# What Moves Markets?

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# What Moves Markets?

## Theoretically: News

Efficient Markets Hypothesis: Asset prices reflect all publicly available information and react instantly to new information

## Empirically: Mostly not news

"*even with hindsight, the ability to explain stock price changes is modest*"

Roll (JoF, 1988)

"*difficulty of linking [..] volatility to observed measures of information*"

Mitchell & Mulherin (JoF, 1994)

## This paper

roughly half of all market movements are "explained" by news

# Basic idea

1. Use continuous high-frequency asset price changes
   - bond yields (2y, 5y, 10y) and stock prices
   - for the US and euro area (EA)
   - starting 2002
2. Collect a vast time-stamped event database
   - covering scheduled news
   - and ad hoc events
3. Compute share of market movements occurring around news

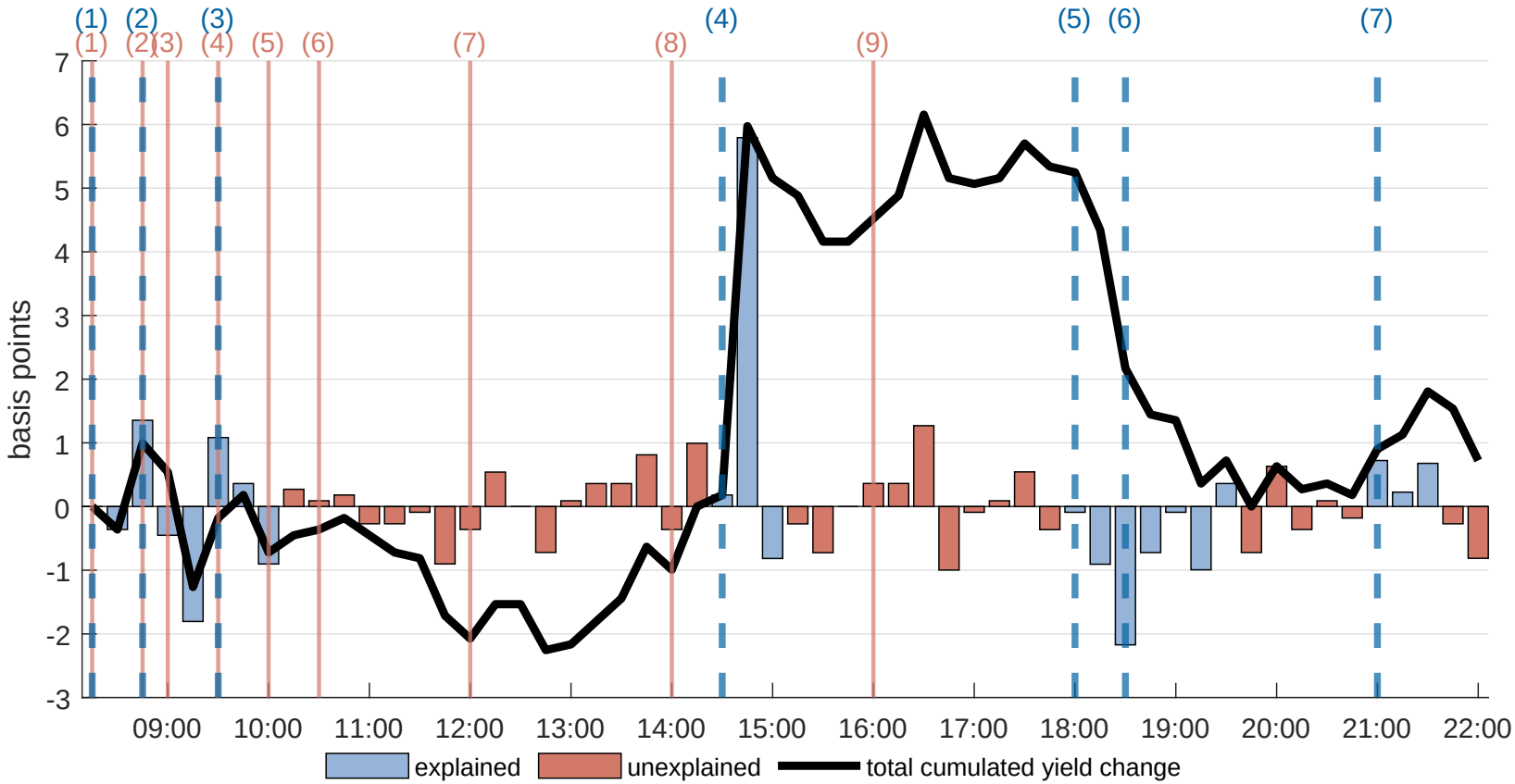
# Main assumption

market movements are *caused* by the news event around which they occur

$\Rightarrow$ strong assumption, but

1. standard in event study literature
2. we weed out irrelevant news first
3. in line with Gürkaynak, Kısacıkoğlu, and Wright (2020, GKW) Details

# Example: 10-year Bund yields on 7 October 2011



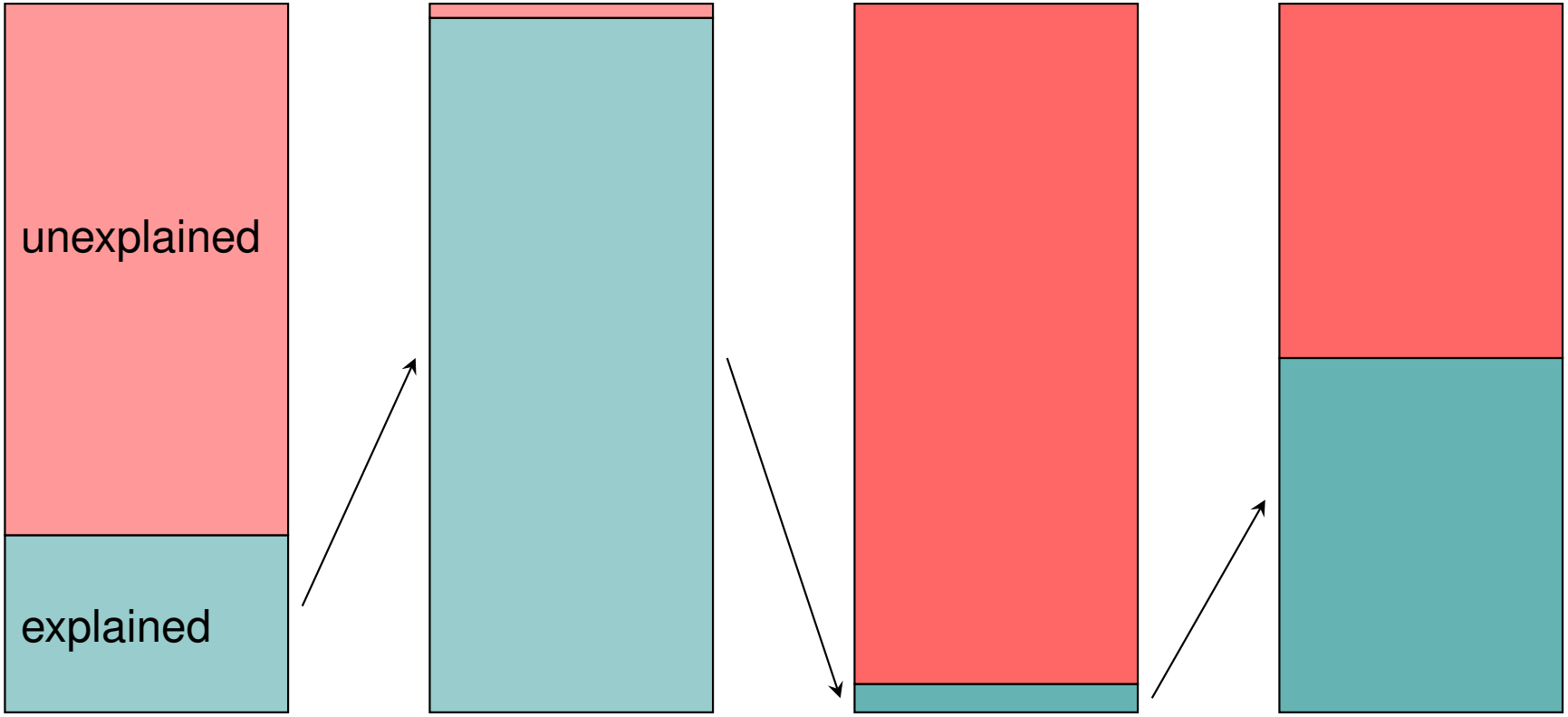

**Important News**: (1) FI Exports & Imports & Trade Balance, BoJ: Press Release, (2) FR Trade Balance, (3) SE Budget Balance, **(4) US Employment Report**, **(5) Fitch downgrades Italy from AA- to A+**, **(6) Fitch downgrades Spain AA+ to AA-**, (7) US Consumer Credit.
**Unimportant News**: (1) CH Unemployment Rate, JP Cabinet Office Indices, JP Official Reserve Assets, (2) FR Budget Balance, (3) DK Industrial Production and Orders, (4) AT Wholesale Price Index (5) NO Ind Prod Manufacturing & NO Industrial Production, (6) UK Price Indices, (7) DE Industrial Production, (8) PL Official Reserves, (9) US Inventories and Trade Balance.

50% of market movements occur in tight windows around important news

(in the above example almost 80%)

# Explanatory Power of News

## Stylized Comparison of Our Finding to Previous Literature




*Conditional* on tight event windows, all market movements due to news

But *unconditional* $R^2$ much lower

GKW example: only roughly one 20min event window every other trading day

# Asset price changes

- stocks (S&P 500 and Eurostoxx) and bond yields (2y, 5y, 10y, US & DE)
  - derived from futures prices
  - sources: Thomson Reuters Tick History for US data, Eurex for EA data
  - using nearest-to-maturity contracts, rolling over on day of expiration
  - bond yield changes approximated using CTD bond
- 15-minute frequency
  - overnight window and up to 55 intraday windows (14h from 2 a.m. to 4 p.m. US Eastern Time)
  - >230,000 observations from March 2002 to September 2020

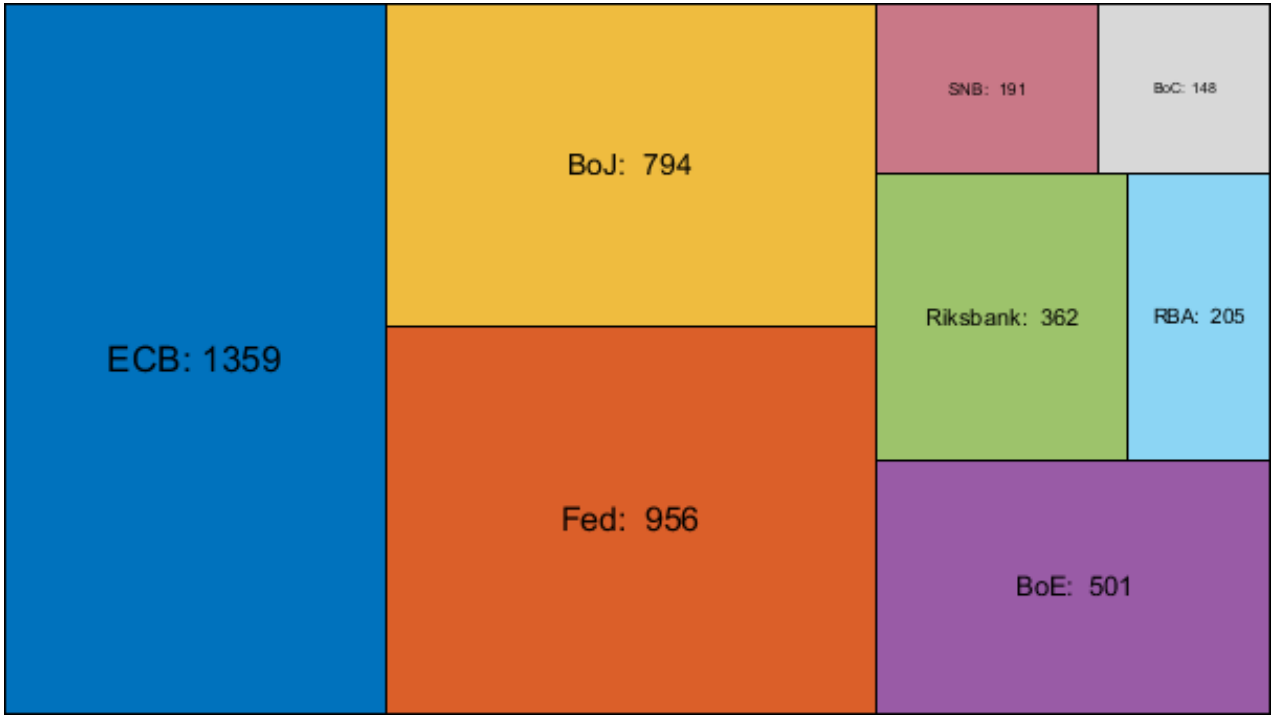
Further Details

# News

1. macro data releases
   - from Bloomberg, covering 22 countries (US, EA, UK, ..)
   - 382 news, covering >1,000 individual series
   - >76,000 events
2. bond auctions
   - auction announcements and publication of results
   - for the US, DE, FR, IT, ES
   - >10,000 auction-related news events
3. central bank announcements
   - 8 central banks (Fed, ECB, BoE, BoJ, SNB, Riksbank, BoC, RBA)
   - press releases, press conferences, speeches, etc.
   - >7,000 central bank news events
4. ad hoc events
   - elections, fiscal policy announcements, natural catastrophes, OPEC announcements, terrorist attacks, etc.
   - >1,000 events

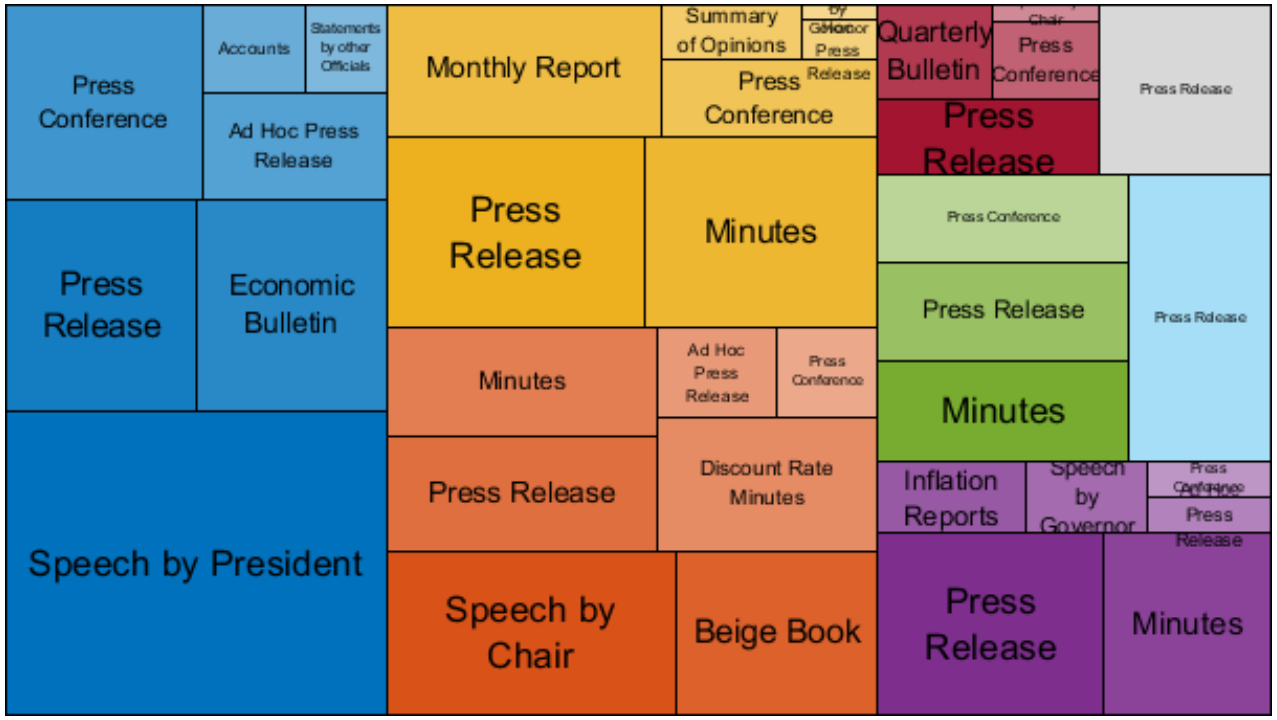
# Example: Central Bank News

Figure: Number of Central Bank Events



# Example: Central Bank News

Figure: Number of Central Bank Events



# Ad Hoc Events

extend previous literature whenever possible:

- Iraq War — Rigobon and Sack (2005); Wolfers and Zitzewitz (2009)
- Global Financial Crisis — Guillen (2009); Ait-Sahalia et al. (2012)
- European Sovereign Debt Crisis — Bahaj (2020)
- OPEC "oil supply news" — Känzig (2021)
- Trump news re trade conflicts and US Fed — Bianchi et al. (2019)
- Sovereign Credit Ratings
- Covid-19
- \+ other news
  - election outcomes, terrorist attacks, natural disasters, etc.

$\Rightarrow$ over 1,000 time-stamped events

# Event Window Length

- usually 45min window: -15min till +30min,
  except for
- central bank press conferences/speeches and ad hoc events
  - → -15min till event end +15min
  - → if exact event end unknown (rare), -15min till +60min
- intraday timestamps from Factiva and/or Bloomberg
- overnight events are allocated to first 30min of next trading day

# Largest Market Movements (1-20)

| Date | Time | $y_{2y}^{US}$ | $y_{5y}^{US}$ | $y_{10y}^{US}$ | $y_{s}^{US}$ | $y_{2y}^{EA}$ | $y_{5y}^{EA}$ | $y_{10y}^{EA}$ | $y_{s}^{EA}$ | unsch. | Event |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 24.06.2016 | ON | -24 | -28 | -26 | -4 | -13 | -18 | -27 | -12 | 1 | Brexit referendum |
| 15.09.2008 | ON | -34 | -30 | -20 | -3 | -21 | -18 | -13 | -3 | 1 | Lehman Brothers bankruptcy |
| 09.03.2020 | ON | -21 | -20 | -18 | -4 | -16 | -17 | -18 | -8 | 1 | Covid-19 spreads, quarantine imposed on Northern Italy; oil price war escalates between Russia and Saudi Arabia |
| 26.06.2002 | ON | -34 | -27 | -19 | -5 | -11 | -11 | -9 | -6 | 1 | Worldcom accounting scandal |
| 22.01.2008 | ON | -19 | -15 | -10 | -5 | -19 | -15 | -10 | -11 | 0 | |
| 16.03.2020 | ON | -9 | -20 | -21 | -5 | -7 | -8 | -9 | -9 | 1 | Covid-19 spreads, quarantine imposed in Spain |
| 10.05.2010 | ON | 12 | 13 | 12 | 3 | 17 | 15 | 13 | 6 | 1 | ECB's Securities Markets Programme announcement |
| 18.03.2009 | 14:30 | -10 | -28 | -37 | 2 | -7 | -12 | -14 | 1 | 0 | FOMC Statement, QE1 announcement |
| 08.09.2008 | ON | 18 | 22 | 17 | 3 | 13 | 13 | 8 | 2 | 1 | Fannie Mae and Freddie Mac taken over by the US government |
| 22.01.2003 | ON | -11 | -14 | -12 | -3 | -9 | -13 | -12 | -6 | 0 | |
| 29.06.2015 | ON | -10 | -14 | -13 | -1 | -5 | -14 | -22 | -5 | 1 | Greek debt crisis, capital controls announced |
| 29.01.2004 | ON | 20 | 22 | 16 | -1 | 11 | 12 | 9 | -1 | 0 | FOMC statement omits promise to hold rates steady for a "considerable period" |
| 15.03.2011 | ON | -9 | -12 | -11 | -2 | -11 | -15 | -12 | -3 | 1 | Fukushima nuclear disaster, explosion at reactor 3 |
| 27.10.2008 | ON | -12 | -10 | -8 | -5 | -7 | -8 | -5 | -5 | 0 | |
| 12.12.2008 | ON | -9 | -11 | -11 | -4 | -7 | -10 | -9 | -3 | 1 | USD14bn auto bail-out deal fails in US Senate |
| 10.03.2020 | ON | 9 | 16 | 14 | 1 | 9 | 11 | 13 | 2 | 1 | Covid-19, negotiations about emergency relief package in US advance |
| 26.06.2003 | ON | 17 | 15 | 11 | -2 | 10 | 11 | 9 | -1 | 0 | Fed cuts policy rate by 25bp |
| 06.05.2010 | 14:45 | -9 | -9 | -10 | -4 | -5 | -7 | -7 | -6 | 1 | Greek parliament approves EU/IMF bailout package amid major riots |
| 25.03.2008 | ON | 13 | 19 | 14 | 2 | 9 | 7 | 6 | 2 | 1 | JPMorgan takes over Bear Stearns |
| 07.04.2003 | ON | 10 | 12 | 8 | 2 | 10 | 9 | 7 | 5 | 1 | Iraq War, US troops enter Bagdad |

# Largest Market Movements (21-30)

| Date | Time | $y_{2y}^{US}$ | $y_{5y}^{US}$ | $y_{10y}^{US}$ | $y_{s}^{US}$ | $y_{2y}^{EA}$ | $y_{5y}^{EA}$ | $y_{10y}^{EA}$ | $y_{s}^{EA}$ | unsch. | Event |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 02.04.2004 | 08:45 | 18 | 19 | 17 | 1 | 9 | -8 | 6 | 1 | 0 | US Employment Report |
| 05.03.2004 | 08:45 | -15 | -19 | -14 | -0 | -13 | -9 | -5 | -1 | 0 | US Employment Report |
| 07.05.2004 | 08:45 | 23 | 20 | 13 | -0 | 7 | 7 | 7 | -0 | 0 | US Employment Report |
| 17.10.2002 | ON | 10 | 14 | 9 | 3 | 8 | 7 | 4 | 5 | 0 | |
| 03.10.2003 | 08:45 | 12 | 14 | 10 | 1 | 11 | 11 | 8 | 1 | 0 | US Employment Report |
| 07.10.2002 | ON | -9 | -18 | -12 | -3 | -7 | -6 | -6 | -2 | 1 | Iraq War, US Pres. Bush: “use of force may become unavoidable” |
| 24.03.2003 | ON | -12 | -11 | -8 | -1 | -7 | -7 | -6 | -5 | 1 | Iraq War, coalition forces face apparent setbacks over preceding weekend |
| 15.08.2002 | ON | 2 | 8 | 7 | 4 | 9 | 11 | 7 | 4 | 0 | |
| 24.04.2017 | ON | 7 | 9 | 8 | 1 | 10 | 11 | 11 | 3 | 1 | Macron beats Le Pen in first round of French presidential election |
| 10.06.2008 | ON | 17 | 12 | 8 | -1 | 12 | 11 | 6 | -1 | 1 | Fed speech by Bernanke: “upside risks to inflation” |

Dates and Times refer to US Eastern Time. Bond yield changes ($y_{2y}$, .., $y_{10y}$) are in basis points, stock price changes ($y_s$) are in percent. For overnight events (Time=ON), market movements refer to the previous trading days’ close till the stated day’s opening price. Unscheduled events, i.e. either unscheduled monetary policy announcements or ad hoc events are marked as *unsch.* $= 1$. The ordering is based on average normalized market movements.

$\Rightarrow$ ad hoc events are important
but often neglected, since no easy-to-use dataset available

# Identifying Important Scheduled News

$$|\Delta y_t| = \alpha + \sum_i^{N_i} \beta_i \cdot D_{it} + \lambda \cdot FE + \gamma \cdot vol + \epsilon_t$$

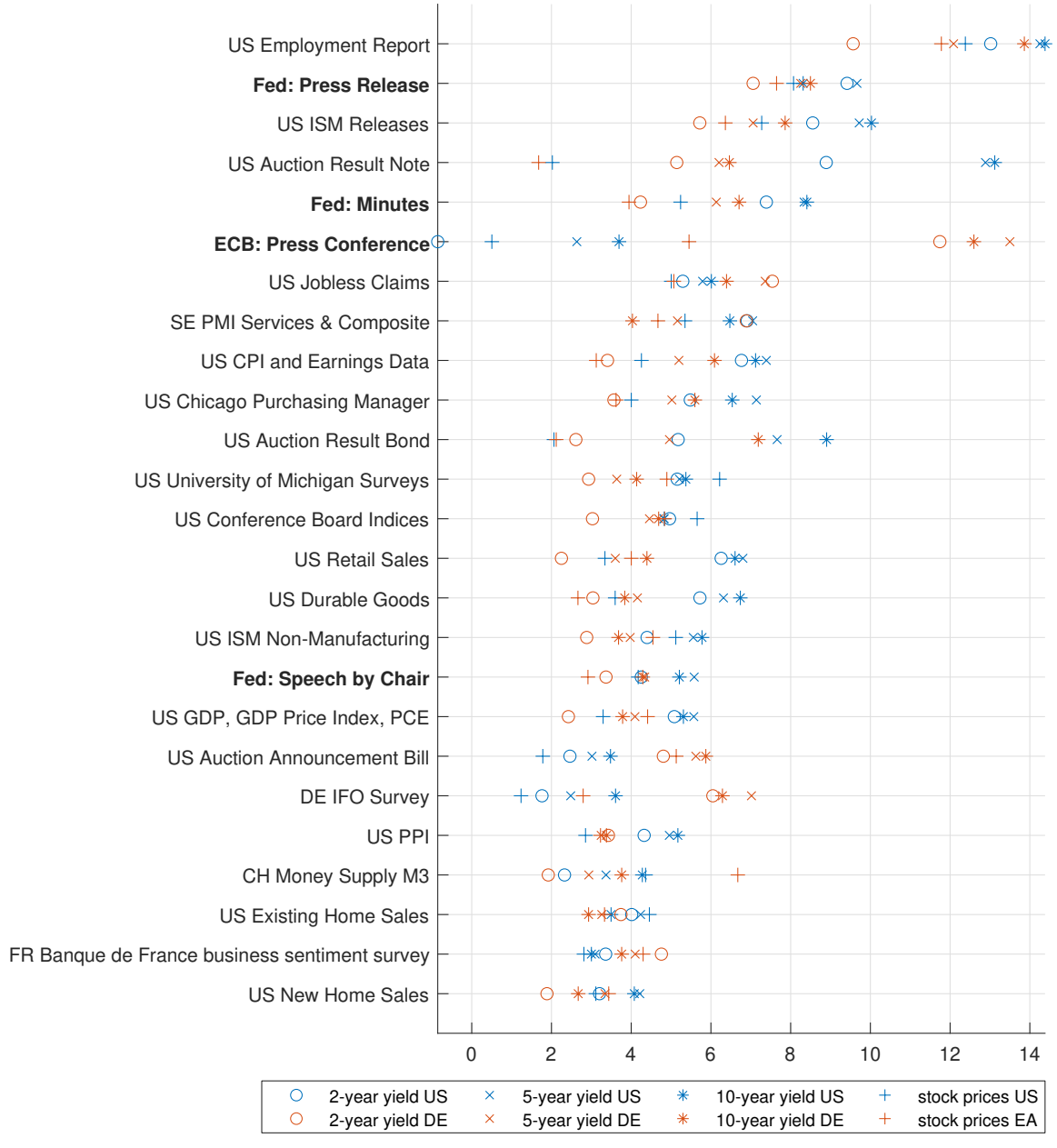
- $\Delta y_t$ are yield changes or stock returns
- $D_{it} = 1$ if news $i$ is released, $N_i = 434$
- $FE$ are time and calendar-based fixed-effects

$$vol = \gamma^{15m}\sigma^{15m} + \gamma^{1h}\sigma^{1h} + \gamma^{2h}\sigma^{2h} + \gamma^{d}\sigma^{d} + \gamma^{w}\sigma^{w} + \gamma^{m}\sigma^{m} + \gamma^{q}\sigma^{q}$$

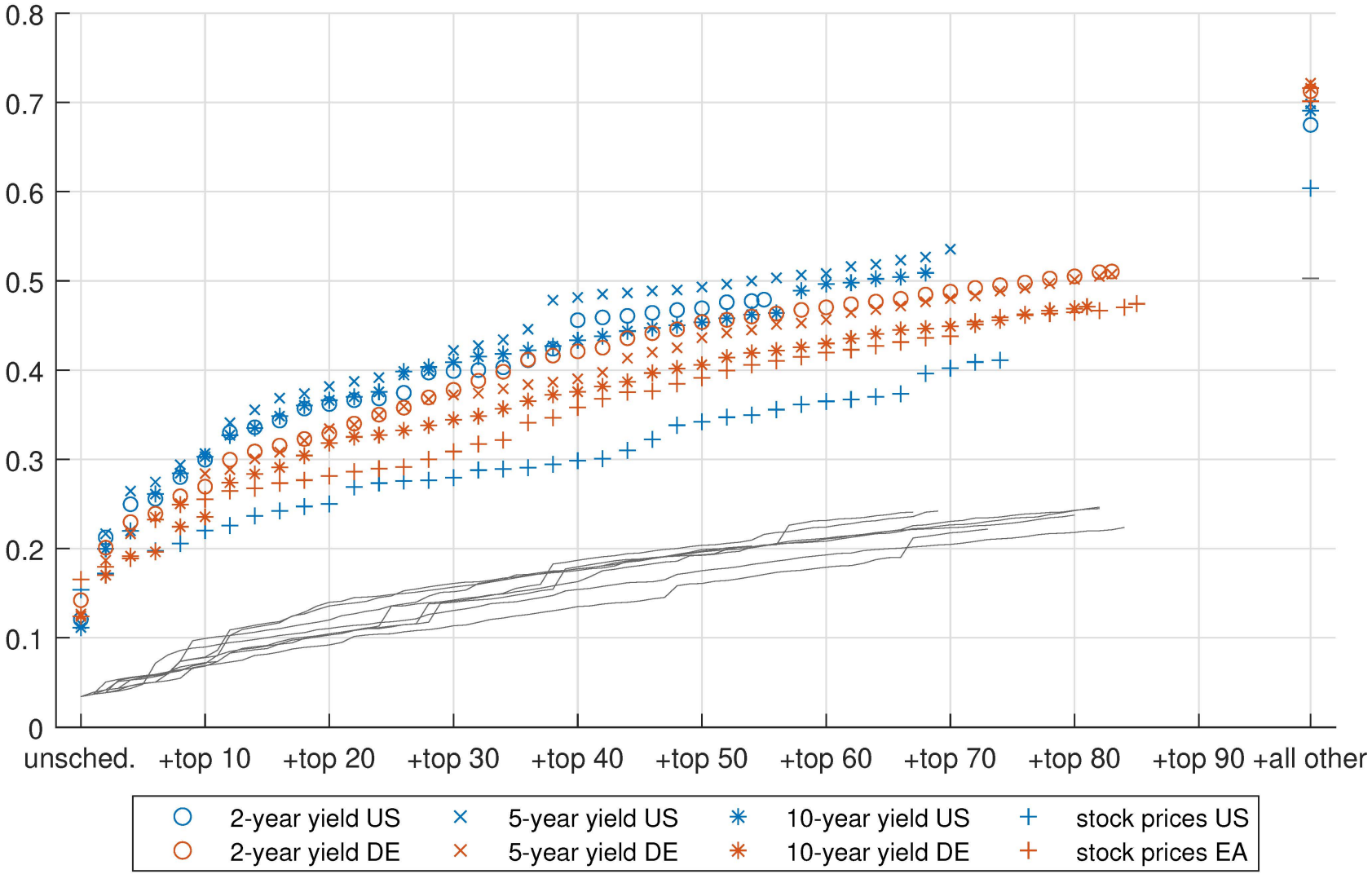
- $\sigma$ are "realized power" measures, i.e. cumulated past absolute returns over different horizons

Goal: find out which *regular* scheduled news move markets.
Hence: drop periods with unscheduled news

# 25 Most Important Scheduled News (according to t-stats from dummy regression)



# Share of Explained Variance




The first entry on the horizontal axis shows the share of explained variance around unscheduled events. The next entries sequentially add the most important scheduled news for each asset, according to the dummy regression. The last entry adds all the remaining news, i.e. even those without a significant impact on an asset's volatility. The grey lines show the percent of observations covered.

# Robustness Checks and Further Results

## Robustness Checks

- Falsification Exercise
- Tighter Event Windows
- Wider Event Windows
- Lower Frequencies
- Excluding Overnight Windows

## Further Results (Appendix)

- Economic Type of News
- Domestic vs. Foreign News
- Large vs. Small Market Movements

skip to conclusion

# Falsification Exercise

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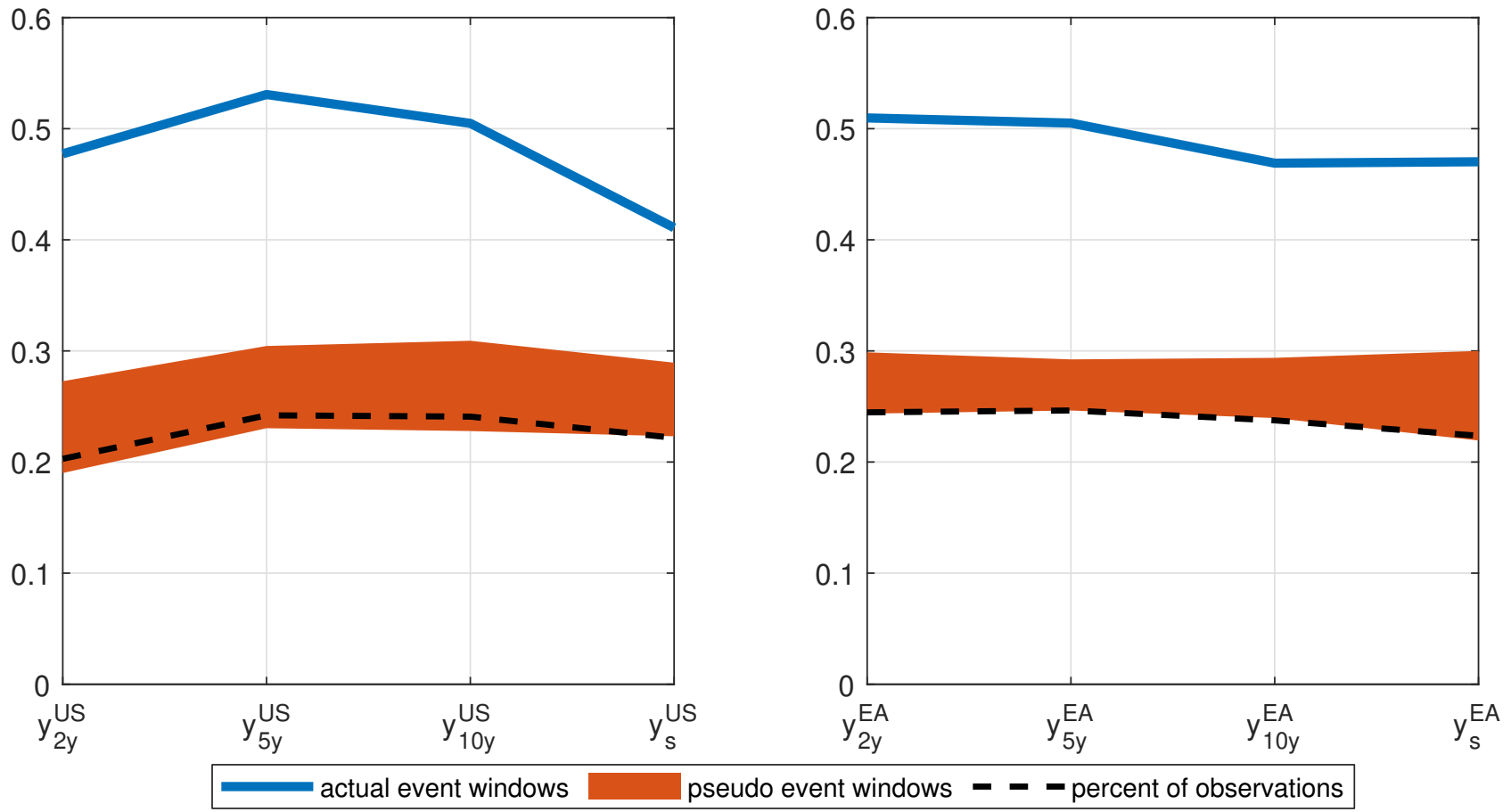
## Sanity check: high $R^2$ by chance? No.

Draw same number of "pseudo event windows" per week as in baseline results, but randomly




For each calendar week in our sample, we randomly draw as many "pseudo event windows" as there are actual event windows in that week. We repeat this 1,000 times and compute the "explained" variance share of the artificial event windows each time. For reference, the dashed black line shows the percent of observations covered, which is identical across all bootstrap draws.

# Tighter Event Windows

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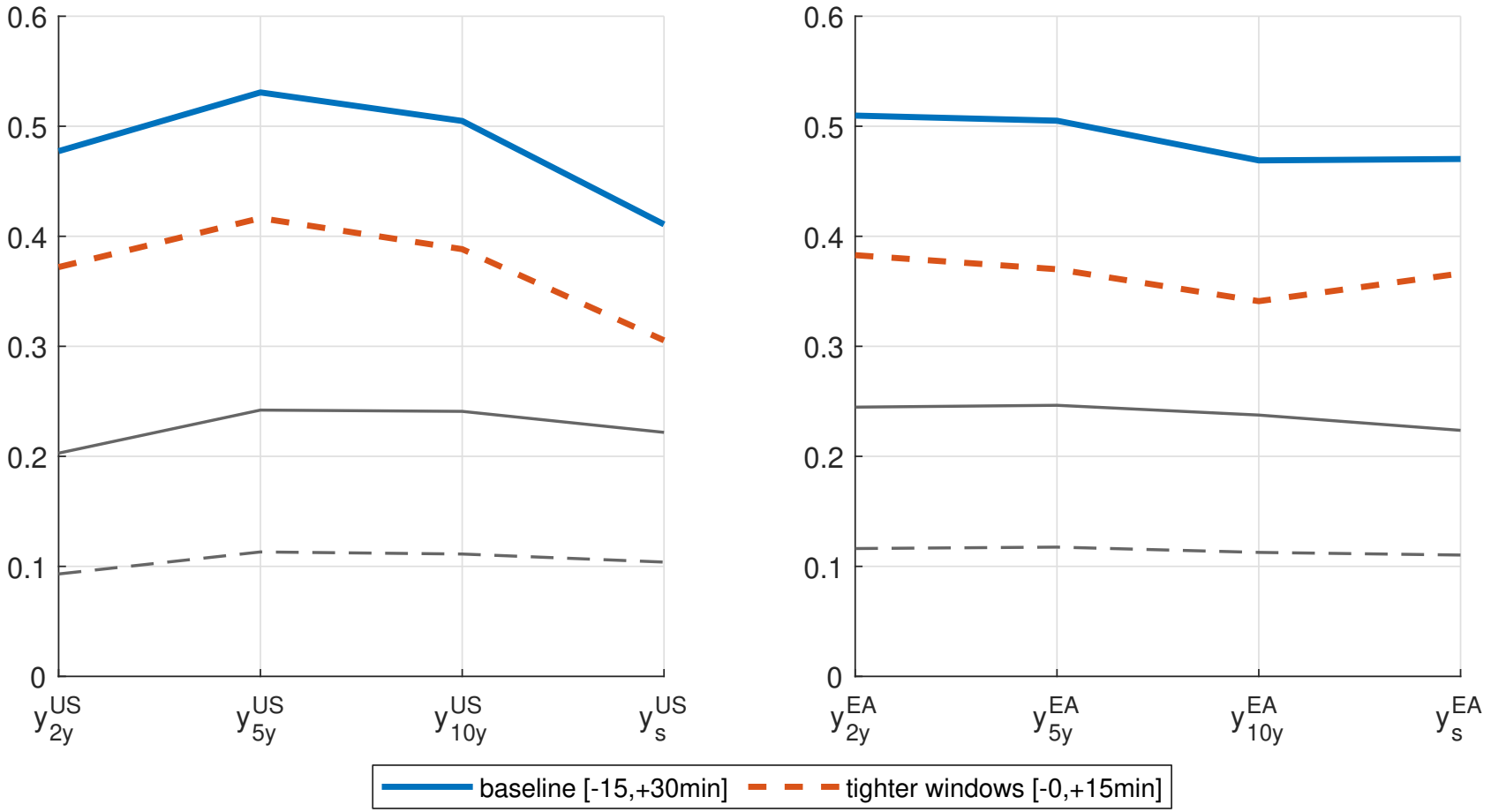
## Event windows too wide? No.

$R^2$ drops by only $\sim$ 10 percentage points when using very tight event windows.




Share of explained variance using the tightest possible windows, given our 15 minute data frequency. For macroeconomic data releases, we include only the 15min window in which the release occurs, i.e. we use [-0,+15] instead of [-15,+30] minute windows. For central bank press conferences, speeches, and ad hoc events, we use [-0,+45] instead of [-15,+60] minute windows. For reference, the black lines show the percent of observations covered.

# Longer Event Windows

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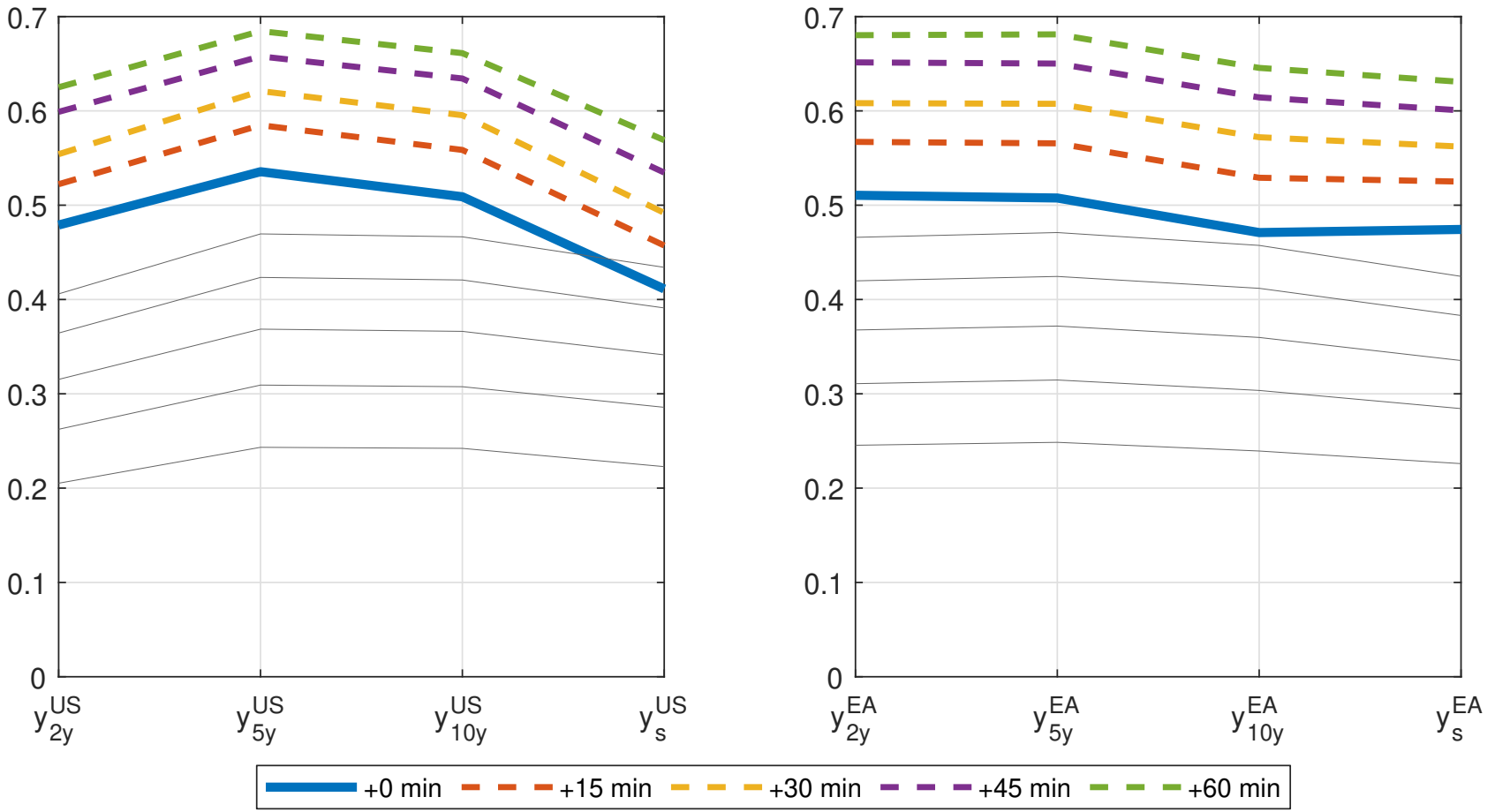
## Event windows too narrow? No.

$R^2$ ↑ the wider the windows, but just mechanically. $R^2$ increases less than sample coverage.




Share of explained variance using longer event windows. Our benchmark choice assumes that most news are entirely reflected in prices within 30 minutes. The figure shows how the $R2$ changes when we extend each window by an additional 15, 30, 45 or 60 minutes. For reference, the solid black lines show the percent of observations covered.

# Lower Frequencies

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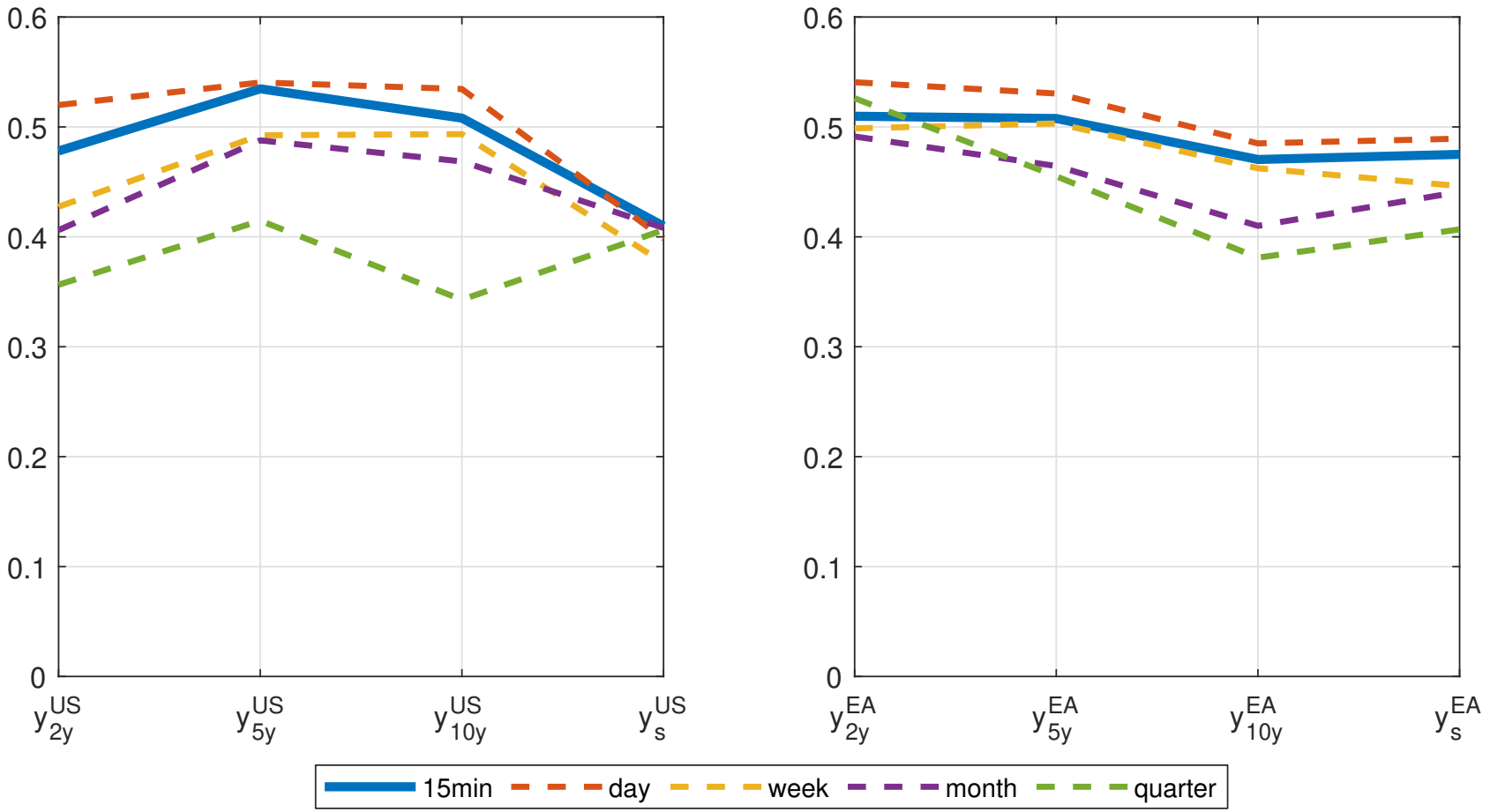
## Does $R^2$ rise or fall at lower frequencies?

Altavilla et al. (2017) show $R^2$ of news ↑ at lower frequencies. Same here? Could be, if prices *drift* after news. But no: $R^2$ ↓ i.e. prices slightly *reverse* after news (initial overreaction).




Estimate $\sum_{j=0}^{H_k} \Delta y_{t-j} = \alpha + \sum_{j=0}^{H_k} \Delta y^*_{t-j} + \epsilon_t$ for different horizons $H$ (e.g $H = 0$ for intradaily and $H = 56$ for daily frequency) where $\Delta y^*_t$ are the "explained" asset price changes, i.e. all changes around unscheduled news or around "important" scheduled releases.

# Overnight vs. Intraday Windows

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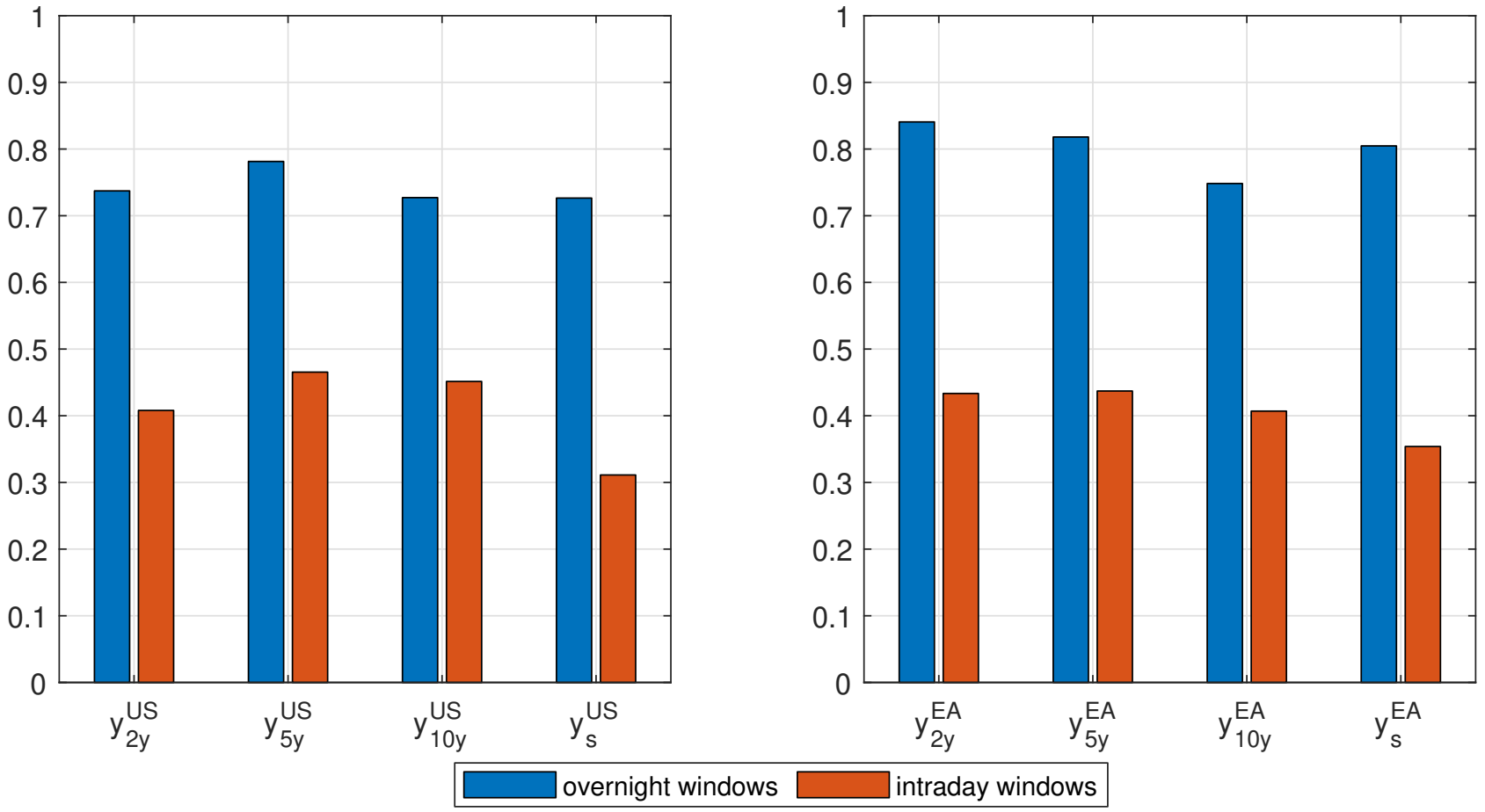
→ $R^2$ much higher for overnight windows (due to Brexit, Lehman Brothers, etc.)

But: overnight windows are only a small fraction of observations. Even entirely dropping them would reduce $R^2$ only by roughly 10 percentage points




Share of market movements “explained” in overnight and intraday windows.

# Conclusion

- ∼50% of asset price variation occurs around clearly identifiable news
- and in this sense can be "explained" by news

- more than most previous studies find
  - asset prices not entirely disconnected from macro news
- but still half of all movements unexplained
  - despite vast event database, strong causality assumption, and agnosticism re mechanism (discount rate vs. cashflows)

- what else is moving markets?
  - sentiment, private info (through trading), noise traders, capital flows, ...?

→ our database isolates non-news driven market movements

- one example: market turmoil on 21 January 2008
  - largest unexplained movement in our sample
  - coincides with unwinding of Societe General's "rogue trader" positions

  → anecdotal evidence for importance of flows
  see Gabaix and Koijen (2021)'s "Inelastic Markets Hypothesis"

# Thank you for your attention

The database will be made publicly available, check the preview at
https://markkersen.github.io/WhatMovesMarkets/

# Discussion of Main Result

Reasons we could overestimate the explanatory power of news

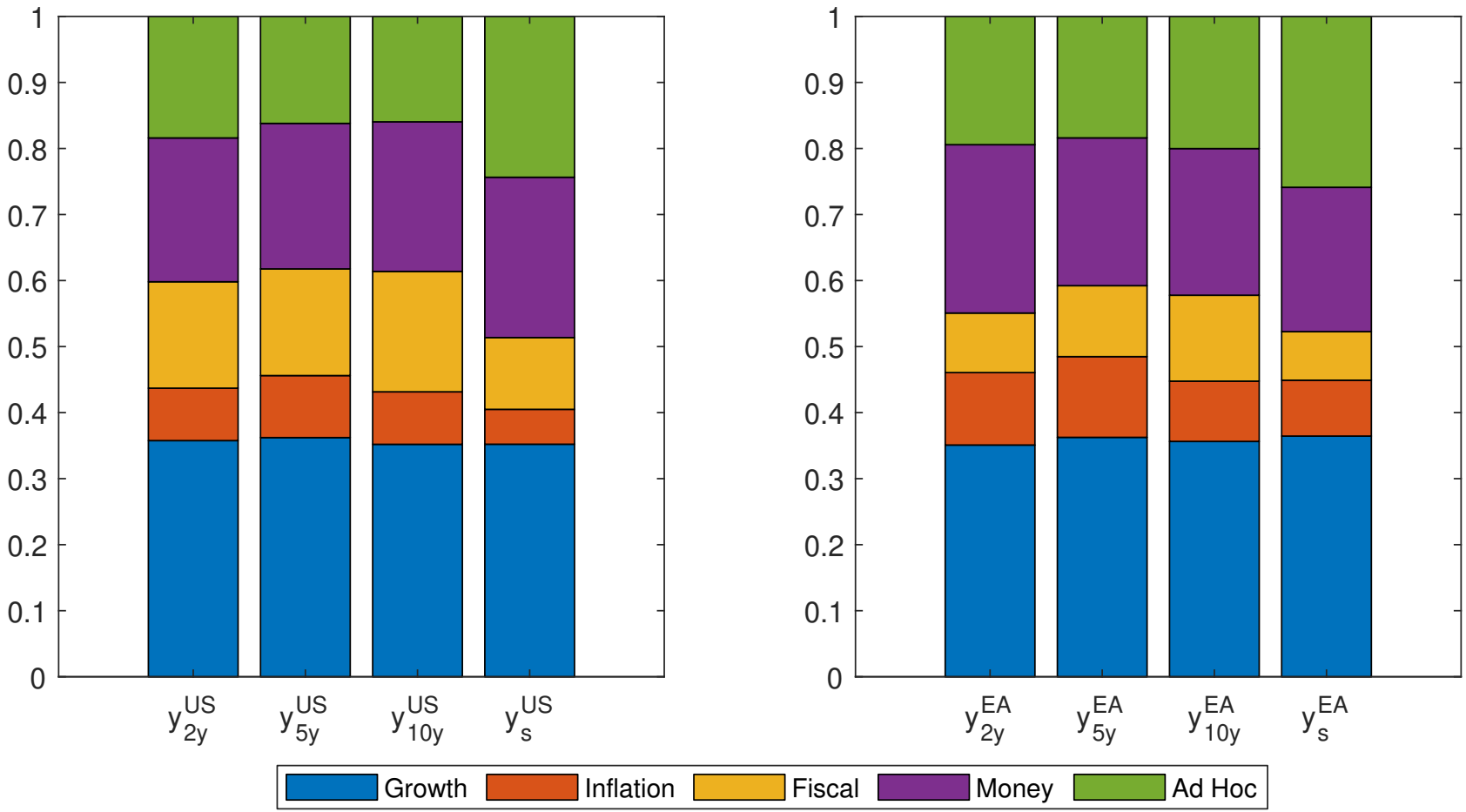
- causality assumption too strong (no movement without news?)
- erroneously identify ad hoc "news" based on subsequent market reaction? (post hoc ergo propter hoc)

Reasons we could underestimate the explanatory power of news

- neglect private info about macro news (early releases, leaks by central bank officials)
- neglect events with unclear timing that diffuse only gradually
- focus on "important" news according to dummy regression, neglect time-variation
- neglect corporate news

# Economic Type of News

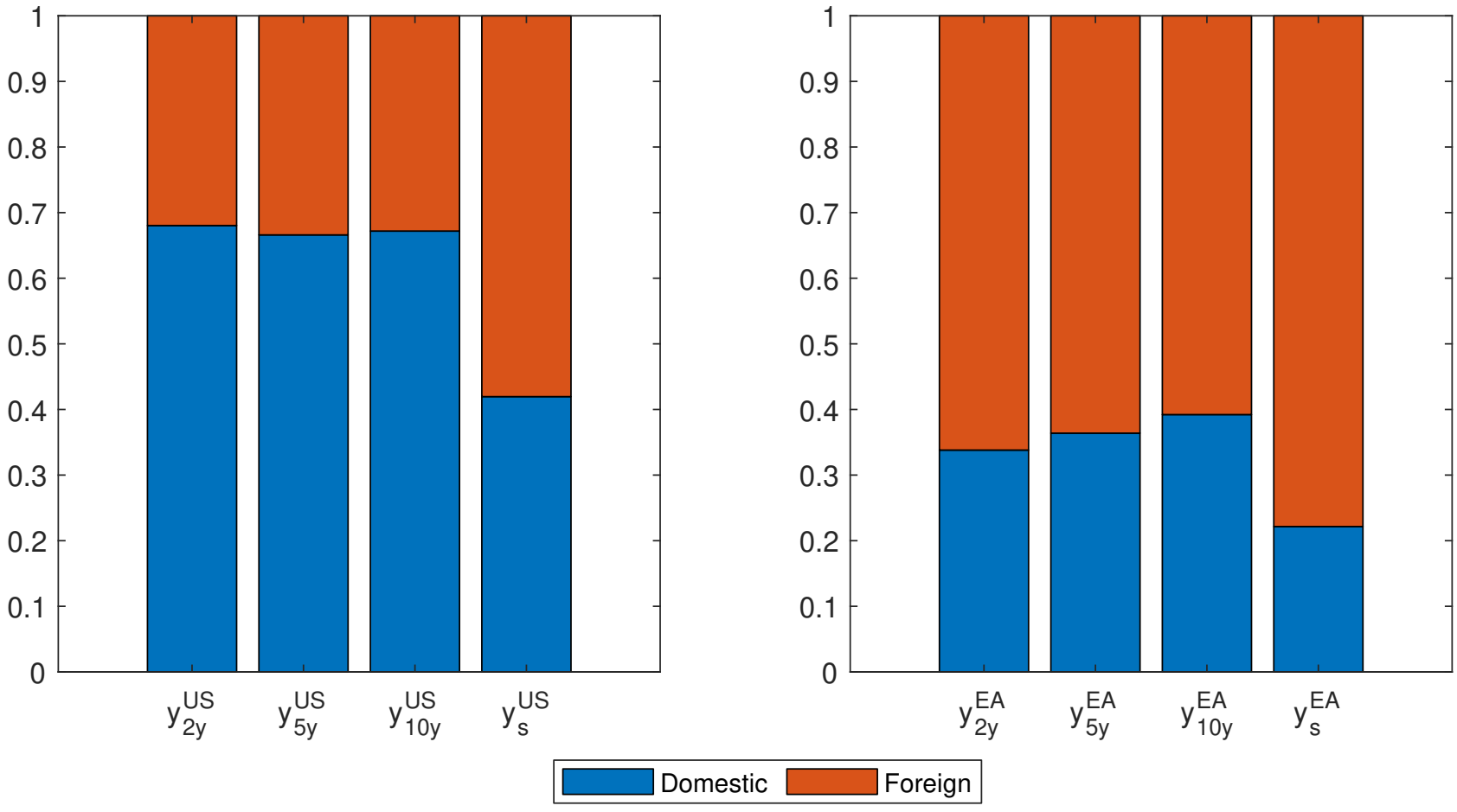
→ Growth news matters most, inflation news least




Decomposition of "explained" market movements into economic categories. We classify each news type into one or multiple economic categories: growth (expectations), inflation, fiscal (e.g. bond auction news), and money (e.g. central bank announcements). We then simply allocate the market movement around a given news to its economic category. If multiple news occurred simultaneously, we use the t-statistics from our dummy regression as weights, assigning zero weight to releases not significant at the 10% level. If a news type belongs to multiple economic categories, we allocate the movement equally to each category. If an ad hoc event took place (e.g. Brexit), we assign the entire market movement to the "ad hoc" category.

# Domestic vs. Foreign News

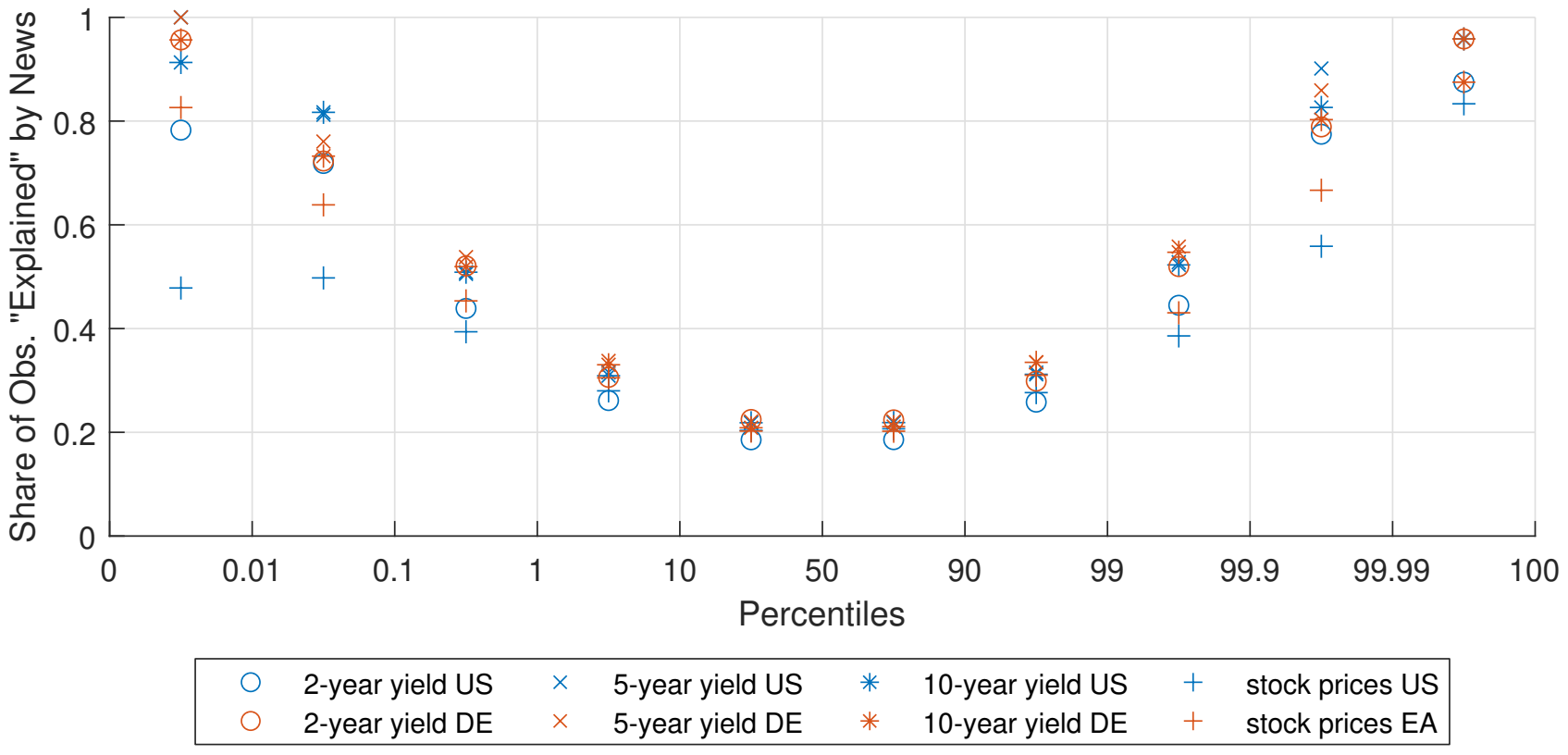
→ Foreign news more important for bonds than stocks, and more for euro area assets than US




Decomposition of "explained" market movements into domestic and foreign news. For the Euro area, domestic news include all country-level news of member states. Movements around ad hoc events are omitted.

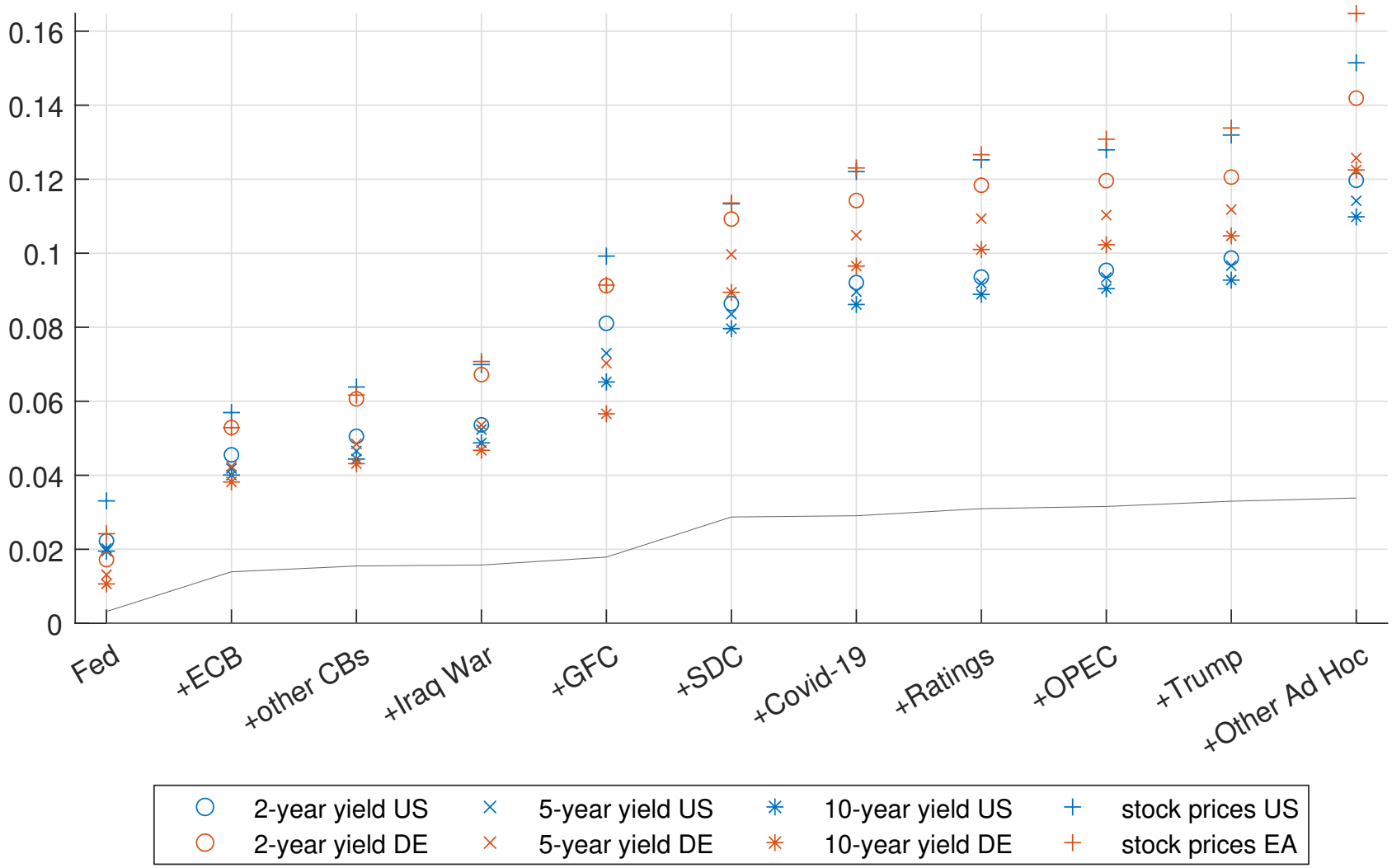
# Large vs. Small Market Movements

→ Share of explained observations highest in the tails of the distribution




Share of market movements "explained" by news at different percentiles of the distribution. The first entry e.g. shows what fraction of the .01% largest yield and stock price declines occurred around news (.01% of the sample corresponds to 23 observations).

# Share of Explained Variance: Only Unscheduled News




The first entry on the horizontal axis shows the share of explained variance around all unscheduled news by the Federal Reserve (such as ad hoc press releases and speeches). The next entries on the x-axis sequentially add other unscheduled news, namely by the European Central Bank (e.g. Draghi's "whatever it takes" speech), by the six other central banks in our dataset and non-monetary ad hoc events ("GFC" refers to the Global Financial Crisis, "SDC" to the European Sovereign Debt Crisis, and "Ratings" to Sovereign Credit Ratings).

# Gürkaynak, Kisacikoglu, Wright (AER, 2020) in a nutshell

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typical event study regression, conditional on tight event windows:

$$\underbrace{\Delta y_t}_{\text{yield change}} = \alpha + \beta \underbrace{s_t}_{\text{macro surprise}} + \epsilon_t \qquad \Rightarrow R^2 \sim 20 - 30\%$$

Low $R^2$ due to measurement problem, example US jobs report:

- $s_t$ is headline figure (non-farm payrolls) minus survey expectation
- but jobs report is a 40p PDF doc, containing much more info
- other info is not surveyed, hence not observable as "surprise"

Solution: combine OLS and hetereoskedasticity-based methods

- use yield changes in event and non-event control windows
- keep observable surprises ($= 0$ during control windows)
- capture unobserved news as latent factors

$\rightarrow$ $R^2 \sim 100\%$

market movements are caused by the news event around which they occur

# High Frequency Futures Data

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Figure: Covered Trading Hours in US Eastern Time

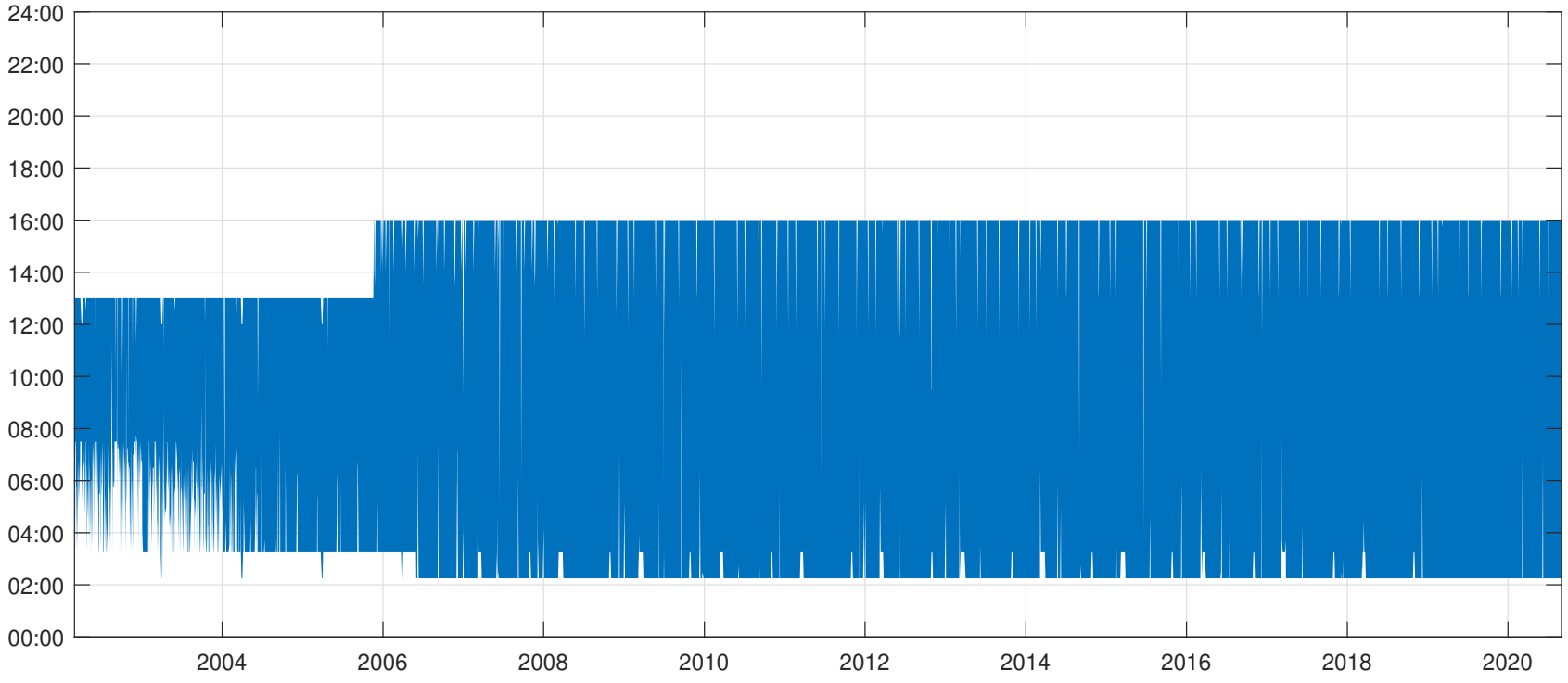


Table: Length of Windows

| 15min | 10:15h | $\leq$ 24h | $\leq$ 48h | $\leq$ 72h | $\leq$ 96h | $>$ 96h |
|---|---|---|---|---|---|---|
| 232303 | 2544 | 1112 | 21 | 883 | 56 | 36 |

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