# Pushing or Pulling?
# Quantitative Easing, Quantitative Tightening and International Capital Flows

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# How have QE and QT affected international k flows?

- No consensus exists on impact of unconventional policies on flows
  - Fratscher et al (2018), Koepke (2014), others find spillovers
  - Ahmed and Zlate (2013), Ahmed et al (2015) disagree

- UMP works through several channels:
  - *Portfolio Balance Channel*– purchases of long-term bonds by CBs compress the term premium, which drives up demand for substitute risky assets
    - Gagnon et al 2010; D'Amico and King 2010, Hamilton and Wu 2012
  - *Signalling Channel*– commitment to keep yields low can boost carry-induced demand for emerging market bonds and equity
    - *Bauer and Rudebusch 2013*
  - *Confidence Channel*– an easing announcement is interpreted as commitment to do "whatever it takes" to support growth
    - *Fratscher et al 2018, Chen 2012*

- Interesting question, even more so now that we can look into QE and QT

# Our Approach

- UMP announcements by 4 developed market central banks
  - Federal Reserve (Fed)
  - Bank of England (BOE)
  - European Central Bank (ECB)
  - Bank of Japan (BOJ)
- Monetary policy surprises (MPS) from Curcuru et al (2018)
- Carefully constructed data set of daily net flows and total assets of 6 mutual fund types:
  - United States bond and equity funds
  - Developed market (DM) bond and equity funds (excluding US)
  - Emerging Markets (EM) bond and equity funds
- Traditional and novel measures of capital flows
  - Isolate active portfolio reallocations using technique described in Ahmed et al (2015)
- Symmetric and asymmetric model allowing both easing and "tightening"

# Plan and Preview of the Results

- More details on our approach
    - MPS
    - Capital Flows
    - Model
- Results
- Robustness
- Conclusion

# Monetary Policy Surprises

- Cover regular meetings and UMP announcements by the Fed, ECB, BOE, and BOJ over the period January 2008-December 2018

- Calculated following Curcuru *et al* (2018)
  - Changes in government bond futures yields around monetary policy announcement times (15 minutes before the announcement, to 1 hour and 45 minutes after the announcement)
    - U.S. 10-year Treasury note futures yields for the US
    - 10-year gilt futures yields for the UK
    - 10-year Japanese government bond  futures for Japan
    - Spreads between Italian and German futures yields on 10-year government bonds for the EA
    Rogers et al. (2014, 2018), Gilchrist et al. (2014) and Bowman et al. (2015) use similar
  - Normalized to lower yields by 25 bps
  - MPS are signed so that a positive surprise represents an easing of monetary policy.

# Monetary Policy Surprises: Fed
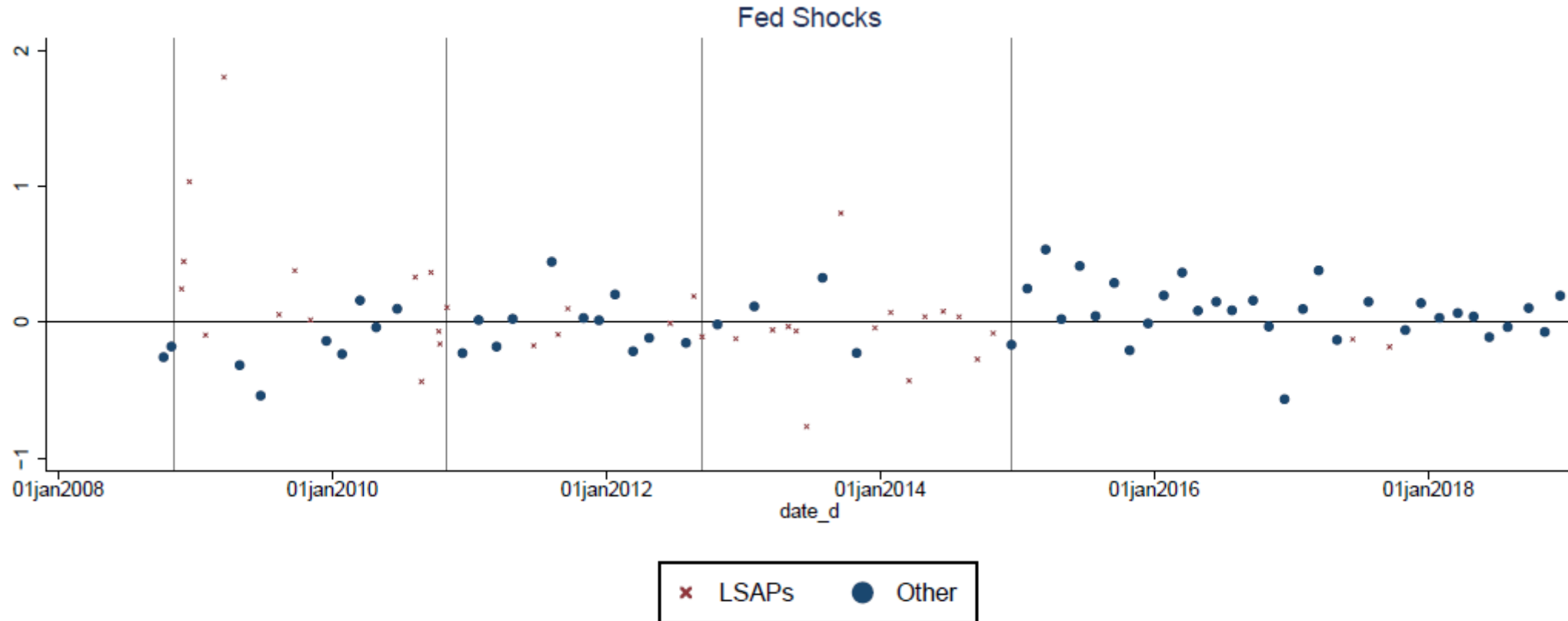


Fed Shocks

Source: Curcuru, DePooter, and Eckard (2018). Easing carries a positive sign, tightening carries a negative sign. Monetary policy shocks are normalized to a 25 basis point shock.

- Surprises vary in size
- Both positive and negative values
- LSAP can be quite large

# MPS: BOE



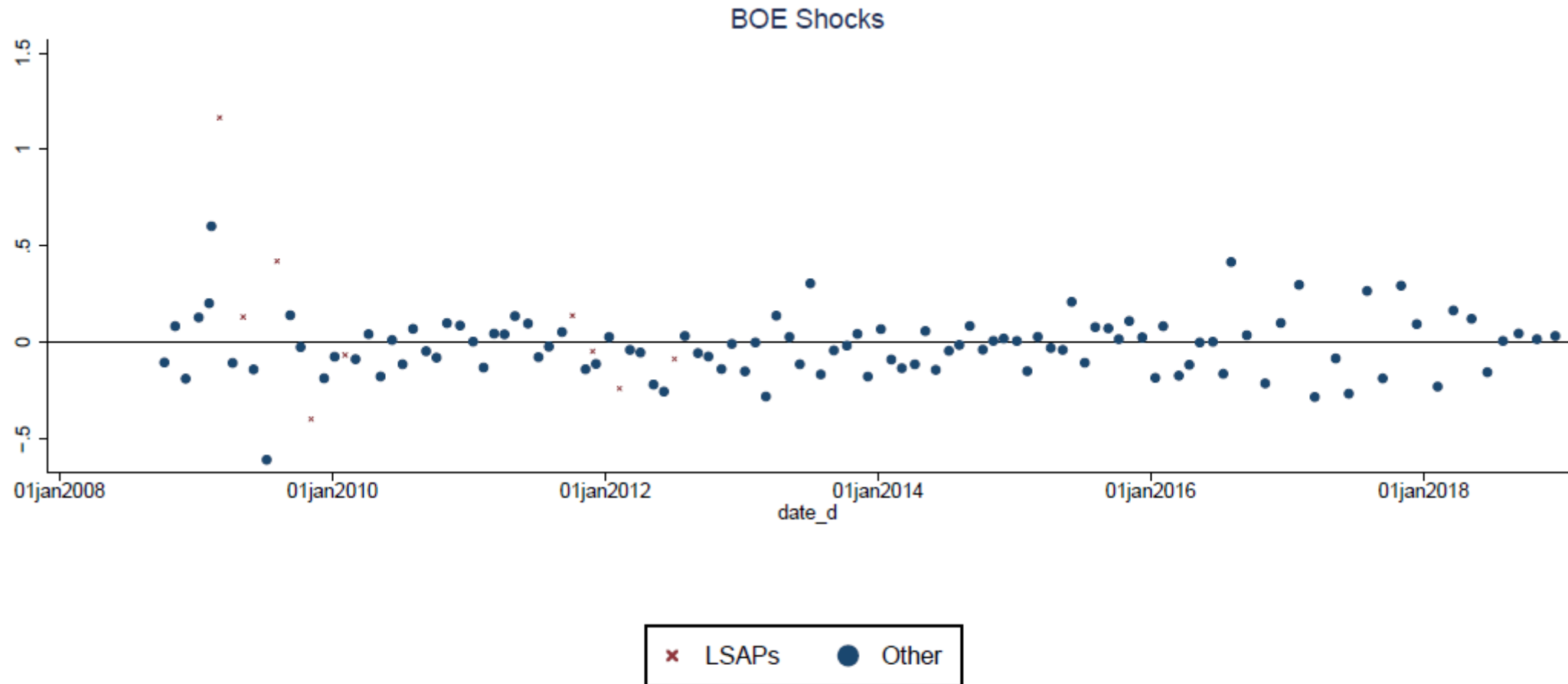BOE Shocks

Source: Curcuru, DePooter, and Eckard (2018). Easing carries a positive sign, tightening carries a negative sign. Monetary policy shocks are normalized to a 25 basis point shock.

# MPS: ECB



ECB Shocks

Source: Curcuru, DePooter, and Eckard (2018). Easing carries a positive sign, tightening carries a negative sign. Monetary policy shocks are normalized to a 25 basis point shock.

# MPS: BOJ



BOJ Shocks

LSAPs ● Other

Source: Curcuru, DePooter, and Eckard (2018). Easing carries a positive sign, tightening carries a negative sign. Monetary policy shocks are normalized to a 25 basis point shock.
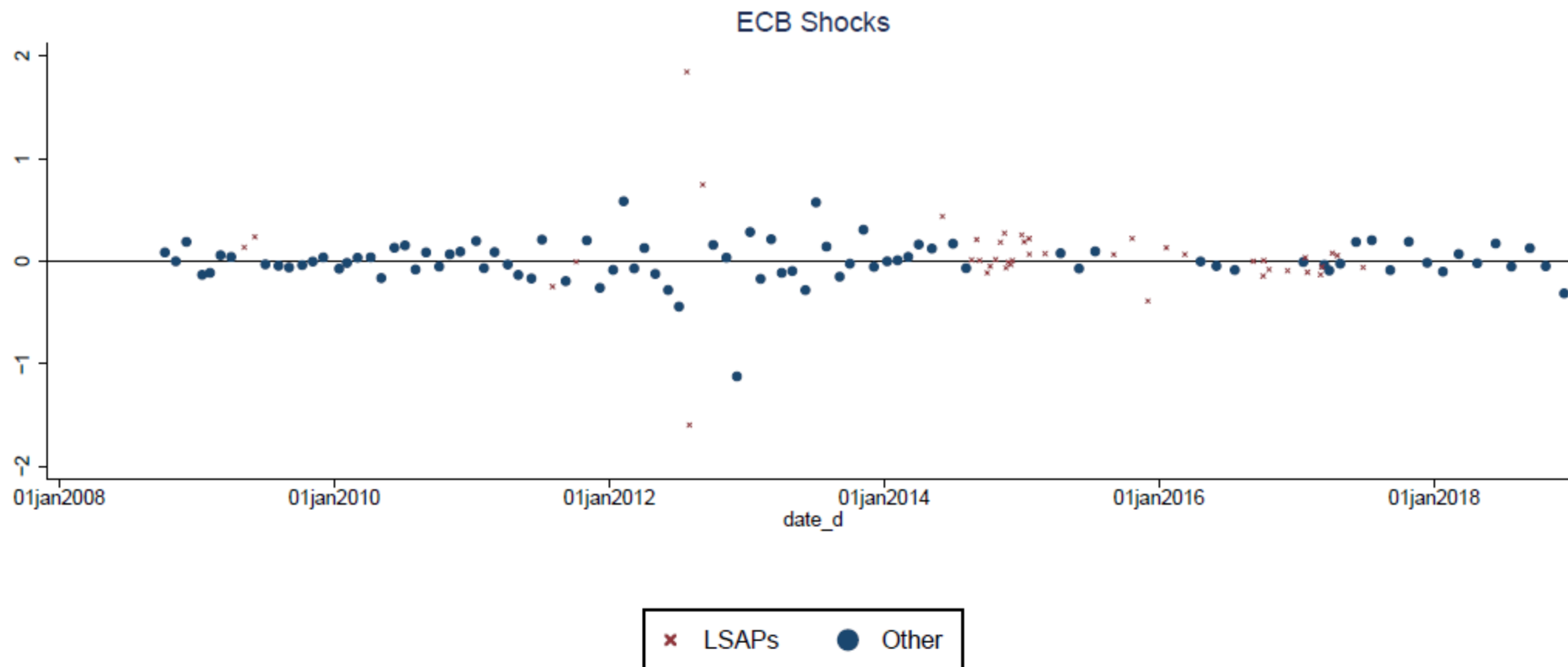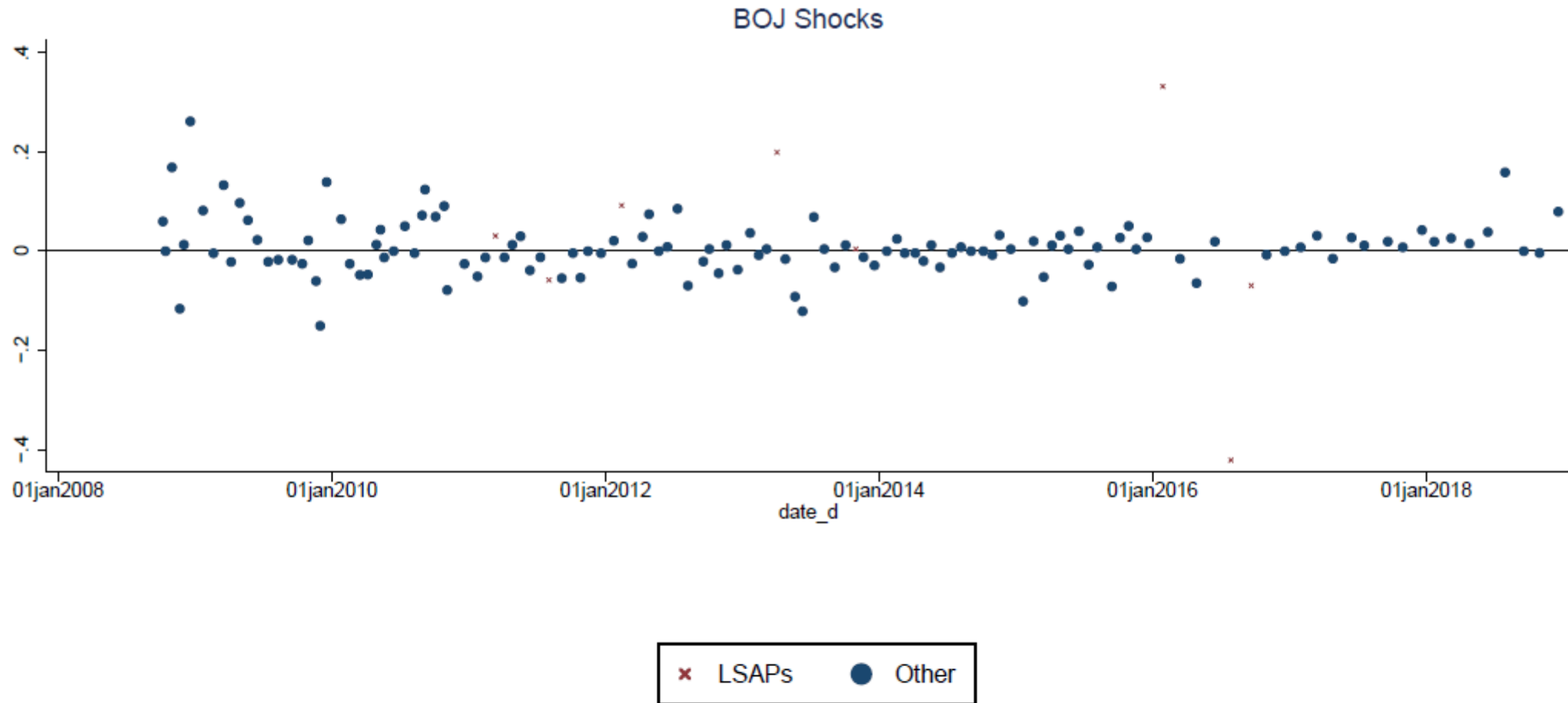
# Capital Flows

- EPFR flows, 1/1/2008-12/30/2018
  - Fund holdings represent between 5 and 25% of the float-adjusted market capitalization of individual equity markets.
  - Sample roughly evenly split between retail and institutional investors.
  - Approximately 40 percent of the funds are domiciled in the U.S. and a further 50 percent are domiciled in other advanced economies, so the bulk of the flows in and out of emerging market funds are cross-border flows.
- Use flows into dedicated country or regional funds to get an accurate reading of the geography of EPFR daily flows
  - For multi-country funds level flows are estimated based on country allocations reported by the fund for the previous month-end. So for funds investing in multiple countries, EPFR will not capture inter-country reallocations between months.

# Figure 2: Cummulative Fund Flows

## Panel A: Billions of USD
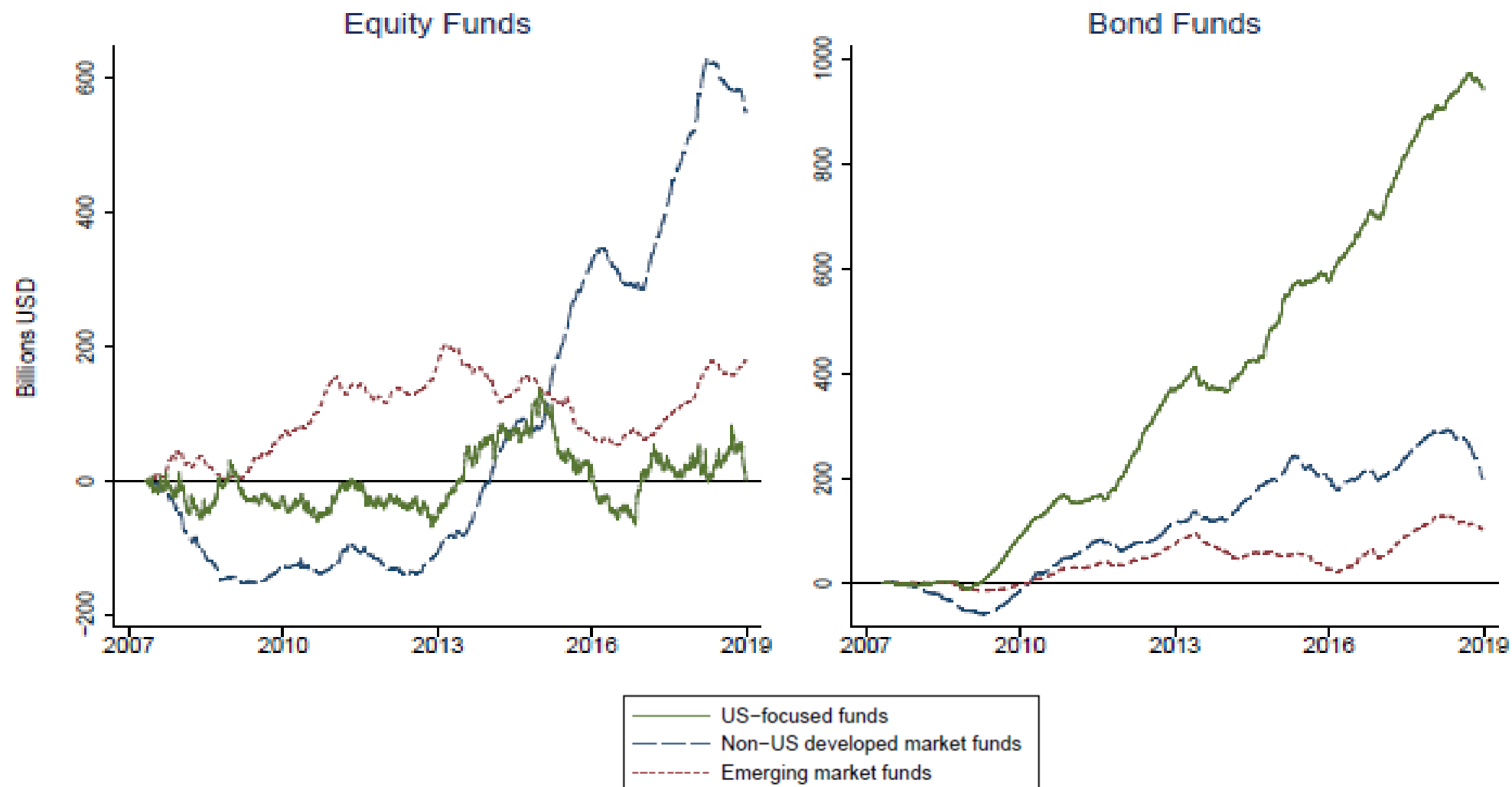


Source: EPFR. Series constructed using daily frequency data on flows to dedicated country or regional funds.

# Panel B: Percent of total assets
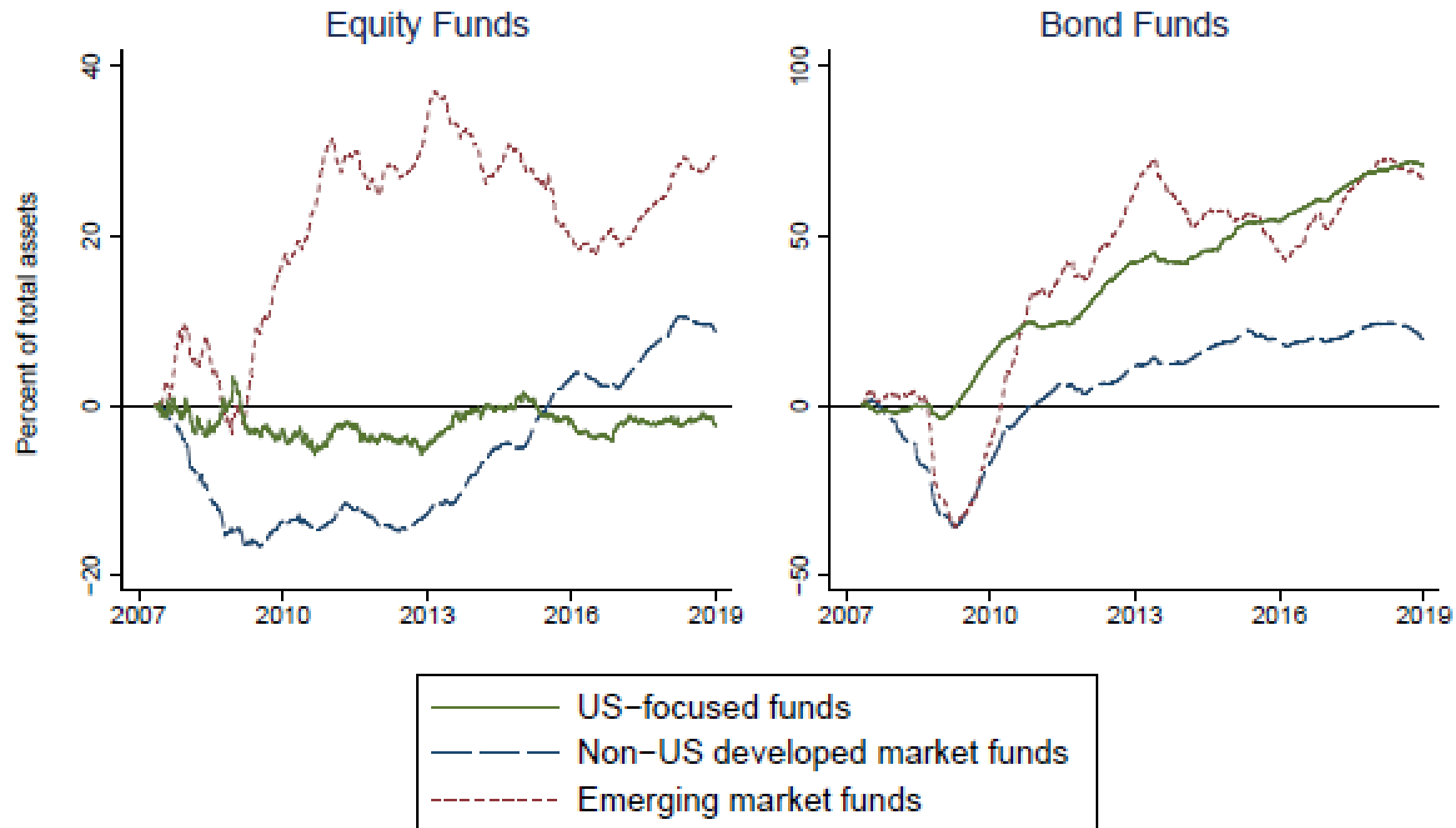


Source: EPFR. Series constructed using daily frequency data on flows to dedicated country or regional funds.

# Capital Flows (2)

- We use 6 daily aggregates into dedicated and regional funds:
  - US bond and equity
  - DM (less US) bond and equity
  - EM bond and equity

- We use 2-day flow measures
  1. Changes in flows scaled by initial NAV
     - Normalizing by NAV makes our coefficient estimates comparable across asset classes
     - Because fund flows are persistent (Froot et al 2001), use change in flows
  2. Portfolio-based flow measure (…explained in a couple of slides)

**Table 1:** Summary Statistics, Fund Flows

| | 2-day flows (Millions USD) | | | Change in 2-day flows (Percent of initital NAV) | | |
|---|---|---|---|---|---|---|
| | Mean | Median | St. Dev. | Mean | Median | St. Dev. |
| **NON Event Days: 2590** | | | | | | |
| US Equity | -5.7 | -34.5 | 4108.5 | 0.003 | -0.002 | 0.268 |
| US Bond | 616.1 | 578.2 | 1415.5 | -0.000 | -0.003 | 0.107 |
| DM Equity | 364.4 | 243.8 | 1729.1 | -0.000 | -0.002 | 0.122 |
| DM Bond | 134.9 | 204.9 | 891.6 | 0.002 | 0.001 | 0.123 |
| EM Equity | 127.9 | 140.6 | 1115.2 | 0.001 | -0.003 | 0.173 |
| EM Bond | 65.8 | 79.5 | 500.1 | -0.002 | -0.007 | 0.239 |
| **FED Event Days: 91** | | | | | | |
| US Equity | 530.3 | 438.7 | 3994.6 | -0.010 | -0.003 | 0.212 |
| US Bond | 673.1 | 675.1 | 1536.5 | 0.027 | 0.018 | 0.112 |
| DM Equity | 293.8 | 424.2 | 1984.5 | 0.002 | 0.002 | 0.138 |
| DM Bond | 27.1 | 217.1 | 983.6 | -0.033 | -0.016 | 0.147 |
| EM Equity | 93.3 | 323.6 | 1203.6 | 0.003 | 0.001 | 0.165 |
| EM Bond | 69.2 | 126.4 | 496.6 | -0.010 | -0.002 | 0.238 |
| **BOE Event Days: 116** | | | | | | |
| US Equity | -830.0 | -552.1 | 4320.3 | -0.031 | -0.033 | 0.234 |
| US Bond | 591.3 | 596.6 | 1437.8 | -0.012 | -0.014 | 0.106 |
| DM Equity | 547.0 | 368.8 | 1848.1 | -0.008 | -0.003 | 0.196 |
| DM Bond | 147.3 | 258.3 | 814.9 | -0.021 | -0.016 | 0.105 |
| EM Equity | 14.9 | 61.5 | 1205.0 | -0.014 | -0.009 | 0.156 |
| EM Bond | 75.8 | 112.3 | 523.2 | 0.014 | 0.025 | 0.234 |

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| EM Equity | 127.9 | 140.6 | 1115.2 | 0.001 | -0.003 | 0.173 |
| EM Bond | 65.8 | 79.5 | 500.1 | -0.002 | -0.007 | 0.239 |
| **ECB Event Days: 153** | | | | | | |
| US Equity | -118.6 | -559.0 | 3624.3 | 0.009 | -0.004 | 0.240 |
| US Bond | 859.7 | 670.7 | 1449.2 | 0.002 | -0.012 | 0.109 |
| DM Equity | 339.5 | 233.0 | 2032.0 | -0.004 | -0.005 | 0.196 |
| DM Bond | 130.2 | 181.2 | 836.5 | -0.035 | -0.020 | 0.112 |
| EM Equity | 74.8 | 140.9 | 1145.0 | 0.001 | -0.010 | 0.177 |
| EM Bond | 118.1 | 116.0 | 449.7 | -0.004 | 0.026 | 0.252 |
| **BOJ Event Days: 150** | | | | | | |
| US Equity | 214.6 | -493.9 | 5170.3 | -0.035 | -0.029 | 0.381 |
| US Bond | 551.1 | 421.8 | 1116.5 | -0.013 | -0.020 | 0.097 |
| DM Equity | 342.9 | 138.9 | 1785.4 | 0.003 | -0.005 | 0.171 |
| DM Bond | 182.6 | 227.3 | 872.2 | 0.007 | 0.004 | 0.142 |
| EM Equity | 74.5 | 125.2 | 1208.3 | -0.014 | -0.025 | 0.200 |
| EM Bond | 87.9 | 73.5 | 410.9 | 0.021 | 0.013 | 0.233 |

# Portfolio reallocation

- Each of the channels through which monetary policy operates involves portfolio rebalancing, which is not accurately captured by looking at bilateral flows

- A sizable portion of flows can be attributed to allocation of new income across assets.
  - The financial wealth of U.S. residents steadily increased from about $40 trillion in 2007 to $63 trillion in 2014
  - Ahmed et al (2015) estimate that allocation of growing wealth accounts for as much as 76% of U.S. investor flows to EM equities 2011-2013.

# Portfolio-based measure

- Capital flows are the result of portfolio growth and portfolio reallocation, which itself has active and passive components (Tille and van Wincoop 2010)

- Passive changes in portfolio weights arise from relative returns of each asset, and also investment of new wealth according to prior portfolio weight

- Active change in portfolio weight measure removes contribution of passive portfolio reallocation:

$$A_{[t,t+1]}^{i,j} = w_{t+1}^{i,j} - w_t^{i,j} \frac{1+r_t^{i,j}}{1+r_t^{TOT}}$$

$$w_t^{i,j} = \frac{NAV_t^{i,j}}{NAV_t^{TOT}}$$

Figure 3: Fund Investors' Aggregate Portfolio
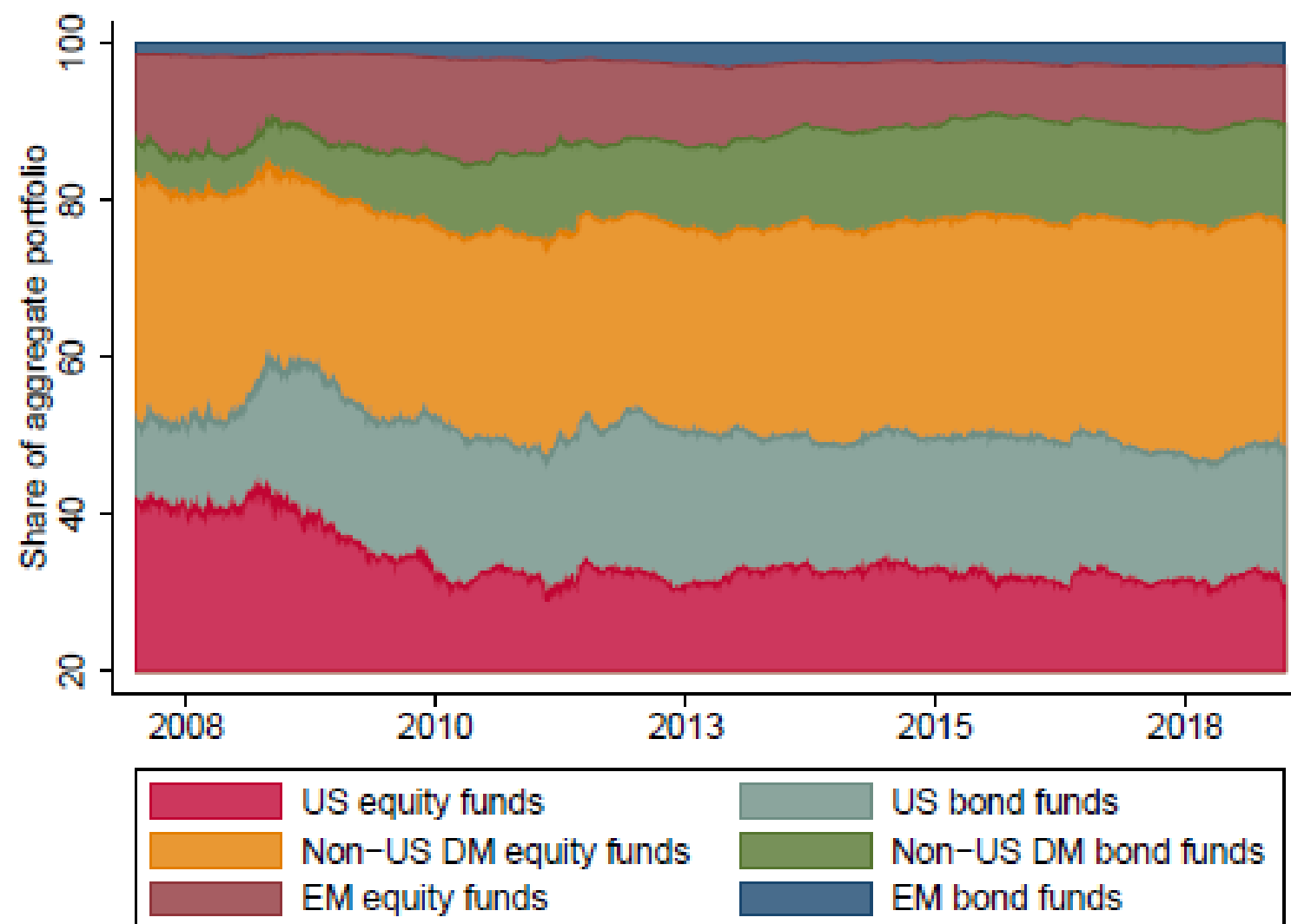
# Model

- Symmetric model

$$\Delta FF_{[t]}^{i,j} = \alpha + \beta^{i,j,b} MPS_t^b + \varepsilon_t^{i,j}$$

- Asymmetric model

$$\Delta FF_{[t]}^{i,j} = \alpha + \beta_1^{i,j,b} MPS_t^b 1\left(MPS_t^b < 0\right) + \beta_2^{i,j,b} MPS_t^b 1\left(MPS_t^b > 0\right) + \varepsilon_t^{i,j}$$

- Interpretation

FF is the flow measure in fund *i=equity, bond* and area *j= US, DM, EM during the day of and the day following the day t monetary policy announcement*

|  | inflows | outflows |
|---|---|---|
| Tightening (MPS < 0) | $\beta_1 < 0$ | $\beta_1 > 0$ |
| Easing (MPS > 0) | $\beta_2 > 0$ | $\beta_2 < 0$ |

# Results - Summary

- Results show some variation depending on the flow measure we use
- Neither during QE nor during QT do we find that easing announcements by the Fed are associated with inflows into EM equity funds.
- Following unexpected policy easings in DM countries, when using active reallocation measure, investors
  - reallocate their portfolio toward DM equity investments and
  - out of other assets

## Table 2: Fund flows and monetary policy shocks

**Dependent Variable:**
**Change in 2-day flows** (percent of initial NAV)

|  | Fed | BoE | ECB | BoJ |
|---|---|---|---|---|
| US Equity | 0.106 (0.108) | -0.043 (0.116) | 0.118 (0.034)*** | -0.110 (0.208) |
| US Bond | 0.015 (0.033) | -0.049 (0.061) | 0.026 (0.040) | -0.177 (0.118) |
| DM Equity | -0.024 (0.033) | -0.029 (0.097) | 0.029 (0.013)** | -0.014 (0.078) |
| DM Bond | -0.027 (0.025) | -0.006 (0.038) | 0.015 (0.040) | 0.111 (0.265) |
| EM Equity | 0.010 (0.033) | -0.240 (0.055) | 0.070 (0.030)** | -0.086 (0.120) |
| EM Bond | 0.121 (0.058)** | -0.060 (0.087) | -0.062 (0.256) | 0.178 (0.172) |
| Observations | (91) | (116) | (153) | (150) |

- ECB appears to affect flows, more so than the Fed
- ECB easings are associated with increased inflows into both US and DM as well as EM equity funds
- Fed easings (tightenings) elicit increased inflows (outflows) to (from) EM bond funds
- Flows do not appear to respond significantly to actions by the BOE or BOJ

## Table 3: Fund flows and monetary policy shocks, asymmetric model

**Dependent Variable: Change in 2-day flows** (percent of initial NAV)

| | | Fed | BoE | ECB | BoJ |
|---|---|---|---|---|---|
| US Equity | Tightening | -0.057 (0.125) | -0.118 (0.228) | 0.075 (0.055) | -0.557 (0.630) |
| | Easing | 0.189 (0.108)* | -0.006 (0.147) | 0.134 (0.052)** | 0.260 (0.313) |
| US Bond | Tightening | 0.174 (0.054)*** | -0.109 (0.090) | -0.026 (0.023) | -0.283 (0.149) |
| | Easing | -0.047 (0.023) | -0.016 (0.077) | 0.080 (0.033)** | -0.087 (0.134) |
| DM Equity | Tightening | 0.044 (0.051) | -0.101 (0.051) | 0.029 (0.017)* | -0.082 (0.084) |
| | Easing | -0.063 (0.095) | 0.147 (0.055)*** | 0.029 (0.029) | 0.076 (0.172) |
| DM Bond | Tightening | -0.103 (0.039) | -0.083 (0.074) | -0.047 (0.157) | -0.223 (0.142) |
| | Easing | 0.010 (0.018) | 0.036 (0.040) | 0.046 (0.027)* | 0.369 (0.177)** |
| EM Equity | Tightening | -0.065 (0.068) | -0.243 (0.084) | 0.036 (0.023) | -0.082 (0.122) |
| | Easing | 0.040 (0.046) | -0.234 (0.095) | 0.109 (0.035)*** | -0.092 (0.232) |
| EM Bond | Tightening | 0.444 (0.094)*** | -0.205 (0.205) | -0.019 (0.054) | 0.048 (0.238) |
| | Easing | -0.003 (0.036) | 0.012 (0.087) | -0.314 (0.046) | 0.295 (0.228) |
| Observations | | (91) | (116) | (153) | (150) |

- Fed policy affects flows primarily through tightening, increased outflows from DM and EM bond funds
- When the ECB eases ($\beta_2$), investors move more into equities across the board (mainly US and EM)
- BoE and BoJ announcements have limited effects

| | inflows | outflows |
|---|---|---|
| Tightening (MPS < 0) | $\beta_1 < 0$ | $\beta_1 > 0$ |
| Easing (MPS > 0) | $\beta_2 > 0$ | $\beta_2 < 0$ |

## Table 4: Active portfolio reallocation and monetary policy shocks, asymmetric model

|  | inflows | outflows |
|---|---|---|
| Tightening (MPS < 0) | $\beta_1 < 0$ | $\beta_1 > 0$ |
| Easing (MPS > 0) | $\beta_2 > 0$ | $\beta_2 < 0$ |

**Dependent Variable: 2-day active reallocation** (basis points)

|  |  | Fed | BoE | ECB | BoJ |
|---|---|---|---|---|---|
| US Equity | Tightening | -14.49 (3.58)*** | -0.22 (5.14) | 2.58 (0.53)*** | -5.11 (10.17) |
|  | Easing | 8.95 (1.37)*** | -5.78 (2.23)*** | 1.50 (0.61)** | -0.60 (5.29) |
| US Bond | Tightening | 1.83 (0.99)* | -2.51 (1.80) | -1.33 (0.81) | 2.77 (8.52) |
|  | Easing | -3.02 (0.56)*** | 3.94 (0.94)*** | -0.62 (0.25)** | -0.69 (4.31) |
| DM Equity | Tightening | 9.84 (1.69)*** | 3.14 (2.78) | 0.67 (0.89) | 0.49 (3.79) |
|  | Easing | -3.30 (1.20)*** | 1.22 (1.95) | 0.82 (1.42) | 0.22 (4.68) |
| DM Bond | Tightening | 0.62 (0.78) | -0.09 (1.24) | -0.19 (0.39) | -0.28 (2.23) |
|  | Easing | -2.20 (0.47)*** | -0.07 (0.94) | -0.77 (0.16)*** | 2.71 (1.98) |
| EM Equity | Tightening | 1.51 (1.02) | -0.15 (1.00) | 0.23 (0.71) | 2.00 (3.01) |
|  | Easing | -0.72 (0.36)** | 2.02 (0.80)** | -0.97 (1.64) | 5.10 (4.62) |
| EM Bond | Tightening | 1.31 (0.35)*** | -0.40 (0.41) | -0.35 (0.24) | -0.42 (1.25) |
|  | Easing | -0.67 (0.18)*** | -0.35 (0.22) | -0.11 (0.09) | -0.22 (0.94) |
| Observations |  | (104) | (116) | (153) | (150) |

- Fed policy has highly significant effects
  - when Fed eases, investors reallocate their portfolio away from EM assets and DM bonds, into DM equity
  - investors react in a similar manner to both monetary policy easings ($\beta_2$) and tightenings ($\beta_1$)
- ECB easing prompts reallocation from DM bonds into US equity, tightening associated with outflows from US equity

**Table 5:** Active portfolio reallocation and Federal Reserve policy shocks, QE vs post-QE periods, asymmetric model

|  | inflows | outflows |
|---|---|---|
| Tightening (MPS < 0) | $\beta_1 < 0$ | $\beta_1 > 0$ |
| Easing (MPS > 0) | $\beta_2 > 0$ | $\beta_2 < 0$ |

## Dependent Variable: 2-day active reallocation (basis points)

|  |  | QE | Post-QE |
|---|---|---|---|
| US Equity | Tightening | -9.78 (2.39)*** | -15.76 (1.98)*** |
|  | Easing | 9.26 (1.33)*** | 7.62 (2.46)*** |
| US Bond | Tightening | 0.91 (1.48) | 3.15 (1.13)*** |
|  | Easing | -2.98 (0.65)*** | -3.35 (1.47)** |
| DM Equity | Tightening | 7.48 (1.91)*** | 8.56 (1.09)*** |
|  | Easing | -2.95 (1.22)** | 1.64 (1.31) |
| DM Bond | Tightening | 0.07 (0.57) | 0.32 (0.84) |
|  | Easing | -2.18 (0.46)*** | -2.40 (1.84) |
| EM Equity | Tightening | 0.25 (0.81) | 1.98 (0.66)*** |
|  | Easing | -0.65 (0.35)* | -2.88 (1.67)* |
| EM Bond | Tightening | 1.18 (0.39)*** | 1.60 (0.39)*** |
|  | Easing | -0.66 (0.17)*** | -0.83 (0.29)*** |
| Observations |  | (56) | (33) |

- Direction of flows similar following announcements during QE and QT (only differences in magnitudes)
- Fed easing associated with reallocation from EM bond and equity, and toward US equity holds across the two periods
- Easing also prompts reallocation away from US and DM bonds and into US equity

# Robustness

|  | Flows (% of initial assets) | Flows (% of initial assets) | Active portfolio reallocation (bps) |
|---|---|---|---|
| **US Equity Funds** | | | |
| QE1 indicator | 0.15*** (0.06) | | |
| QE2 indicator | 0.07** (0.03) | | |
| QE3 indicator | -0.01 (0.06) | | |
| QE1 MPS | | 0.34*** (0.05) | 7.65*** (1.20) |
| QE2 MPS | | -0.13 (0.23) | -11.96* (6.39) |
| QE3 MPS | | -0.11 (0.66) | 2.47 (3.72) |
| **US Bond Funds** | | | |
| QE1 indicator | 0.01 (0.02) | | |
| QE2 indicator | -0.02 (0.03) | | |
| QE3 indicator | -0.04*** (0.01) | | |
| QE1 MPS | | 0.02 (0.02) | -2.56*** (0.57) |
| QE2 MPS | | 0.41*** (0.11) | 3.09 (3.46) |
| QE3 MPS | | 0.45*** (0.14) | 11.57 (11.75) |
| **DM Equity Funds** | | | |
| QE1 indicator | 0.04* (0.02) | | |
| QE2 indicator | -0.01 (0.03) | | |
| QE3 indicator | -0.02 (0.05) | | |
| QE1 MPS | | 0.03** (0.01) | -2.88*** (0.66) |
| QE2 MPS | | 0.00 (0.21) | 8.39 (5.24) |
| QE3 MPS | | 0.40 (0.62) | 3.07 (22.23) |
| **DM Bond Funds** | | | |
| QE1 indicator | -0.01 (0.03) | | |
| QE2 indicator | -0.02 (0.03) | | |
| QE3 indicator | 0.05** (0.02) | | |
| QE1 MPS | | -0.12 (0.07) | -1.77*** (0.43) |
| QE2 MPS | | 0.47*** (0.09) | 2.33 (1.61) |
| QE3 MPS | | -0.28 (0.23) | -0.86 (5.55) |
| **EM Equity Funds** | | | |
| QE1 indicator | 0.05* (0.03) | | |
| QE2 indicator | -0.00 (0.05) | | |
| QE3 indicator | 0.14** (0.06) | | |
| QE1 MPS | | 0.15*** (0.03) | -0.06 (0.14) |
| QE2 MPS | | 0.15 (0.37) | -1.24 (4.66) |
| QE3 MPS | | -1.70*** (0.65) | -15.24*** (1.60) |
| **EM Bond Funds** | | | |
| QE1 indicator | 0.02 (0.05) | | |
| QE2 indicator | 0.07*** (0.02) | | |
| QE3 indicator | 0.06 (0.05) | | |
| QE1 MPS | | -0.10* (0.06) | -0.39*** (0.09) |
| QE2 MPS | | -0.06 (0.22) | -0.61** (0.30) |
| QE3 MPS | | -0.49 (0.64) | -1.02*** (0.39) |

- use an alternative model setup, which separates the surprise variables by phase of QE, but does not distinguish between easing and tightening announcements:

$$F_{[t+1]}^{i,j} = \alpha + \beta_1^{i,j} QE1 + \beta_2^{i,j} QE2 + \beta_3^{i,j} QE3 + \varepsilon_t^{i,j}$$

- First column: flows/NAV, dummy variable

- Second column: flows/NAV, MPS

- Third column: active portfolio flows, MPS

# Conclusion

- We study MPS by Fed, BOE, ECB and BOJ during WE and QT

- Analyze the effect on capital flows

- Find interesting results that help to solve the puzzle of the different results in the literature.