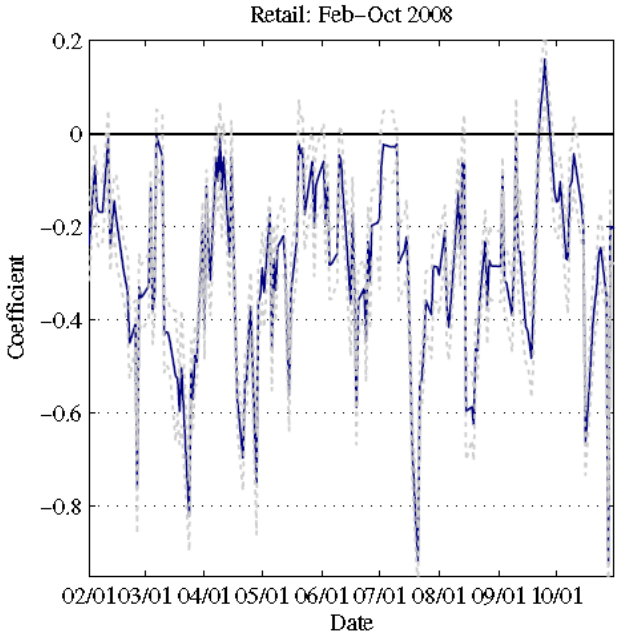

Quantiles of Prime Retail Flows: September–October 2008
Net Flow
0.05
0
−0.05
Q10
Q50
Q90
09/01
09/06
09/11
09/16
09/21
09/26
10/01
10/06
10/11
10/16
10/21
10/26

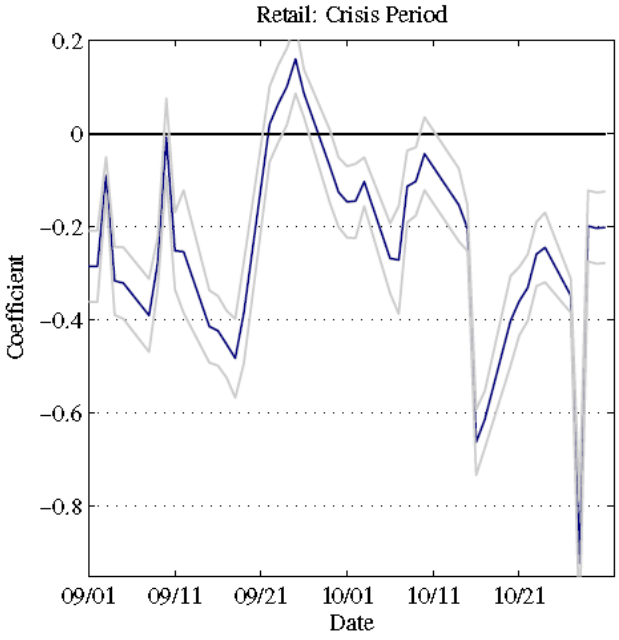



# Rolling AR(1) Coefficients for Daily Fund-Level Log Flows

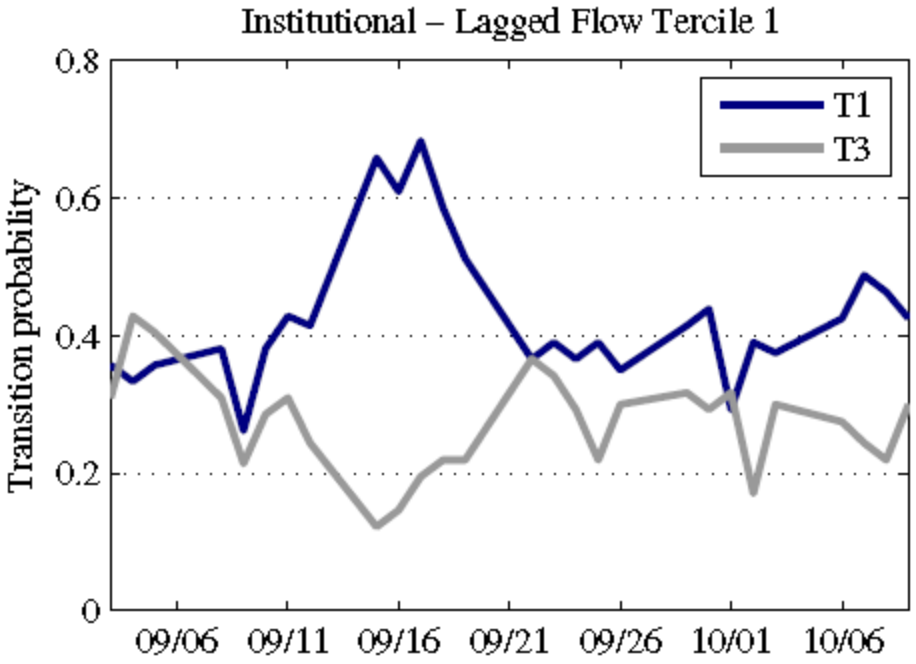
$$y_{it} = \alpha_t + \phi y_{it-1} + \varepsilon_{it}$$



# Rolling Transition Matrix Graph

## Ranked Terciles are Based on Previous Day Flow
## Probability of Following Week Flow Terciles
## (T1 is biggest outflow tercile)



# Basic Econometric Model

- Dependent variable $Y_{i,t+j} = \log\left(TNA_{i,t+j} / TNA_{i,t}\right)$
- Variables of interest, $X_{i,t}$; categories from McCabe (2010)
  - Portfolio risk proxies: 7 day yield (DCY7), weighted average maturity, fund rating
  - Investor risk proxies: expense ratio, % complex TNA in Prime Inst funds, volatility of historical flows
  - Sponsor risk proxies: bank affiliation, other non-money fund AUM (not yet completed)
- Assume

$$Y_{i,t+j} = X'_{i,t}\beta_m + \varepsilon_{m,t+j}, \qquad P[\varepsilon_{m,t+j} < 0 \mid \Gamma_t] = 0.5$$

$$Y_{i,t+j} = X'_{i,t}\beta_m - \exp\left[X'_{i,t}\beta_l\right] + \varepsilon_{m,t+j}, \qquad P[\varepsilon_{l,t+j} < 0 \mid \Gamma_t] = 0.1$$

$$Y_{i,t+j} = X'_{i,t}\beta_m + \exp\left[X'_{i,t}\beta_u\right] + \varepsilon_{m,t+j}, \qquad P[\varepsilon_{u,t+j} < 0 \mid \Gamma_t] = 0.9$$

| | Common Shock | | | |
|---|---|---|---|---|
| Variable | (Baseline) | (Pre-Crisis) | (Crisis) | (Post-Crisis) |
| $y_{i,t-1} - \bar{y}_{t-1} > 0$ | -0.0270 | **0.1124** | **0.2260** | -0.0125 |
| | [0.070] | **[0.019]** | **[0.014]** | [0.345] |
| $y_{i,t-1} - \bar{y}_{t-1} < 0$ | -0.0057 | **0.2369** | **0.5761** | **0.0796** |
| | [0.335] | **[0.032]** | **[0.043]** | **[0.005]** |
| *AVGYIELD* | 0.0002 | -0.0007 | **-0.0064** | **-0.0007** |
| | [0.128] | [0.080] | **[0.000]** | **[0.022]** |
| *EXPR* | -0.0000 | **0.0009** | 0.0033 | **0.0012** |
| | [0.348] | **[0.049]** | [0.054] | **[0.003]** |
| *FLOWSTDEV* | 0.0001 | -0.0002 | -0.0040 | -0.0011 |
| | [0.284] | [0.343] | [0.117] | [0.086] |
| *PIPERC* | -0.0002 | -0.0006 | -0.0002 | -0.0005 |
| | [0.066] | [0.206] | [0.365] | [0.194] |
| *LOGTNA* | **0.0002** | **-0.0026** | **-0.0133** | **-0.0013** |
| | **[0.019]** | **[0.000]** | **[0.000]** | **[0.016]** |

| | Left Tail Exposure | | | |
|---|---|---|---|---|
| Variable | (Baseline) | (Pre-Crisis) | (Crisis) | (Post-Crisis) |
| $y_{i,t-1} - \bar{y}_{t-1} > 0$ | **0.1064** | -0.0211 | 0.0038 | **0.0545** |
| | **[0.000]** | [0.405] | [0.572] | **[0.003]** |
| $\lvert y_{i,t-1} - \bar{y}_{t-1} < 0 \rvert$ | **0.0693** | 0.0369 | -0.0154 | **0.0819** |
| | **[0.000]** | [0.106] | [0.284] | **[0.003]** |
| *AVGYIELD* | -0.0217 | 0.1283 | 0.2314 | 0.0490 |
| | [0.334] | [0.080] | [0.095] | [0.238] |
| *EXPR* | **-0.1978** | **-0.5379** | -0.2021 | **-0.2998** |
| | **[0.012]** | **[0.004]** | [0.144] | **[0.002]** |
| *FLOWSTDEV* | **0.5162** | **0.4453** | **0.3451** | **0.3044** |
| | **[0.000]** | **[0.003]** | **[0.003]** | **[0.000]** |
| *PIPERC* | 0.0588 | 0.1092 | **0.2902** | 0.0818 |
| | [0.089] | [0.107] | **[0.010]** | [0.106] |
| *LOGTNA* | -0.0040 | 0.0507 | 0.0632 | -0.1031 |
| | [0.625] | [0.188] | [0.161] | [0.063] |

| | Right Tail Exposure | | | |
|---|---|---|---|---|
| Variable | (Baseline) | (Pre-Crisis) | (Crisis) | (Post-Crisis) |
| $y_{i,t-1} - \bar{y}_{t-1} > 0$ | 0.0108 | 0.1168 | -0.0066 | 0.0591 |
| | [0.125] | [0.098] | [0.322] | [0.068] |
| $\lvert y_{i,t-1} - \bar{y}_{t-1} < 0 \rvert$ | **0.0595** | 0.0716 | 0.0584 | **0.0538** |
| | **[0.000]** | [0.075] | [0.135] | **[0.003]** |
| *AVGYIELD* | -0.0229 | -0.0121 | 0.1080 | 0.0090 |
| | [0.332] | [0.456] | [0.119] | [0.559] |
| *EXPR* | **-0.2059** | -0.0918 | -0.0290 | **-0.1761** |
| | **[0.000]** | [0.180] | [0.177] | **[0.043]** |
| *FLOWSTDEV* | **0.6262** | **0.5556** | **0.4517** | **0.4205** |
| | **[0.000]** | **[0.002]** | **[0.007]** | **[0.000]** |
| *PIPERC* | **0.0924** | 0.1509 | 0.0057 | 0.0486 |
| | **[0.026]** | [0.066] | [0.356] | [0.407] |
| *LOGTNA* | 0.0551 | 0.0846 | 0.2846 | -0.0374 |
| | [0.156] | [0.268] | [0.064] | [0.312] |

**Table 6:** Fund-Level Panel Quantile Regressions - Prime Institutional

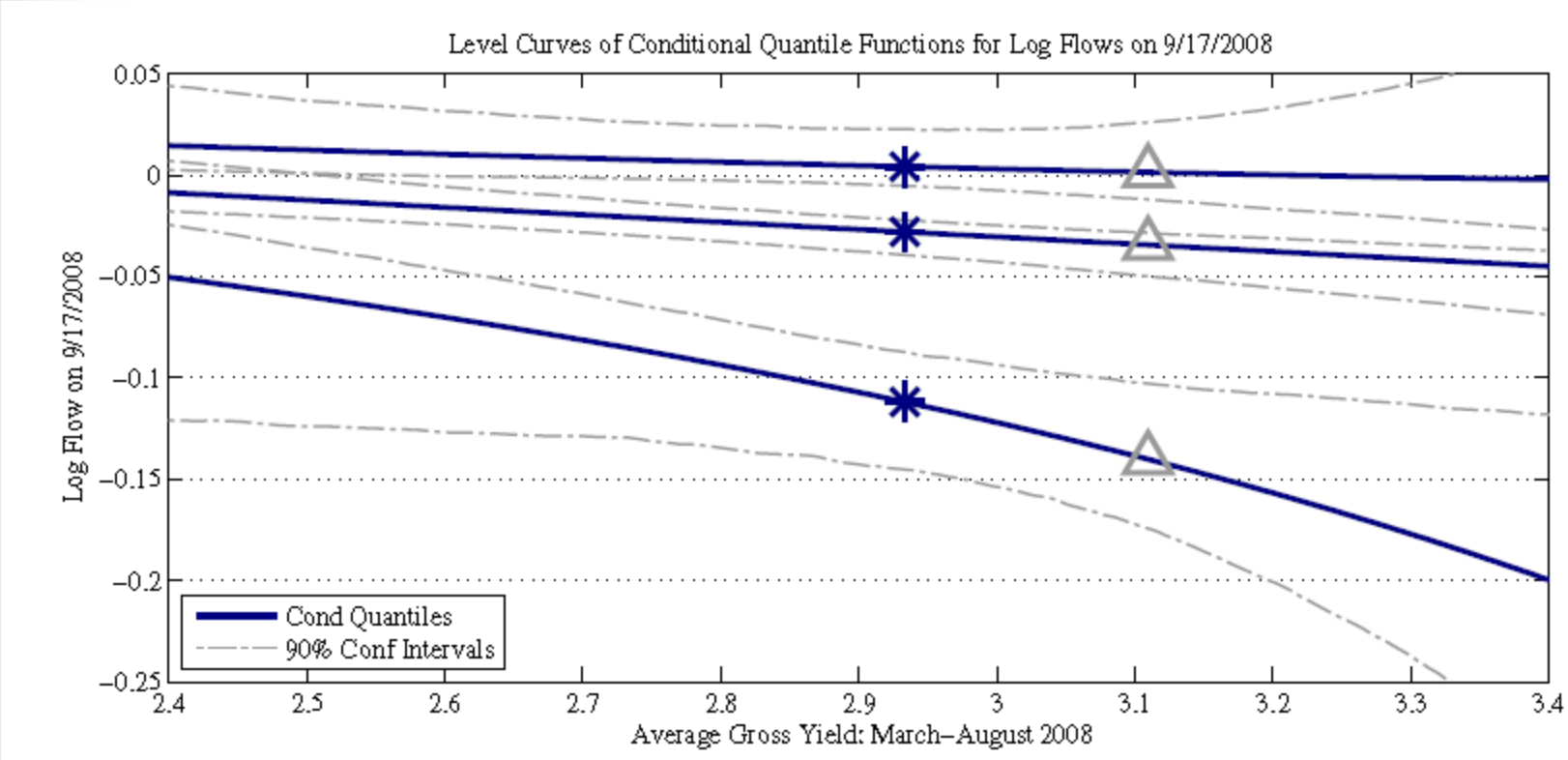
| Variable | Common Shock (Baseline) | (Pre-Crisis) | (Crisis) | (Post-Crisis) |
|---|---|---|---|---|
| $y_{i,t-1} - \bar{y}_{t-1} > 0$ | -0.0273 | **0.0951** | **0.2055** | 0.0012 |
| | [0.068] | **[0.013]** | **[0.023]** | [0.617] |
| $y_{i,t-1} - \bar{y}_{t-1} < 0$ | -0.0057 | **0.2390** | 0.5723 | **0.0813** |
| | [0.353] | **[0.039]** | [0.056] | **[0.007]** |
| *AVGYIELD* | 0.0002 | -0.0006 | **-0.0078** | **-0.0007** |
| | [0.126] | [0.090] | **[0.000]** | **[0.034]** |
| *EXPR* | -0.0000 | 0.0007 | 0.0033 | **0.0012** |
| | [0.363] | [0.052] | [0.058] | **[0.002]** |
| *FLOWSTDEV* | 0.0001 | -0.0002 | -0.0033 | -0.0013 |
| | [0.282] | [0.297] | [0.117] | [0.070] |
| *PIPERC* | -0.0002 | -0.0003 | -0.0001 | -0.0002 |
| | [0.086] | [0.283] | [0.463] | [0.323] |
| *LOGTNA* | **0.0002** | **-0.0028** | **-0.0127** | **-0.0012** |
| | **[0.045]** | **[0.000]** | **[0.000]** | **[0.016]** |
| *MULTCAT* | 0.0000 | -0.0001 | 0.0019 | **0.0010** |
| | [0.476] | [0.484] | [0.130] | **[0.040]** |
| *LAGOTHER* | **0.0003** | **0.0011** | 0.0002 | 0.0003 |
| | **[0.021]** | **[0.041]** | [0.247] | [0.343] |

| Variable | Left Tail Exposure (Baseline) | (Pre-Crisis) | (Crisis) | (Post-Crisis) |
|---|---|---|---|---|
| $y_{i,t-1} - \bar{y}_{t-1} > 0$ | **0.1073** | -0.0175 | 0.0100 | **0.0373** |
| | **[0.000]** | [0.387] | [0.485] | **[0.013]** |
| $\lvert y_{i,t-1} - \bar{y}_{t-1} < 0 \rvert$ | **0.0699** | 0.0390 | -0.0173 | **0.0700** |
| | **[0.000]** | [0.150] | [0.319] | **[0.010]** |
| *AVGYIELD* | -0.0191 | 0.1573 | 0.2337 | 0.0575 |
| | [0.360] | [0.082] | [0.097] | [0.169] |
| *EXPR* | **-0.1978** | **-0.3824** | -0.1960 | **-0.3044** |
| | **[0.015]** | **[0.013]** | [0.218] | **[0.000]** |
| *FLOWSTDEV* | **0.5108** | **0.4688** | **0.4026** | **0.3201** |
| | **[0.000]** | **[0.001]** | **[0.001]** | **[0.000]** |
| *PIPERC* | 0.0525 | 0.1207 | **0.3097** | 0.0760 |
| | [0.108] | [0.141] | **[0.023]** | [0.192] |
| *LOGTNA* | -0.0069 | 0.1575 | 0.1259 | **-0.1222** |
| | [0.639] | [0.168] | [0.105] | **[0.047]** |
| *MULTCAT* | -0.0265 | -0.1041 | 0.0487 | -0.0900 |
| | [0.213] | [0.120] | [0.405] | [0.066] |
| *LAGOTHER* | 0.0212 | -0.0193 | **-0.2457** | -0.0094 |
| | [0.300] | [0.336] | **[0.035]** | [0.359] |

| Variable | Right Tail Exposure (Baseline) | (Pre-Crisis) | (Crisis) | (Post-Crisis) |
|---|---|---|---|---|
| $y_{i,t-1} - \bar{y}_{t-1} > 0$ | 0.0120 | 0.1204 | -0.0163 | 0.0500 |
| | [0.136] | [0.093] | [0.313] | [0.066] |
| $\lvert y_{i,t-1} - \bar{y}_{t-1} < 0 \rvert$ | **0.0599** | 0.0660 | 0.0544 | **0.0516** |
| | **[0.000]** | [0.073] | [0.149] | **[0.004]** |
| *AVGYIELD* | -0.0215 | 0.0016 | 0.1365 | 0.0075 |
| | [0.310] | [0.476] | [0.139] | [0.517] |
| *EXPR* | **-0.2006** | -0.0836 | -0.0371 | **-0.1502** |
| | **[0.001]** | [0.148] | [0.156] | **[0.031]** |
| *FLOWSTDEV* | **0.6445** | **0.5120** | **0.4280** | **0.4628** |
| | **[0.000]** | **[0.002]** | **[0.011]** | **[0.000]** |
| *PIPERC* | **0.0749** | 0.1282 | 0.0312 | 0.0402 |
| | **[0.034]** | [0.079] | [0.442] | [0.524] |
| *LOGTNA* | 0.0532 | 0.0672 | 0.2399 | -0.0525 |
| | [0.156] | [0.261] | [0.071] | [0.325] |
| *MULTCAT* | -0.0700 | -0.0586 | -0.0824 | -0.0730 |
| | [0.078] | [0.313] | [0.154] | [0.089] |
| *LAGOTHER* | -0.0005 | -0.1395 | 0.1350 | 0.0397 |
| | [0.427] | [0.273] | [0.327] | [0.255] |

**Table 9:** Fund-Level Panel Quantile Regression - Prime Institutional with Cross-Category Variables

# Yield as a Predictor of Runs



# Fitted Model-Implied Effect of 10% Shift in Prior-Day Flow

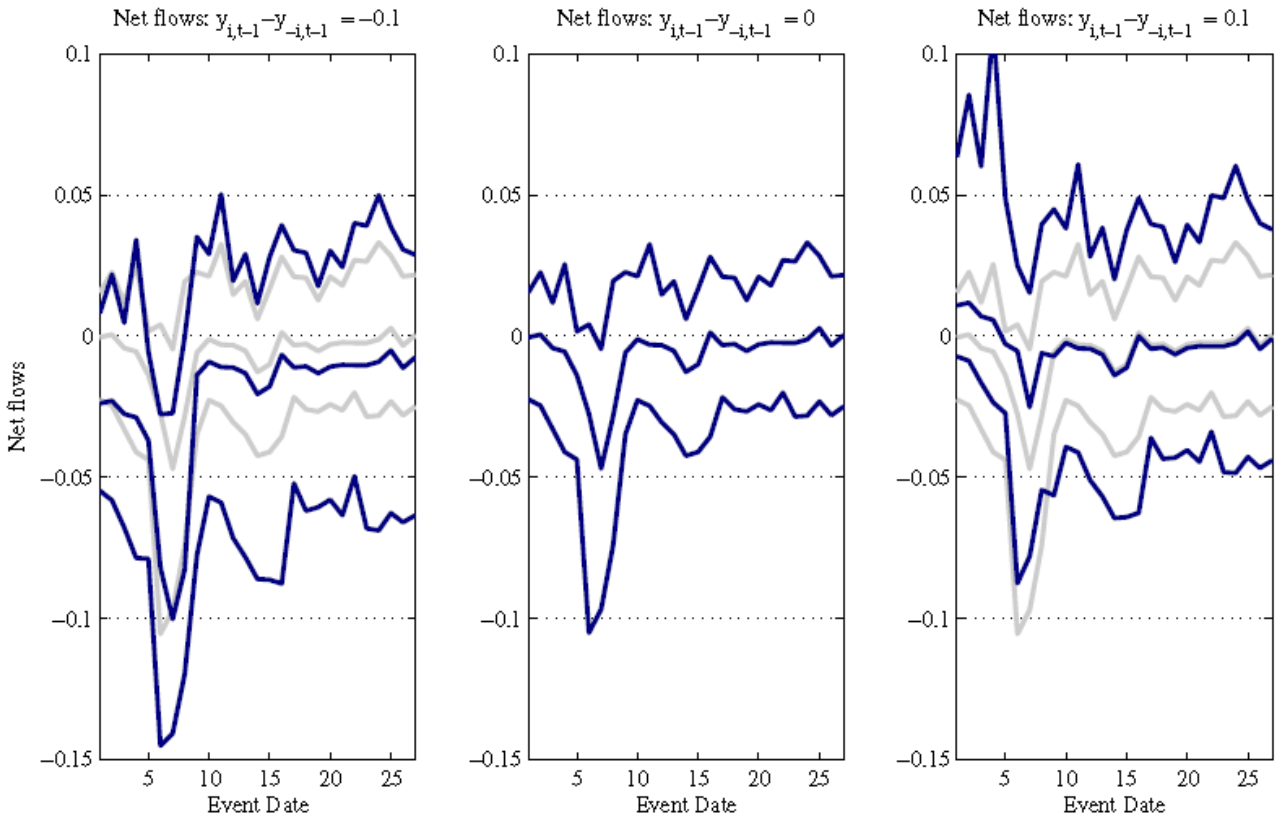



**Figure 11:** Impact of lagged flows for Prime Institutional funds in baseline specification

# Marginal Fitted Effects of 1 Sigma Shift on Flow Distribution During Sep 17-19

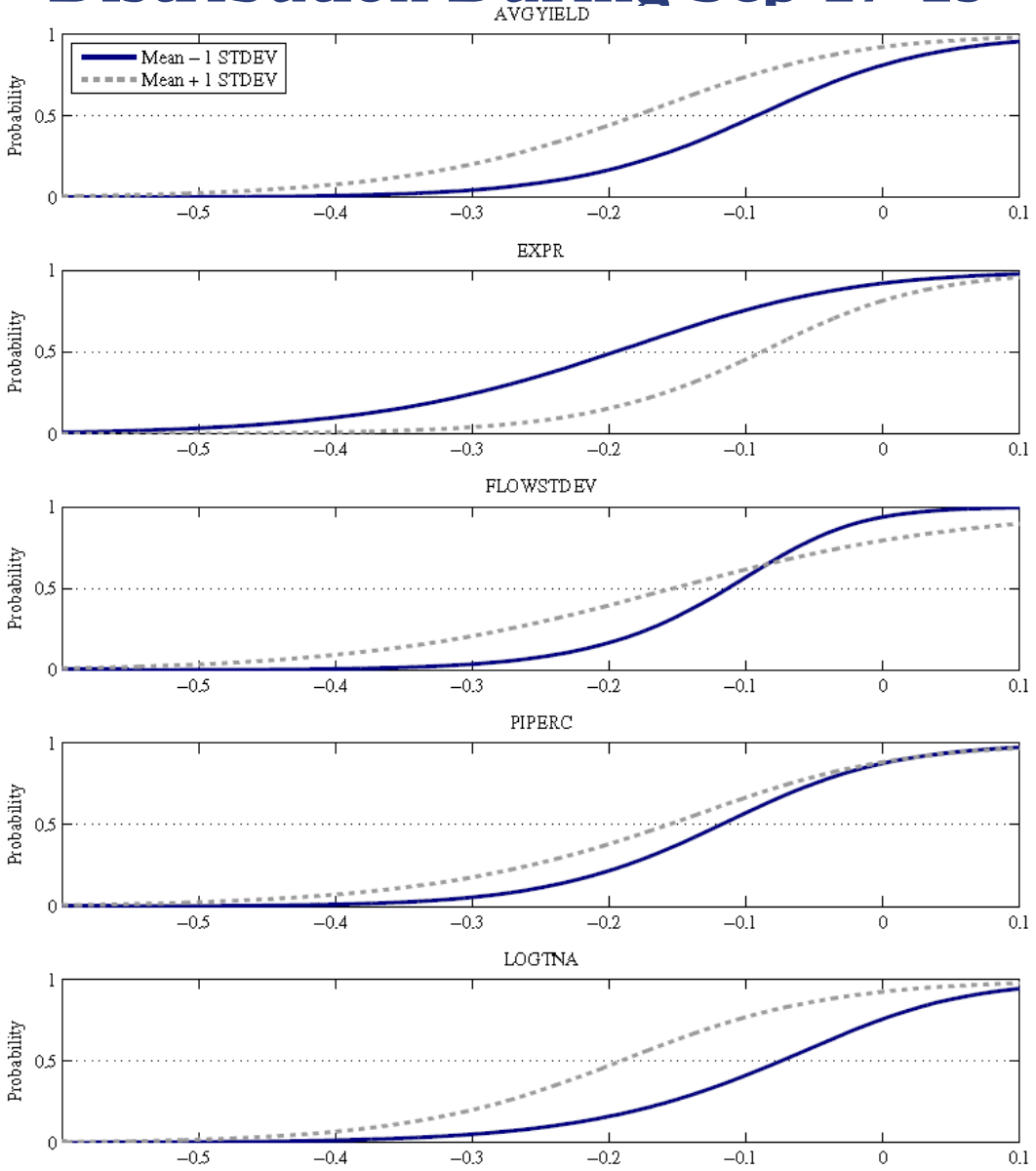



**Figure 14:** Marginal Effect of Explanatory Variables on Cumulative Flow Distributions During Crisis Period - Institutional Funds

# What Did We Learn?

- September 2008 period unique for study of “shadow bank runs”
- Prime funds exhibit many characteristics of runs
  - Flows highly autocorrelated with one-day lagged flows
- Highest autocorrelations in flows to funds catering to institutions
- Some correlation in flows for retail funds, but Treasury intervention appears to have precluded further retail runs
- Run-like behavior in institutional shareclasses with risky fundamentals and “hot money” clientele in the early days (pre-crisis)
  - An information effect rather than pure panic?
- Higher autocorrelations during later days of the crisis
  - Investor panic or model misspecification?
- Many unanswered questions, but we now have a framework to study money fund runs