

Paying for the prices: the cost of taming inflation

A high(er)-frequency perspective
on a very ambitious title



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Usual disclaimer

The views expressed in this presentation are those of the authors and do not necessarily reflect the views of the Eurosystem or of National Bank of Slovakia.

Shameless promotion: the NBS

- We welcome international cooperation
- Visiting researcher positions available
- Research grants
- Interesting data
- Fame!
- Glory!
- Money!
- False advertisement!

The whole idea in five points

- Use bank transactions to build a proxy of consumption
- Estimate the MP pass-through to HH consumption
- Explore the impact of rates maturity profile
- Disentangle positive and negative shocks
- Look at demographic differences



Research idea(s)

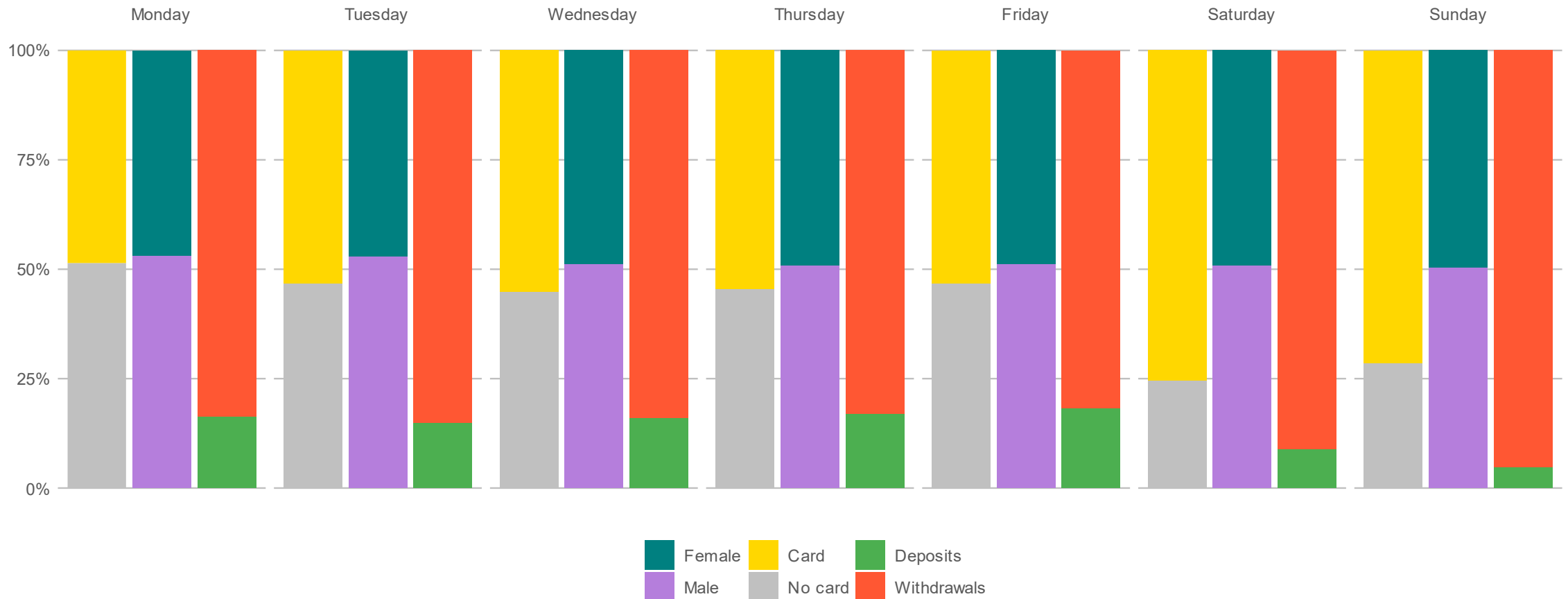
- How contractionary is a tighter monetary policy stance?
 - Focus on household consumption
 - Lag of transmission
 - Intensity of impact
 - Dynamics of impact-recovery
- How symmetric is the effect?
 - Negative vs positive shock
 - Demographic characteristics
 - Merchant characteristics



- HF stock market info to identify MP: Bagliano&Favero (1999)
 - But also: Gertler&Karadi 2015; Jarociński&Karadi 2020; Miranda-Agrippino&Ricco 2021; Andrade&Ferroni 2021
- Use of card data: Sandri&Grigoli (2022)
 - But also: Andersen et al. 2020; Bounie et al. 2020; Chetty et al. 2020; Hacıoğlu-Hoke, Känzig, and Surico 2021
- HF monetary events: Altavilla et al. (2019)
 - But also considering: Romer&Romer 2000; M-A&R 2021; Cieslak and Schrimpf 2019; J&K 2020
- Data frequency can change phenomena interpretation: Paccagnini&Parla (2023)

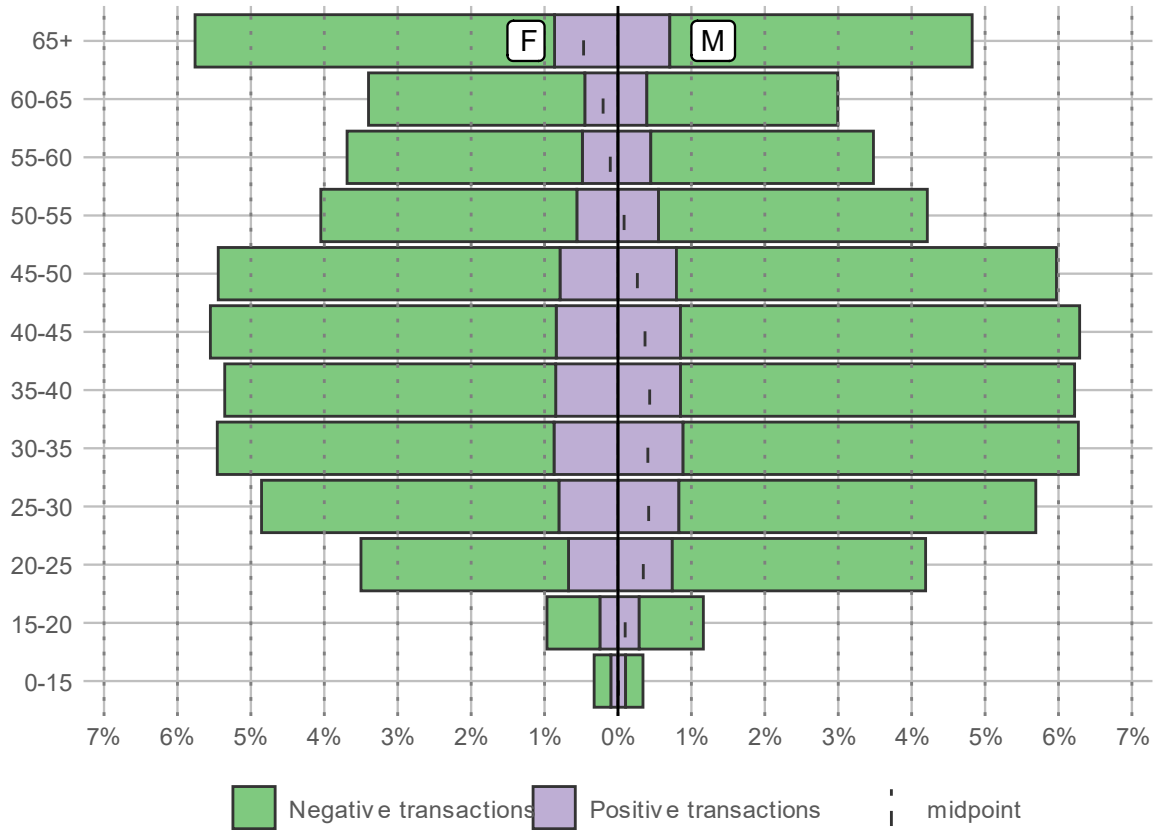
What is the data looking like?

2.516.693.323 transactions from 1/1/2019 to 31/12/2022

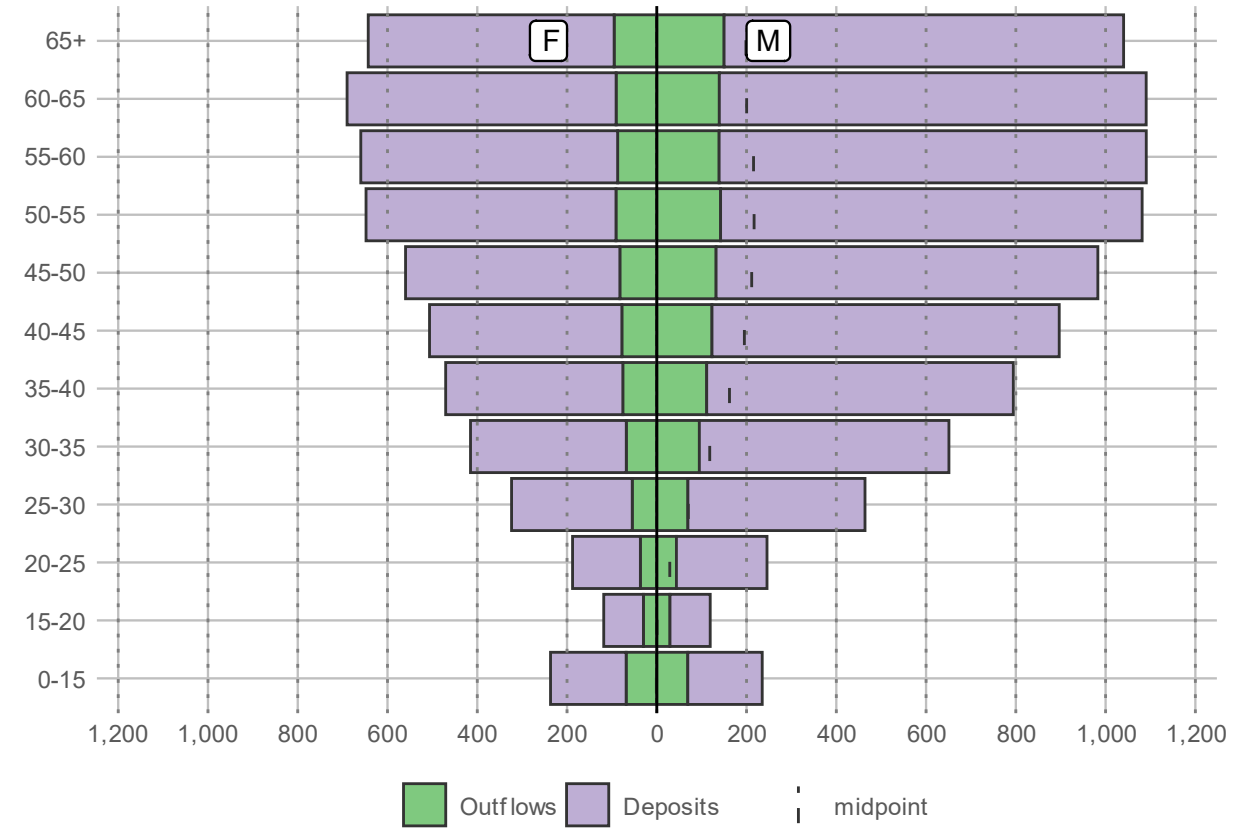


What is the data looking like?

2.614.307 account holders

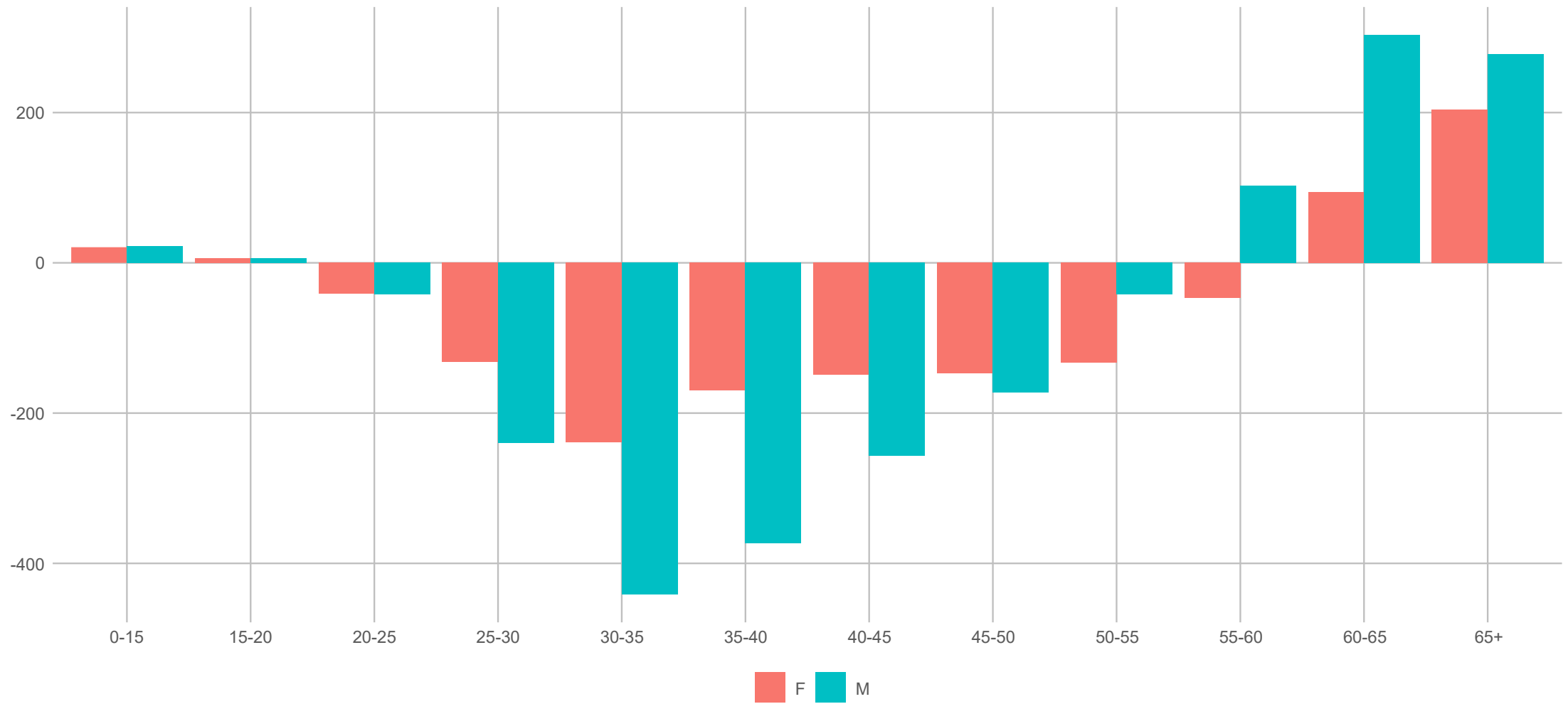


Shares of transactions by age, gender and sign



Average size of transaction by age, gender, and sign

How about the account balances?



Balance (in EUR millions) of inflows-outflows by age and gender

Information available (and limits)

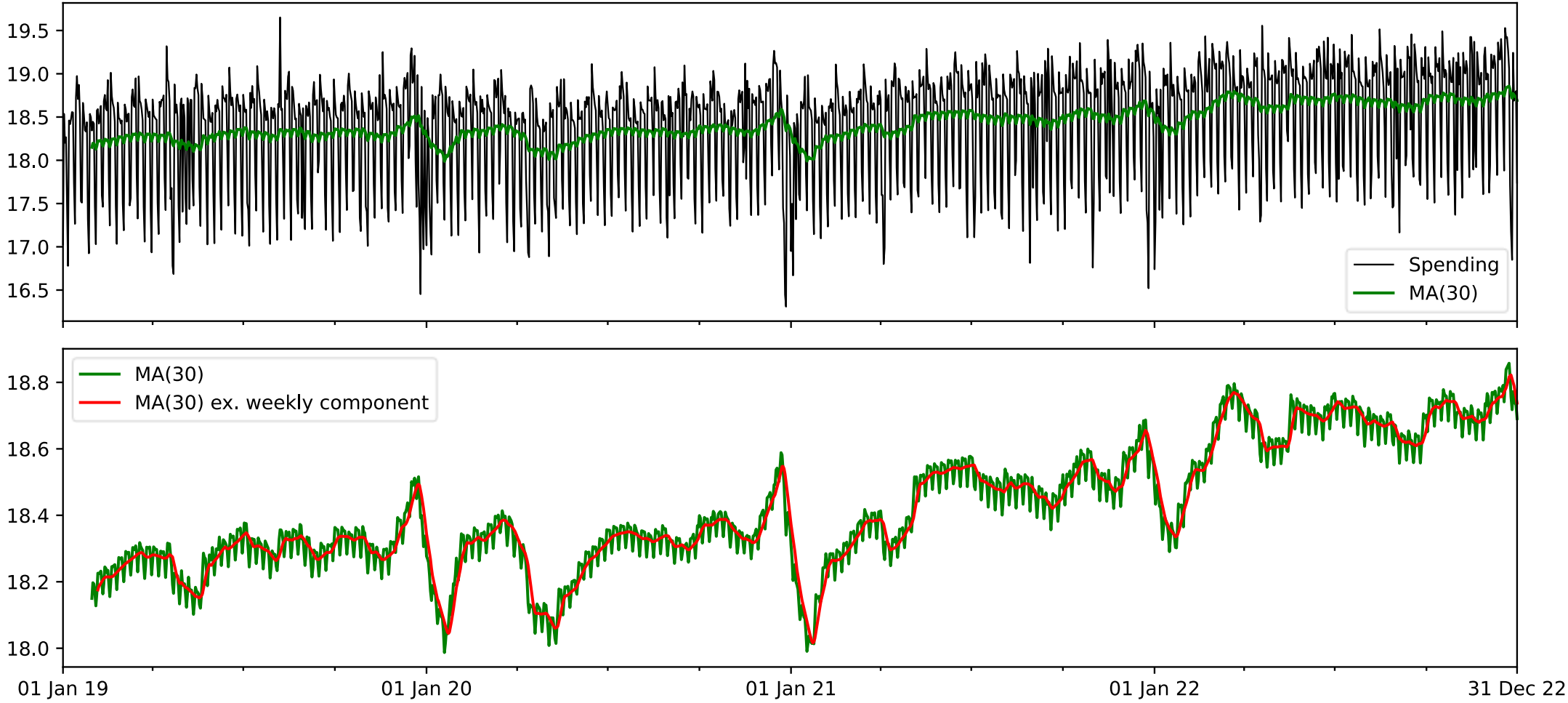
- Daily transaction:
 - Date
 - Card/Account
 - Amount
 - Category
 - Customer
- Customer
 - Gender
 - Age
 - Region (NUTS3 level)
 - Education level
 - Covid Moratoria
- We do not observe households
- Customer data are a snapshot
- Category and taxonomy only partially comparable
- Lots of misreporting in region/education level

From the data to the proxy

Starting from the individual daily transactions:

- Focus on the negative ones (the outflows)
- Use taxonomy to exclude some of them:
 - Investments
 - Debt instalments
 - Taxes
 - Fines
- Sum what remains by day
- ~~Pretend everything is fine~~
- Here it is a consumption proxy!

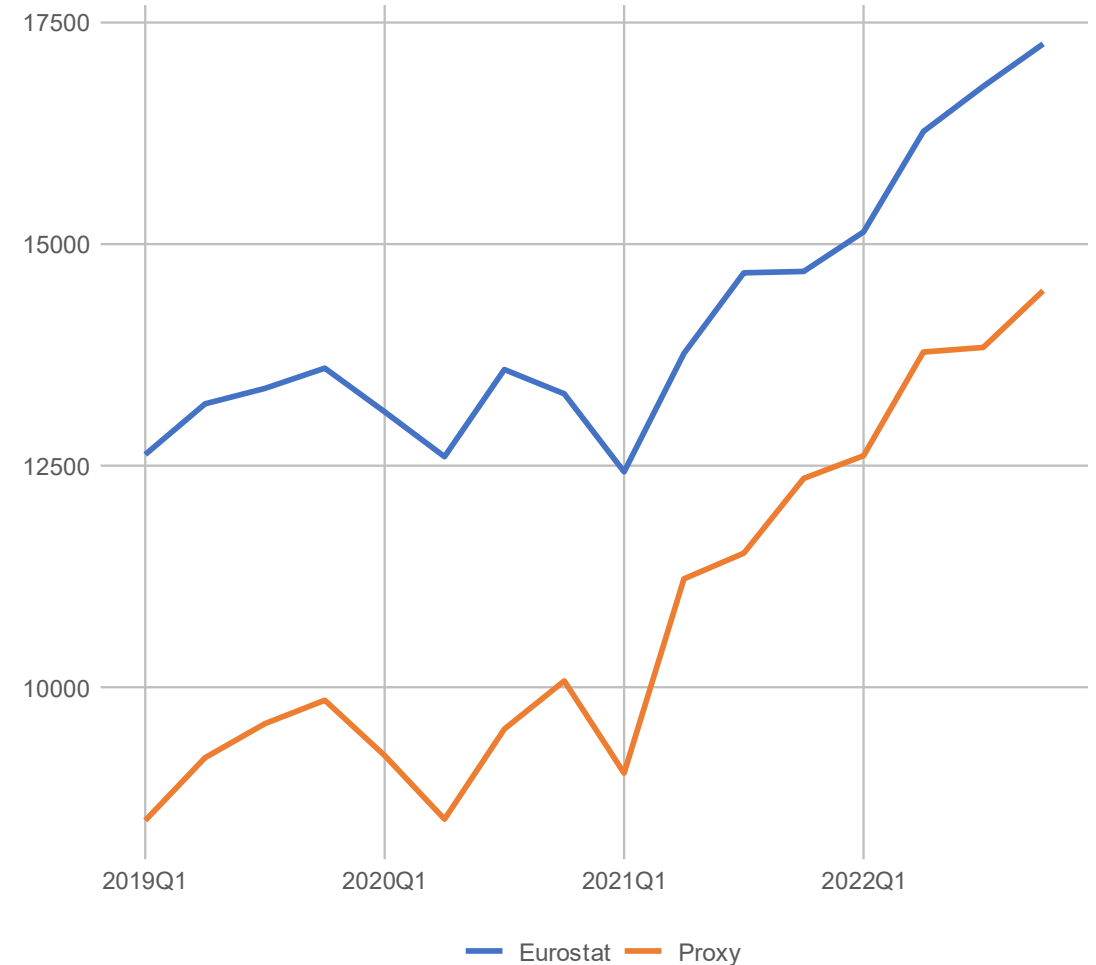
The daily series: smoothing the beast



How good is the proxy?

	Correlation
Levels	97.3%
QoQ	84.8%
YoY	87.1%

- Comparison on at most 16 data points
- Powerful scale effects on volatility
- Possibly overestimates
- All in all, not that bad



Spending = β Interest rate shock +
Pandemic controls +
Calendar controls +
Information controls +
Inflation controls +
Persistence controls

Long story short:

- Exogenous shock variable: interest rate shock
- Relatively small sample (2019-2022), all in COVID times
- Time fixed effects are a ~~pain in the~~ problem
- Persistence of consumption

Methodology: a non-algebraic outline

$$\text{Spending} = \beta \text{Interest rate shock} + \text{Pandemic controls} + \text{Calendar controls} + \text{Information controls} + \text{Inflation controls} + \text{Persistence controls}$$

TARGET!



Long story short:

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Methodology: the LP-IV

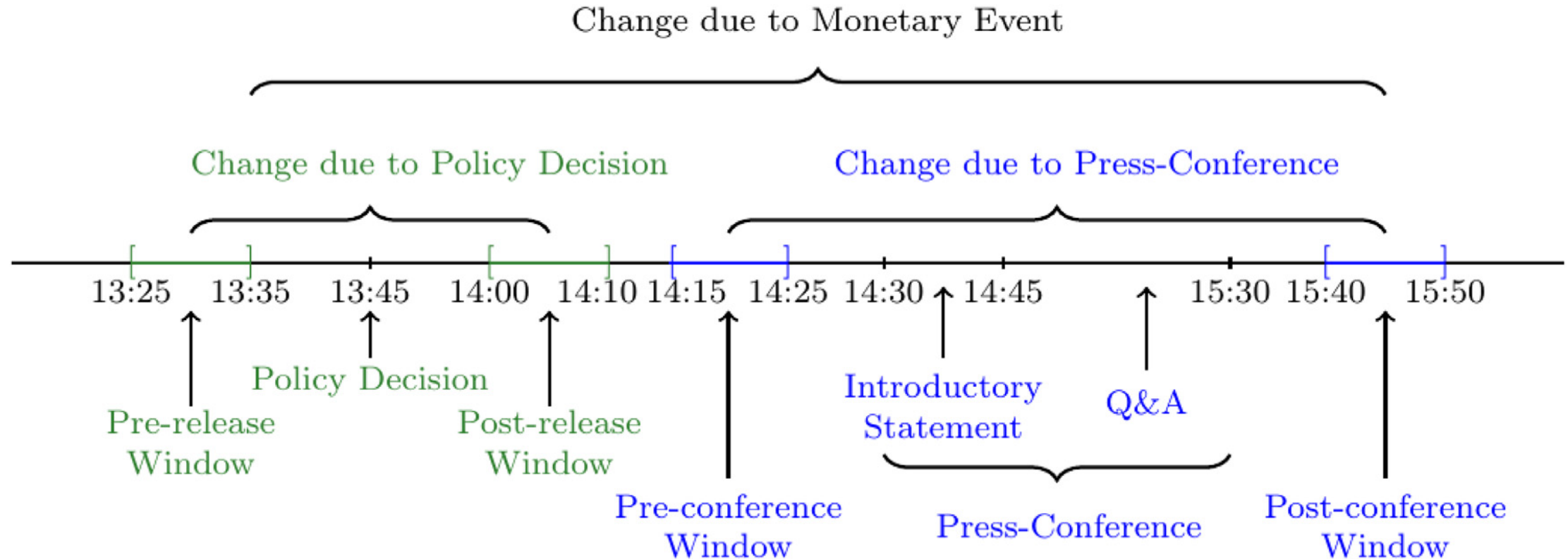
$$\begin{aligned}
 & S_{t+h} - S_{t-1} \\
 & = \beta^h I_{t+h-1} + \sum_{p=1}^{\bar{p}} \xi_p^h I_{t-p} \times SP_{t-p} + \sum_{p=1}^{\bar{p}} \psi_p^h SP_{t-p} + \\
 & \quad \sum_{p=1}^{\bar{p}} \gamma_p^h c_{t-p} + \sum_{p=1}^{\bar{p}} \phi_p^h d_{t-p} + \sum_{p=1}^{\bar{p}} \theta_p^h w_{t-p} + \\
 & \quad \sum_{p=1}^{\bar{p}} \rho_p^h s_{t-p} + \\
 & \quad \sum_{p=1}^{\bar{p}} \beta_p^h \Pi_{t-p}^e + \sum_{p=1}^{\bar{p}} \beta_p^h \Pi_{t-p}^P + \sum_{p=1}^{\bar{p}} \beta_p^h \Pi_{t-p} + \\
 & \quad \text{dow}^h + \text{doy}^h + \varepsilon_t^h
 \end{aligned}$$

- $\bar{p} = 7$
- S : log spending at time t
- s : year-on-year log difference in spending
- I : OIS 2Y (Hanson&Stein 2015; Gilchrist, López-Salido, Zakrajšek 2015)
- c : covid cases
- d : covid deaths
- w : covid support
- dow, doy : day of the week/year
- SP : euro STOXX50E index change
- Π^e : inflation expectation
- Π^P : inflation perception
- Π : HICP, annual rate of change
- Newey-West errors, with SSC

Interest rate surprises

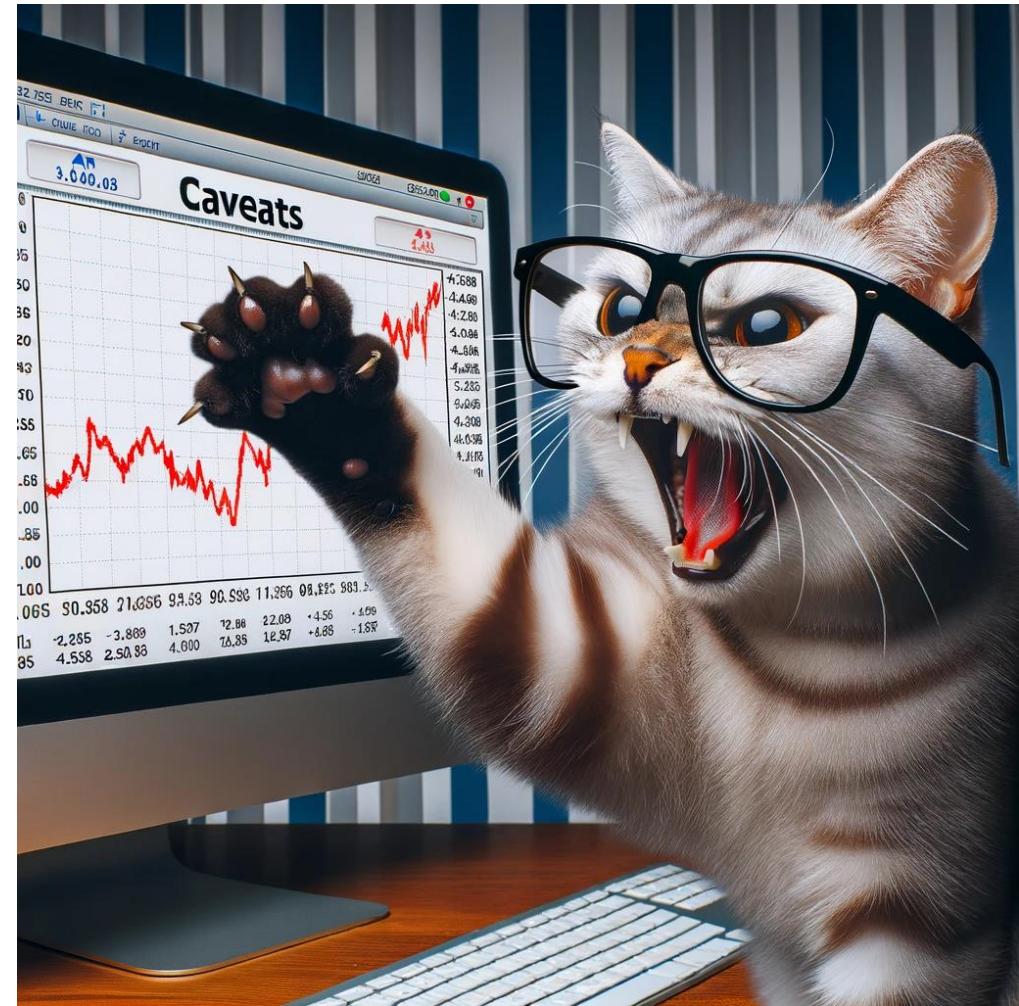
- Standard approach in HF identification: Altavilla et al. (2019)
- Straightforward to build and easy to use:
 1. Take as reference Overnight Index Swaps (OIS) rates as proxy of risk-free rate of the euro area
 2. Consider the intra-day fluctuations
 3. Event study: measure change after the event
 4. Identification via timing assumption
- Caveat: informative content rebus

OIS: the communication timeline

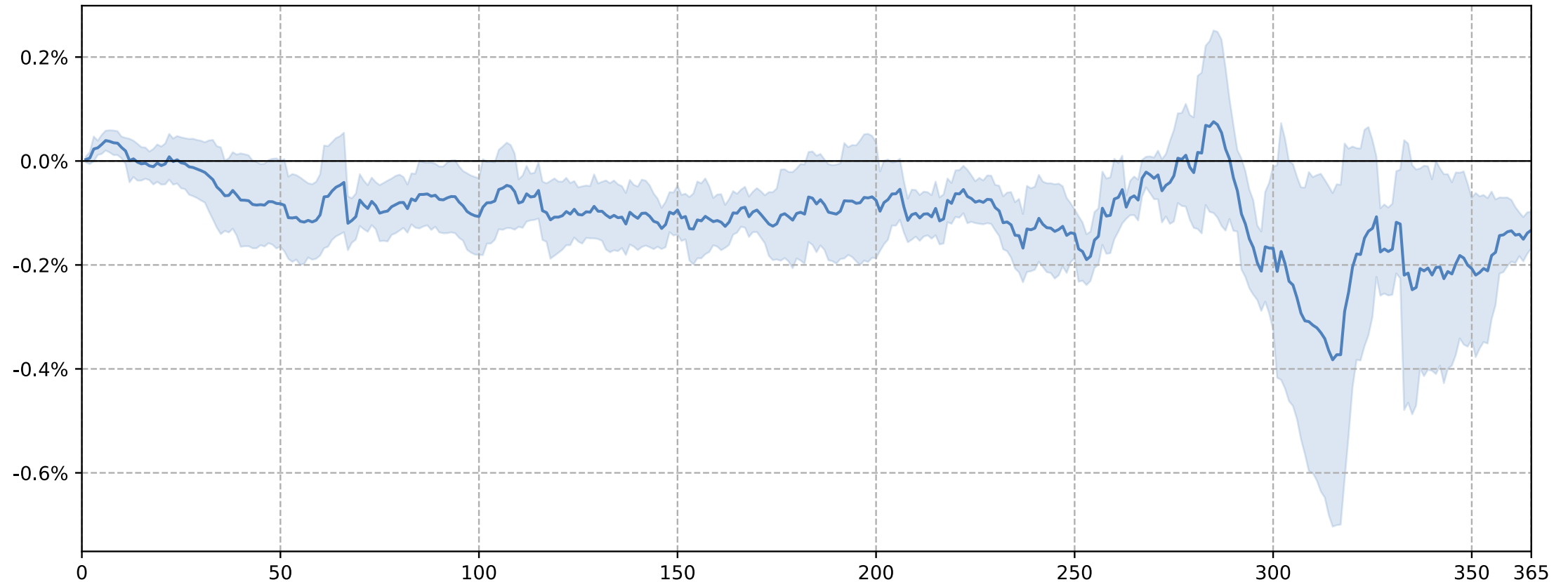


Cahiers de doléances

- Usual concerns about LP-IV...
- ...and about shock identification
- Covid cases and deaths don't proxy lockdowns
- We are ignoring regional heterogeneity
- Calendar effects work up to a point
- *LOTS* of double counting
- Deflating is ~~hell~~ challenging



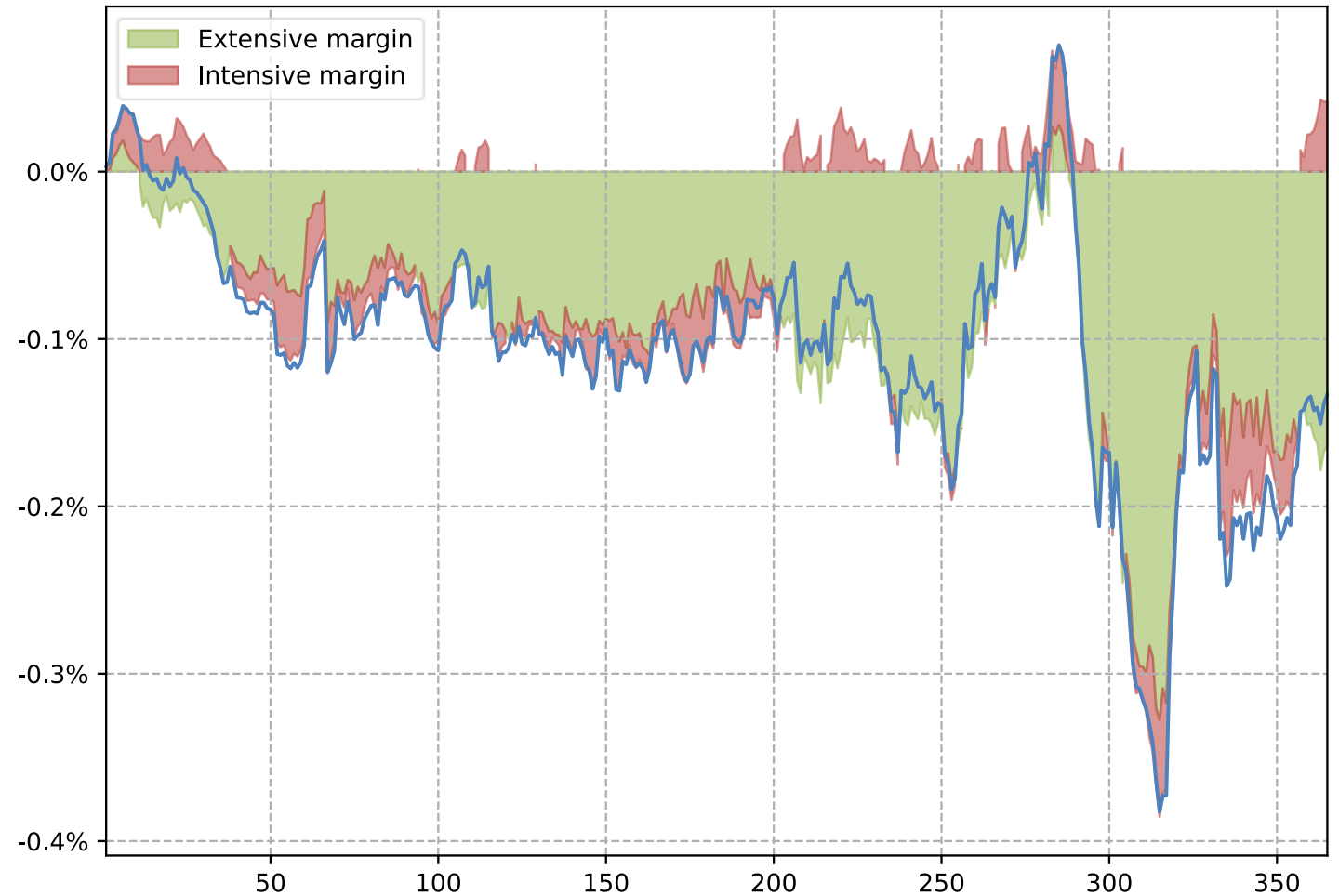
Results: cumulative spending response



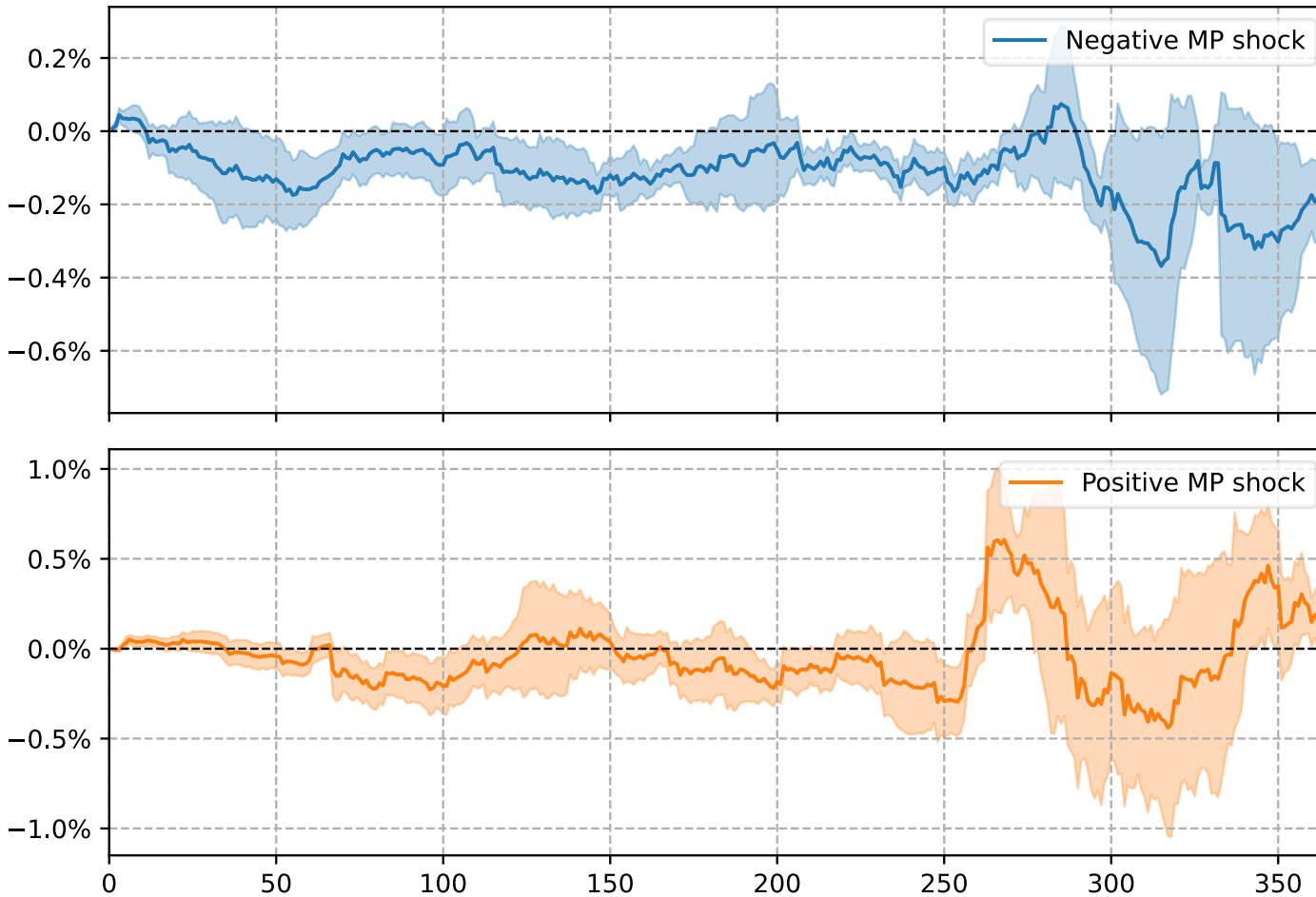
Response of spending to a 100bp interest rate shock at 2-year maturity. Y-o-y percent change. Regression includes pandemic, inflation, persistency, and income support controls, as well as calendar effects.

Margins: intensive ad extensive

- Same equation as before
- Change in dependent variable
- Extensive: number of transactions
- Intensive: average value

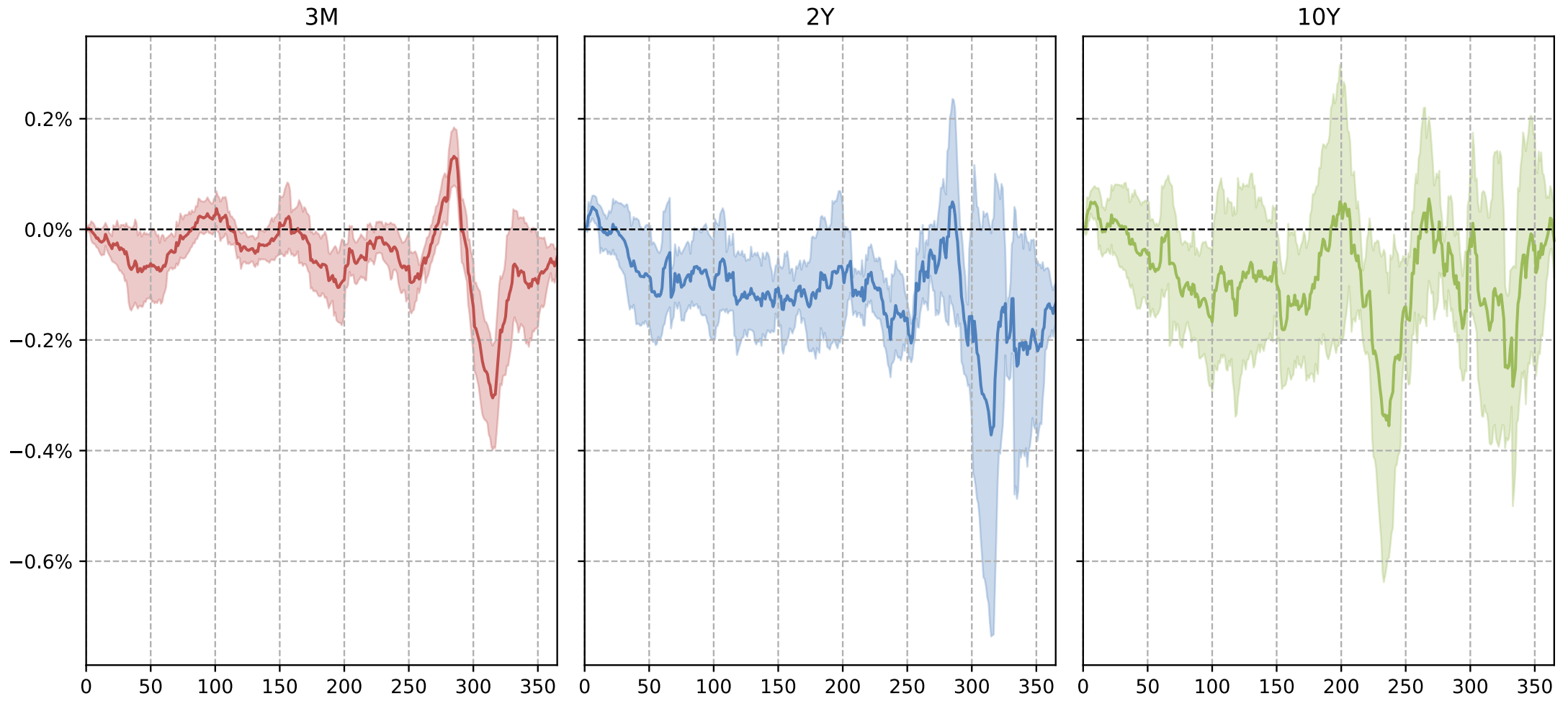


Positive and negative shocks



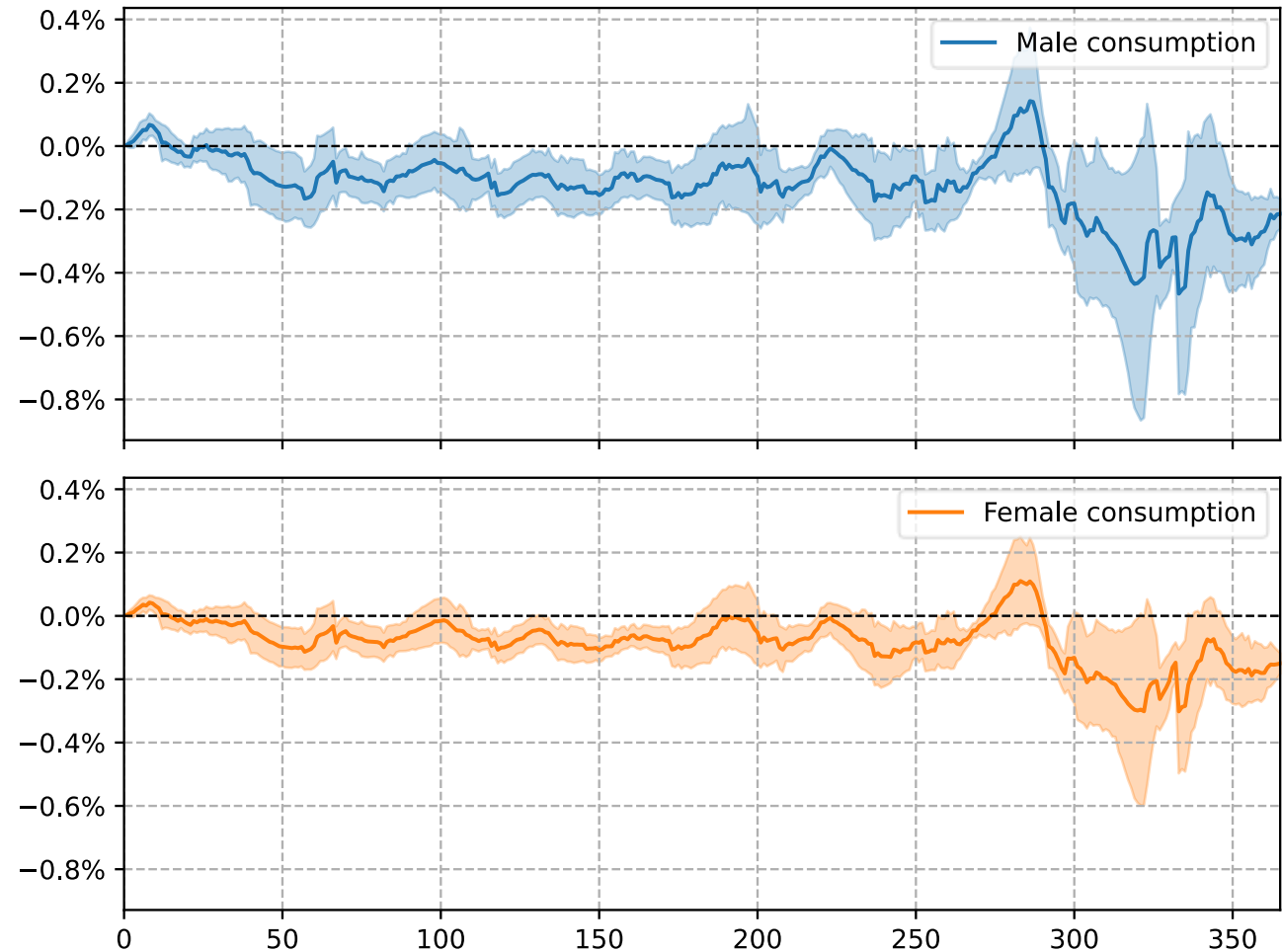
- Classically, two ways to go:
 - Dummy variables
 - **Transition function**
- *Fake* nonlinearity
- Split the model between
 - State 1: negative MP shock
 - State 2: positive MP shock
- IRFs conditional on state and not transitional

Horizons of monetary policy

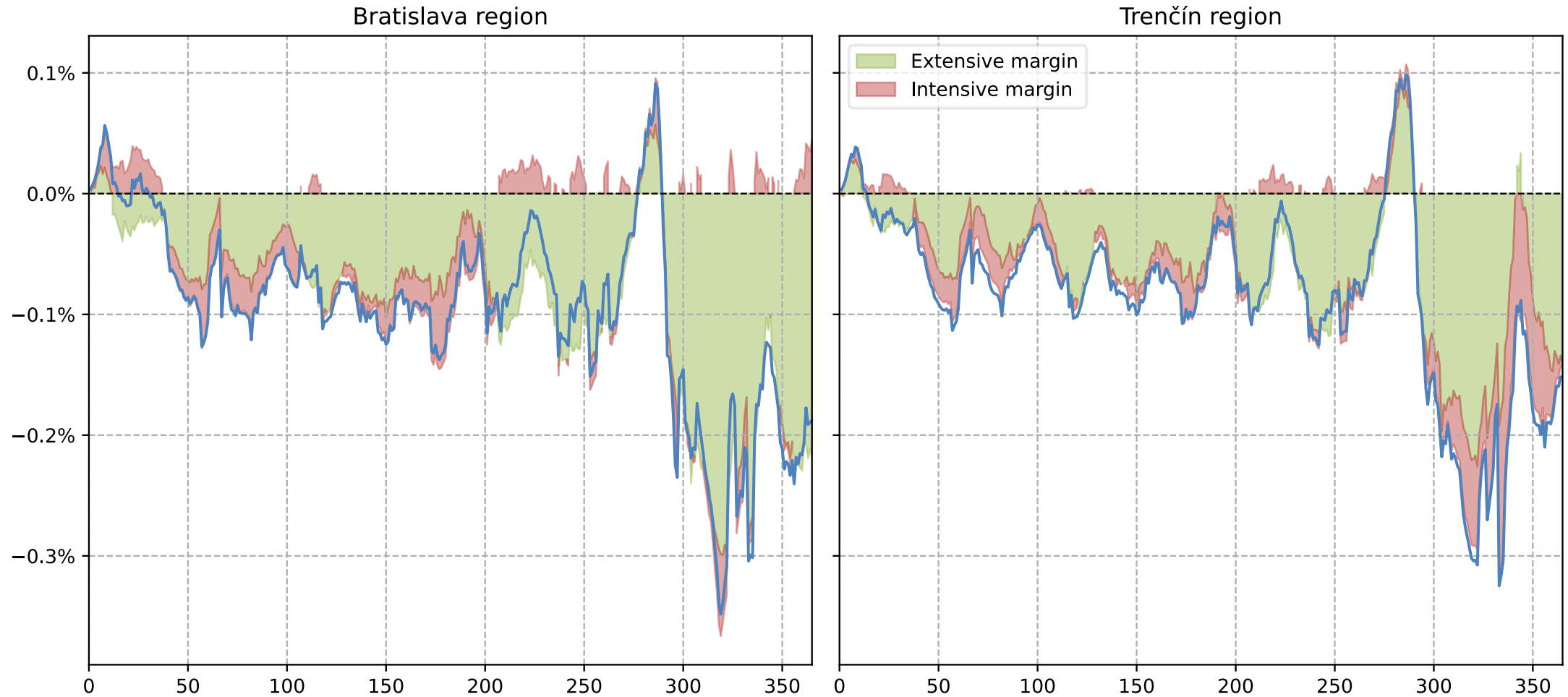


Male and female consumption

- Loss of stability in estimation
- Within HH optimization problem...
- ...choosers vs payers
- Overall behavior consistent
- Male consumption averages 1.5 times female

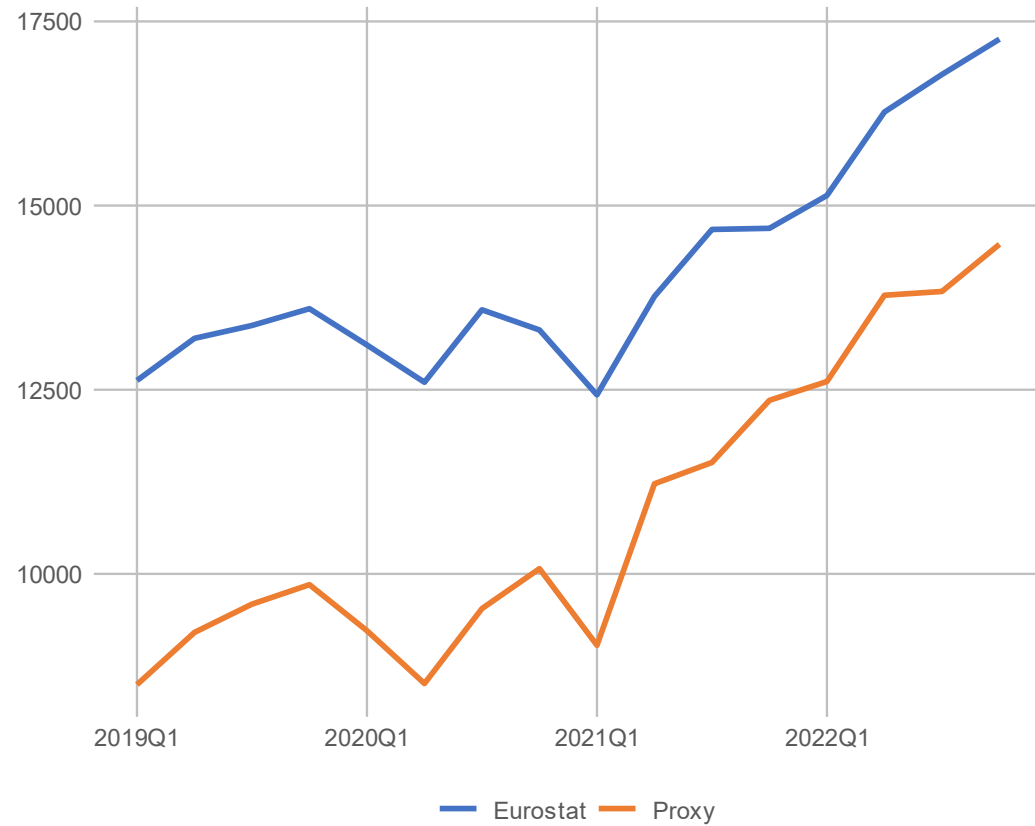


Regional heterogeneity... or not

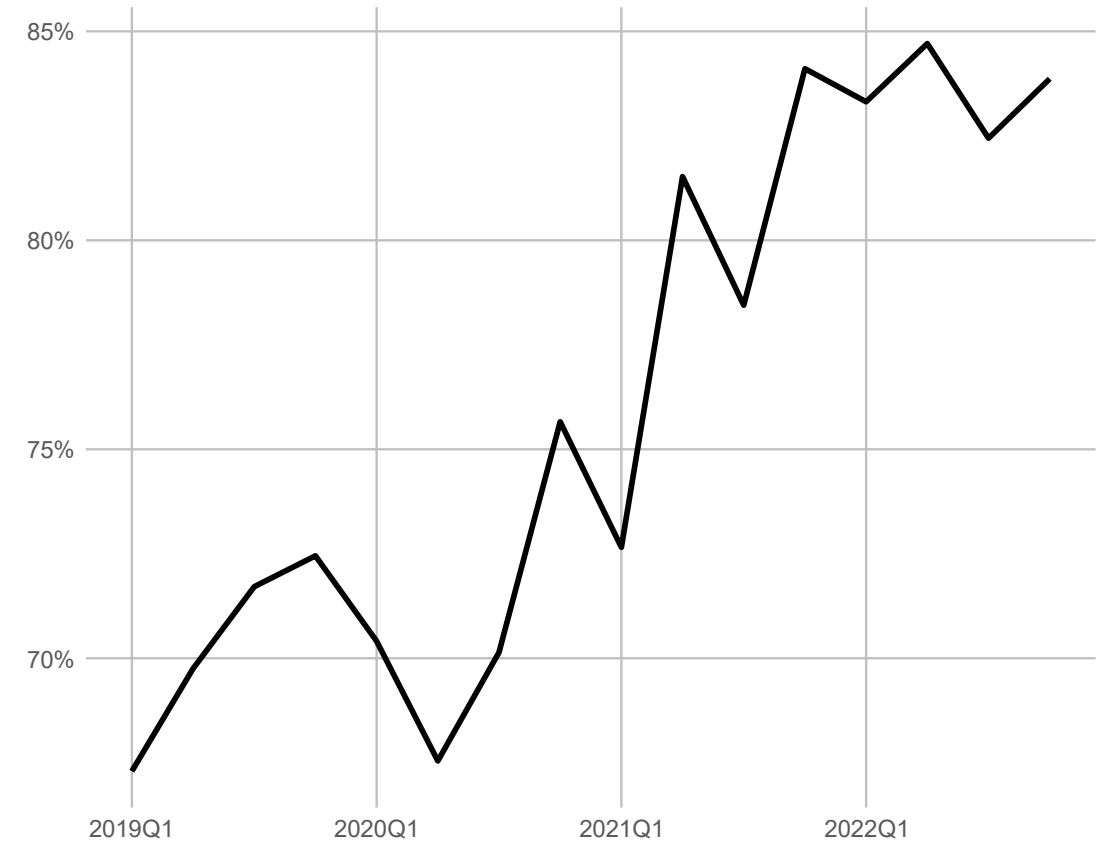


- Interest rate shocks affects consumption in about 2 months
- Larger dynamics at horizon 9-11 months
- Positive and negative shocks dynamics broadly as expected
- Longer maturities peak faster: RE market transmission?
- Male and female consumption dynamics consistent
- Intensive margin more relevant for male consumption
- Regionally consistent response to MP shocks (caveats apply)

How good is the proxy?

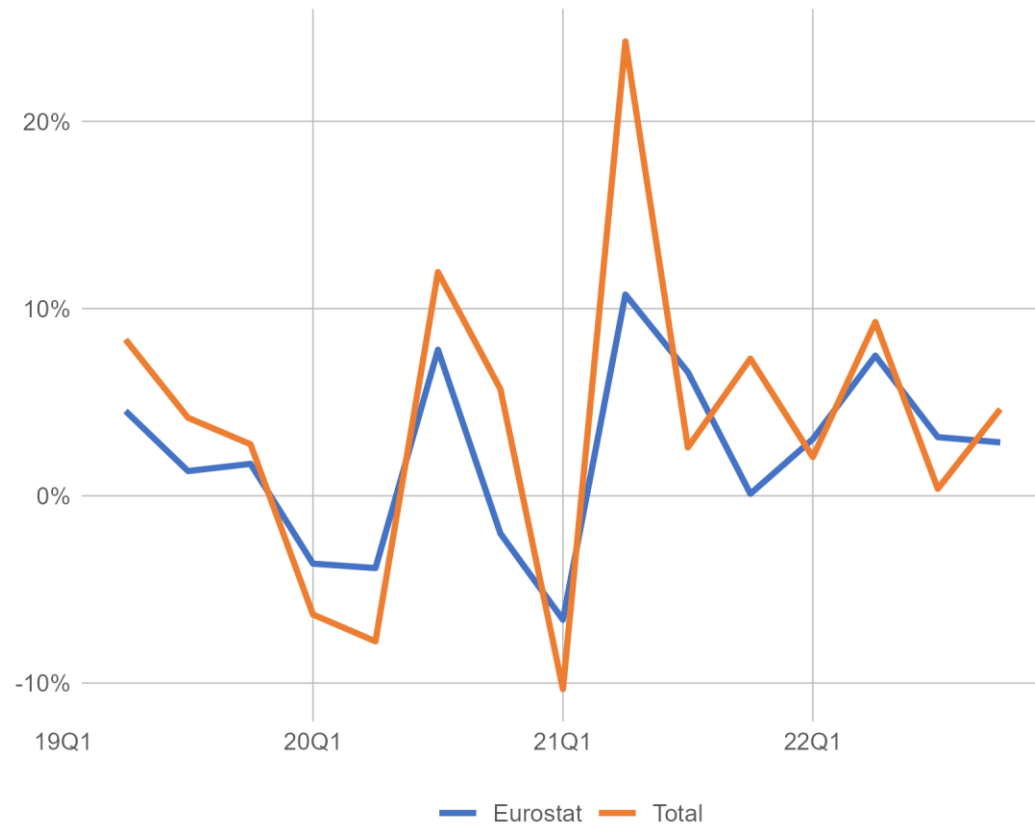


Eurostat and proxy

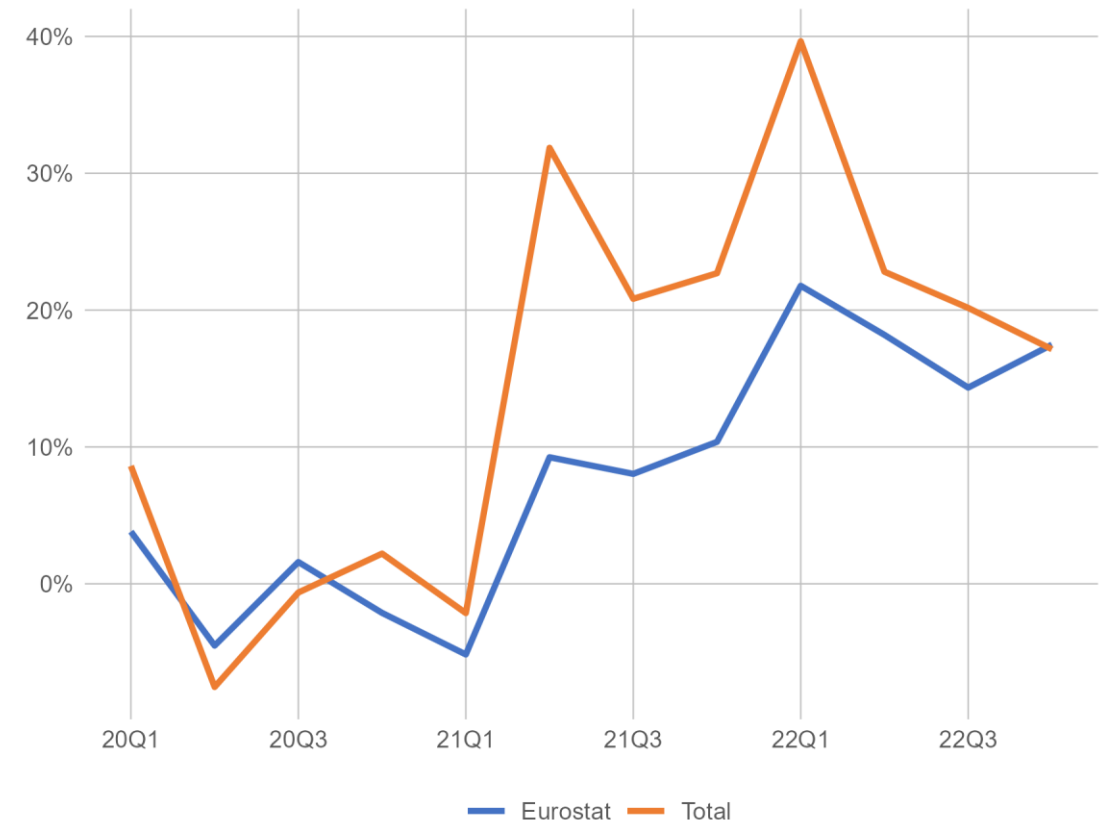


Proxy share of nominal consumption

How good is the proxy?

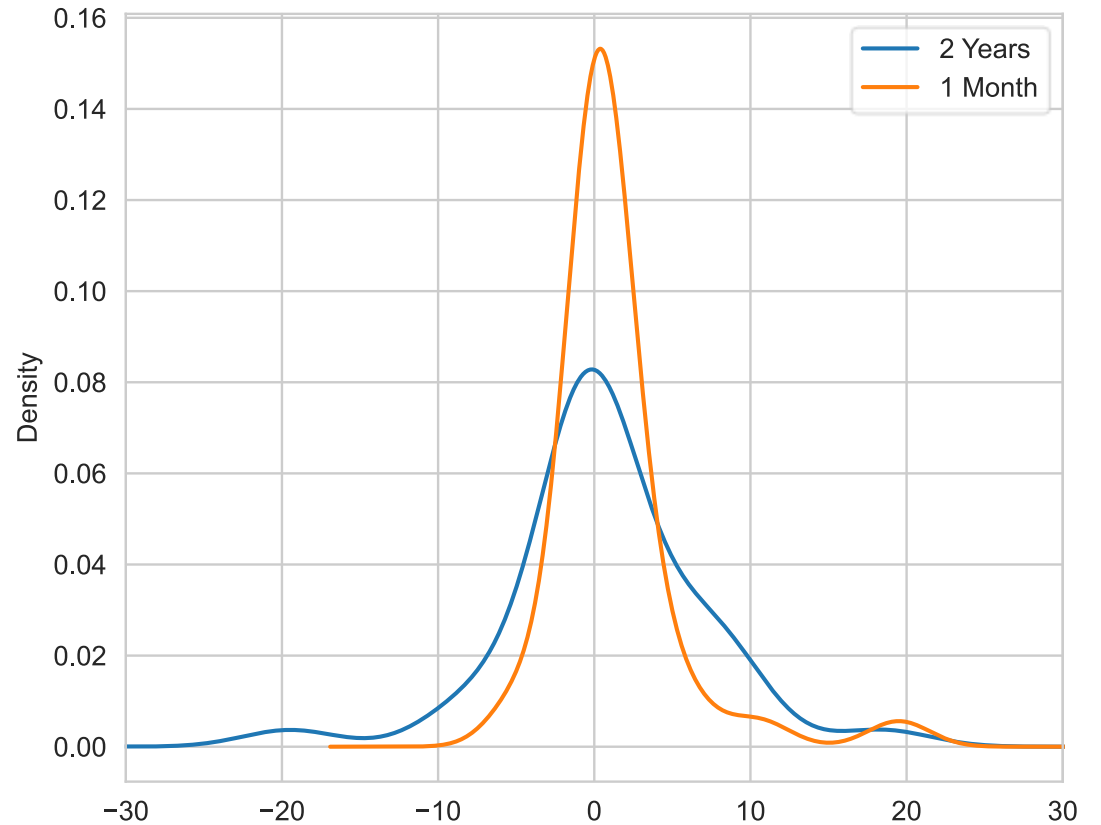
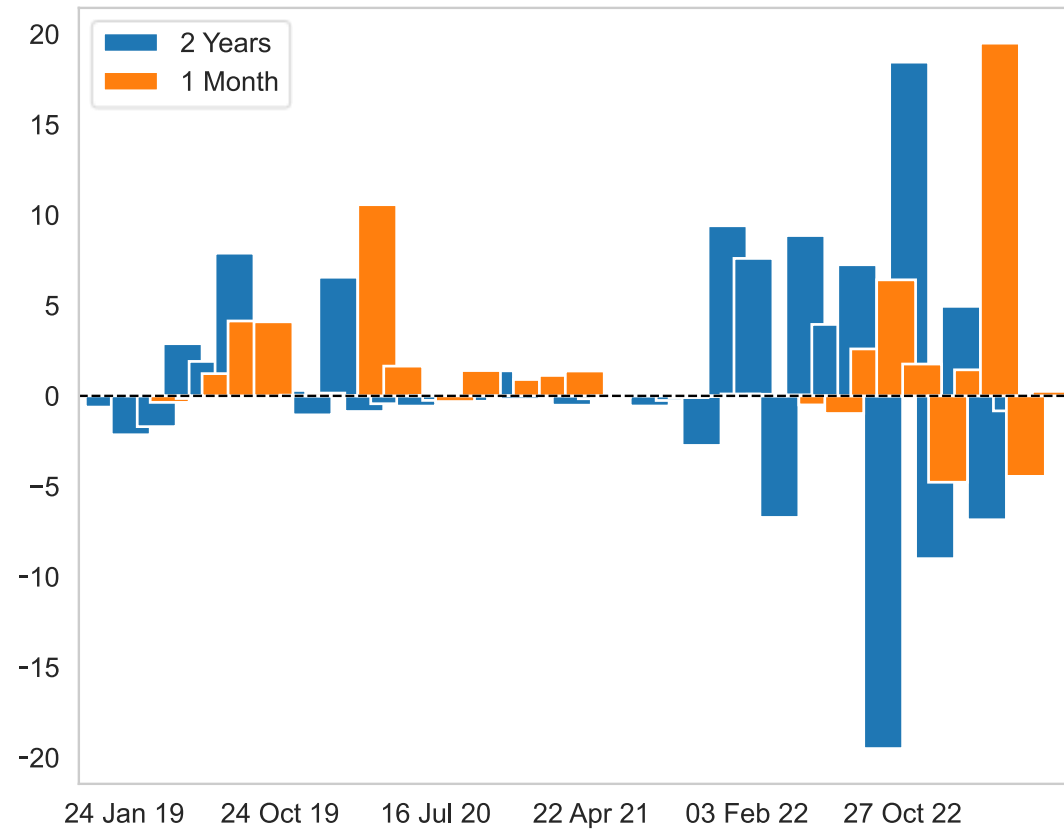


QoQ – Quarterly series



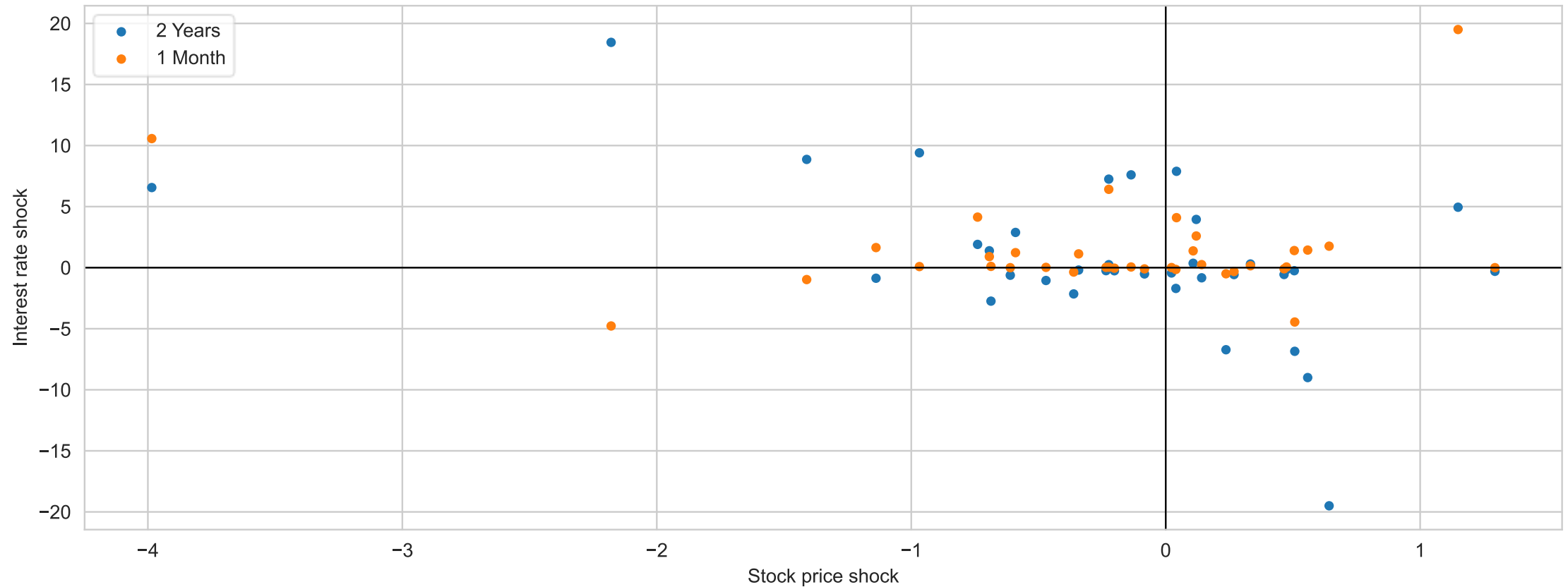
YoY – Quarterly series

OIS in our sample



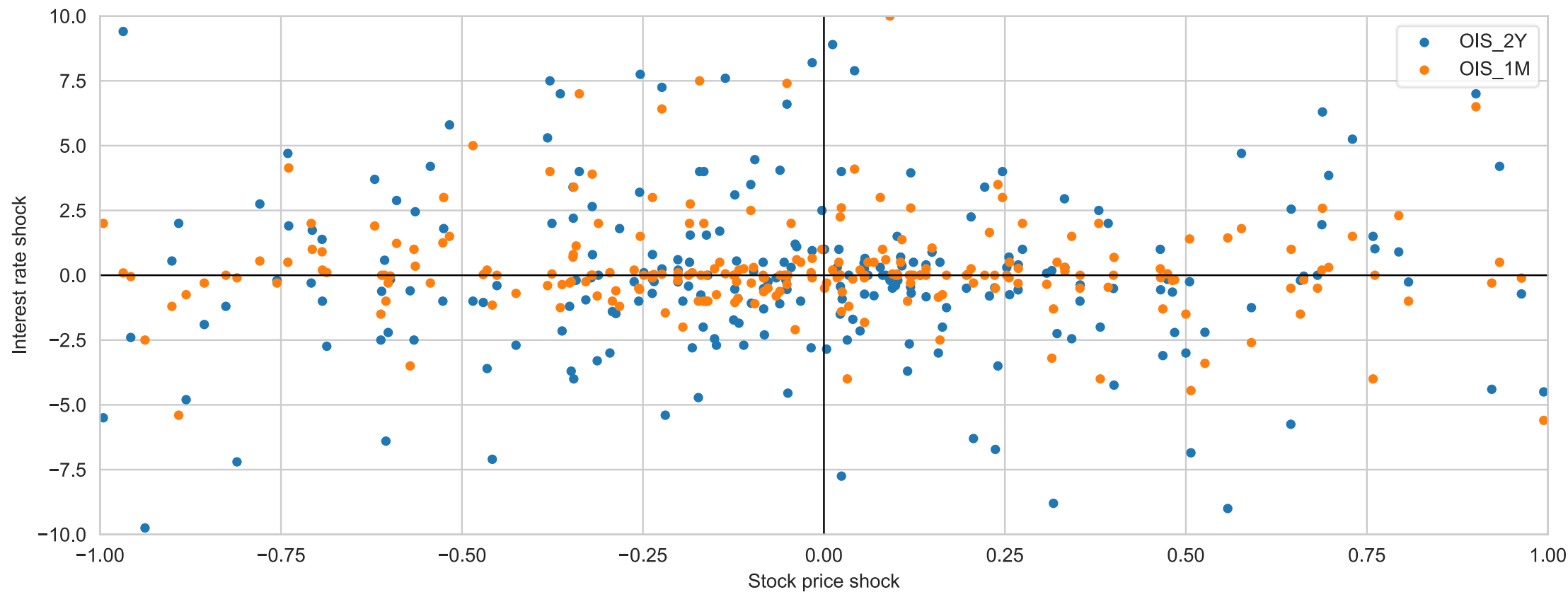
Interest rate shocks defined as changes in the 1-month and 2-year OIS rates around monetary policy announcements (full Monetary Event window)

OIS in our sample



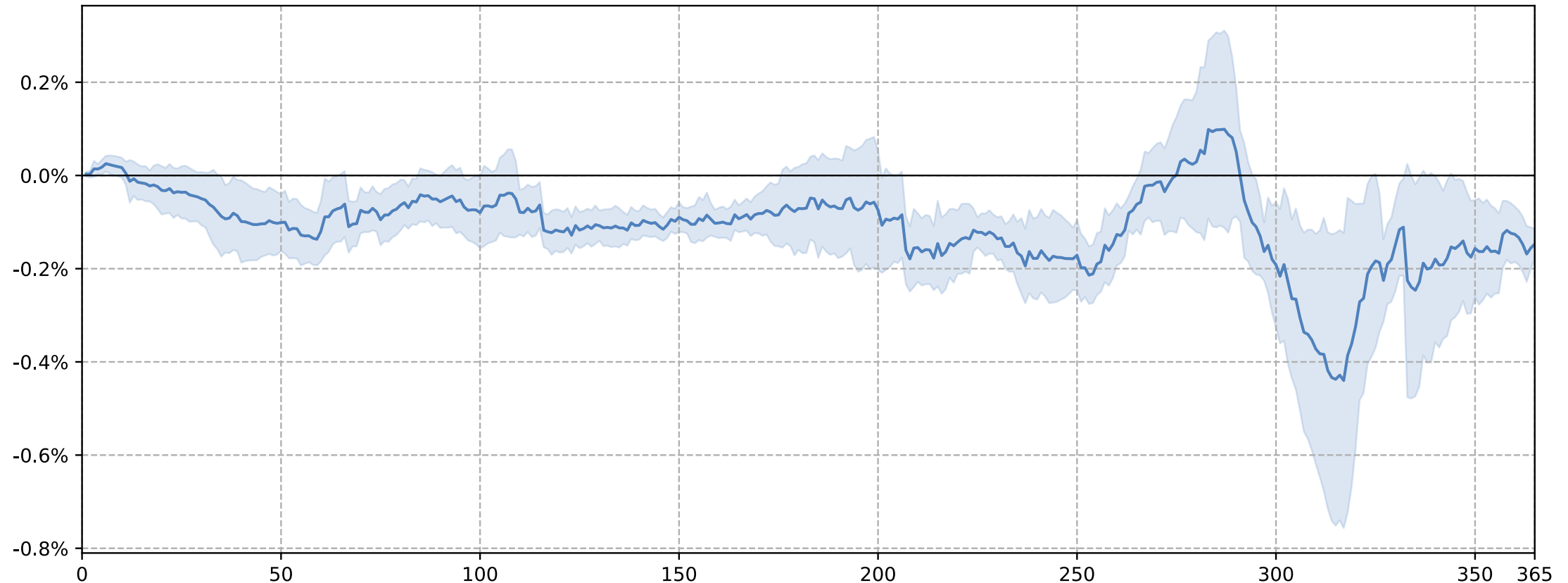
Changes in the 2-year and 1-month OIS rates (bp) against concomitant changes in the Euro STOXX50 (%).

OIS shocks: the information rebus-detail



Changes in the 2-year and 1-month OIS rates against concomitant changes in the Euro STOXX50. Chart is limited to OIS shocks between -10 and 10 bp and stock prices oscillations between -1% and 1%.

Cumulative spending: card-only data

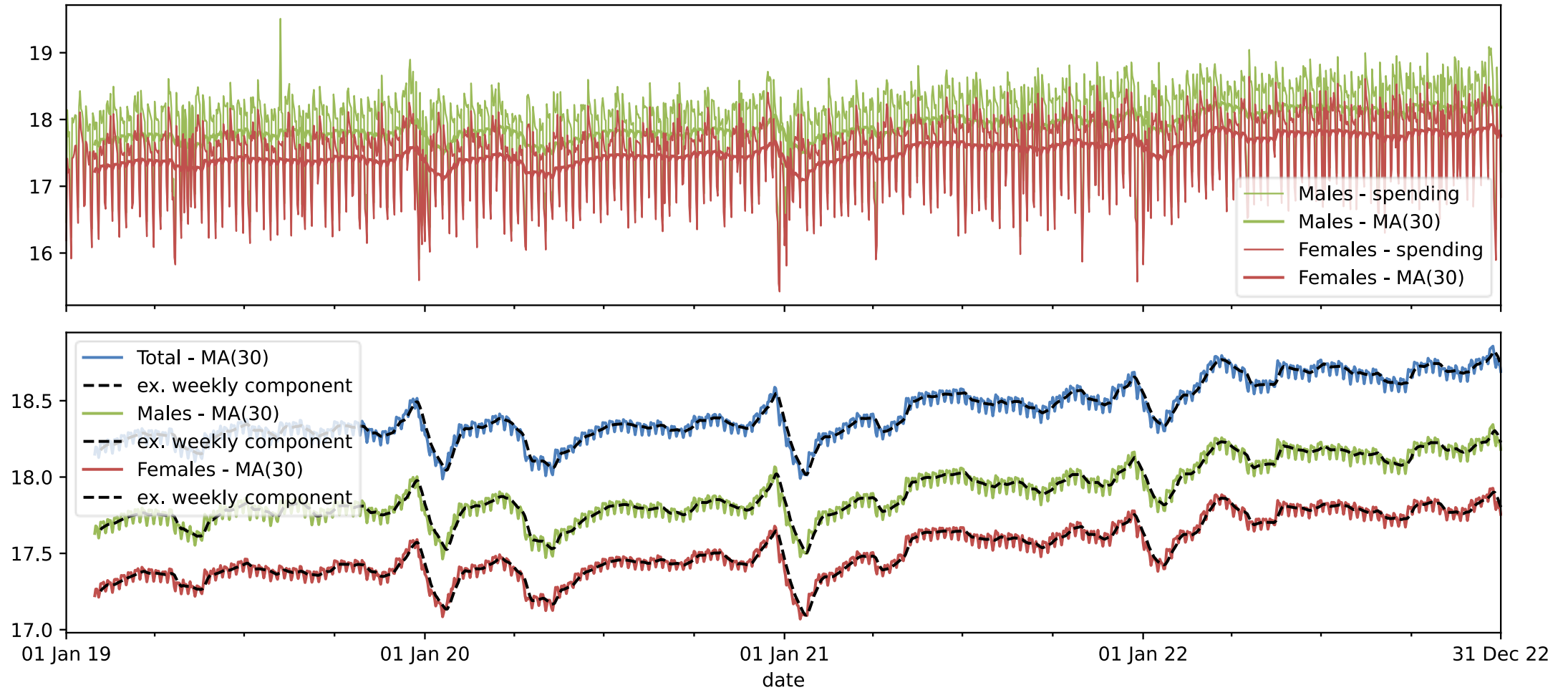


Response of spending to a 100bp interest rate shock at 2-year maturity. Y-o-y percent change. Regression include pandemic, inflation, persistency, and income support controls, as well as calendar effects. Card-only data.

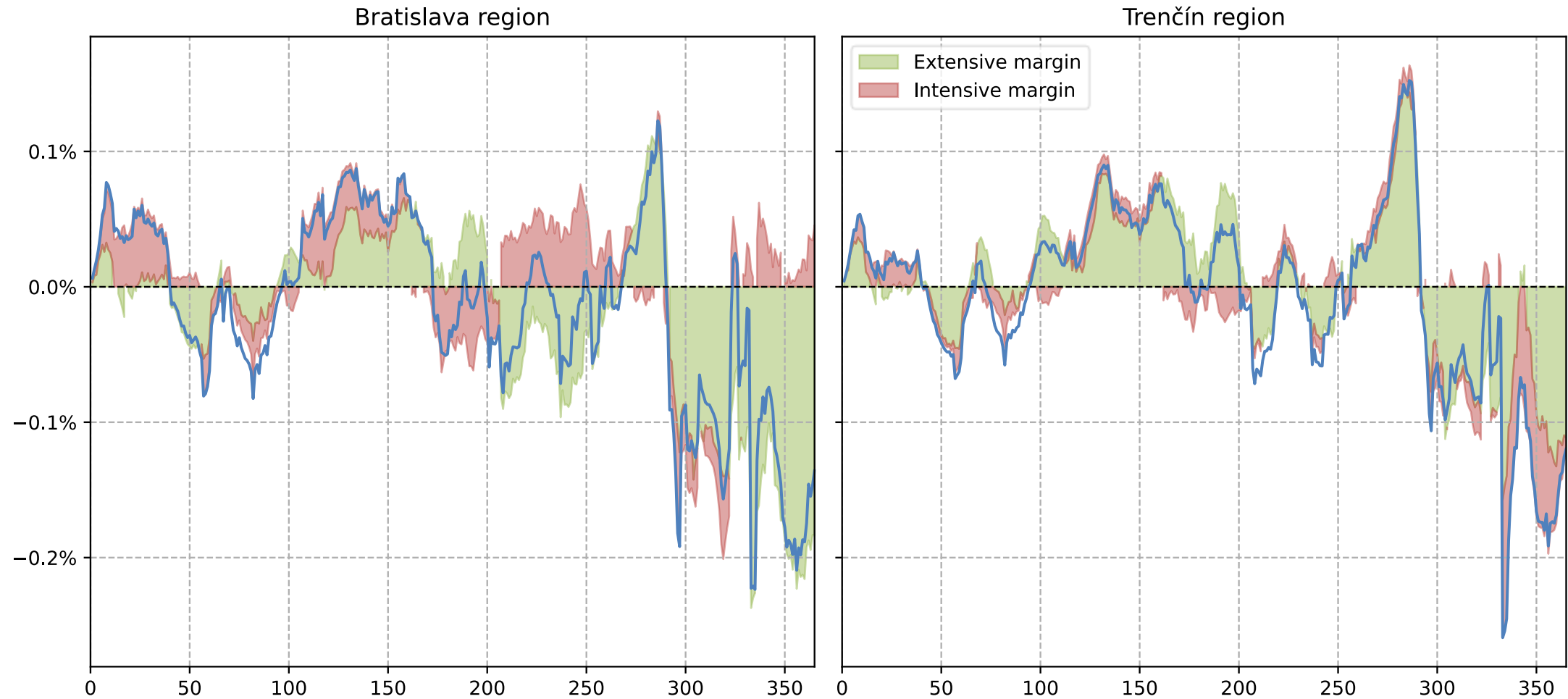
Nonlinear specification

$$\begin{aligned}
 S_{t+h} - S_{t-1} = & \\
 & F(z_t) \left(\beta^h I_{t+h-1} + \sum_{p=1}^{\bar{p}} \xi_p^h I_{t-p} \times SP_{t-p} + \sum_{p=1}^{\bar{p}} \psi_p^h SP_{t-p} \right) + \\
 F(z_t) = & \frac{e^{-\gamma z_t}}{1 + e^{-\gamma z_t}} \\
 & (1 - F(z_t)) \left(\beta^h I_{t+h-1} + \sum_{p=1}^{\bar{p}} \xi_p^h I_{t-p} \times SP_{t-p} + \sum_{p=1}^{\bar{p}} \psi_p^h SP_{t-p} \right) + \\
 & \sum_{p=1}^{\bar{p}} \gamma_p^h c_{t-p} + \sum_{p=1}^{\bar{p}} \phi_p^h d_{t-p} + \sum_{p=1}^{\bar{p}} \theta_p^h w_{t-p} + \sum_{p=1}^{\bar{p}} \rho_p^h s_{t-p} + \sum_{p=1}^{\bar{p}} \beta_p^h \Pi_{t-p}^e + \sum_{p=1}^{\bar{p}} \beta_p^h \Pi_{t-p}^P + \sum_{p=1}^{\bar{p}} \beta_p^h \Pi_{t-p} \\
 & + dow^h + doy^h
 \end{aligned}$$

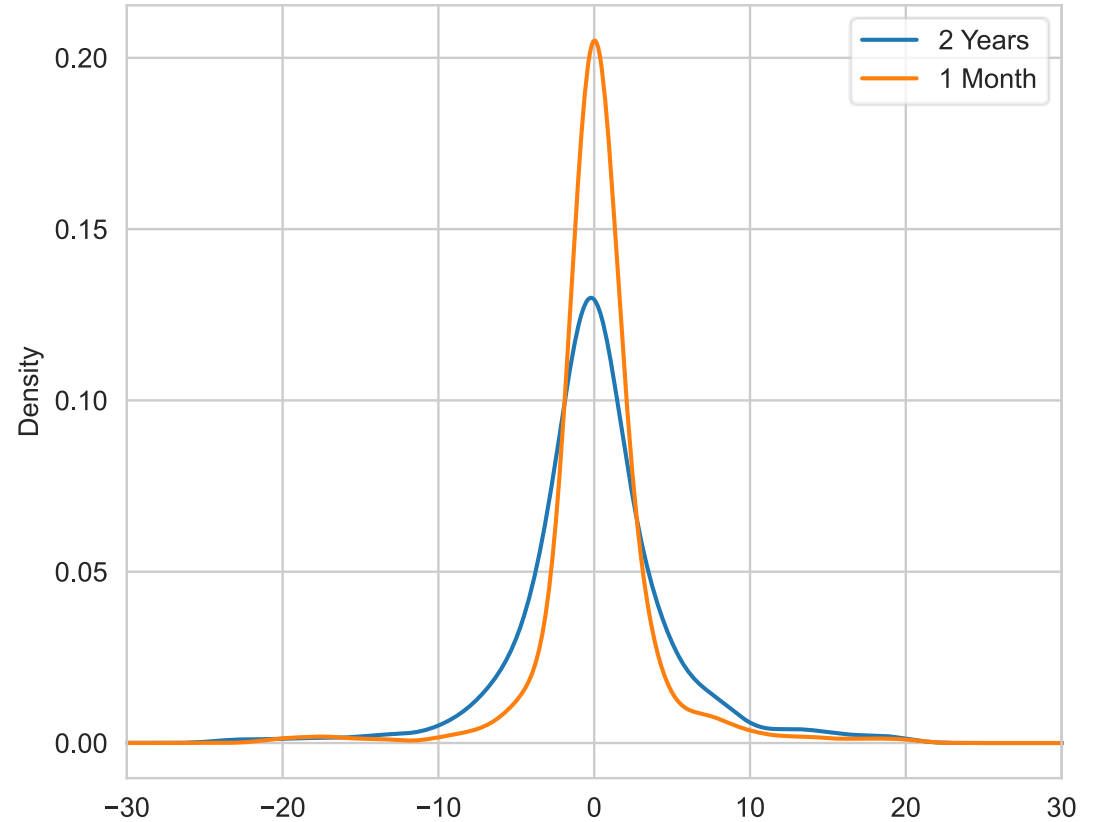
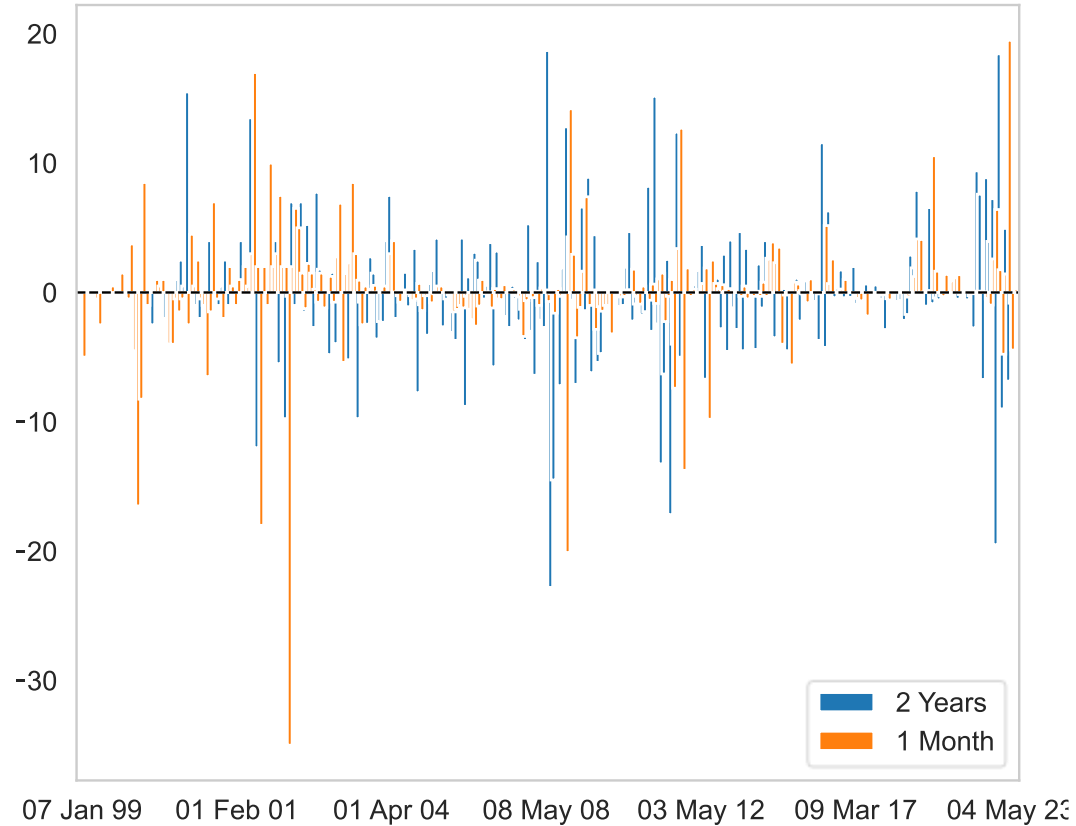
Male and female consumption



Regional heterogeneity... or not ex. pandemic controls

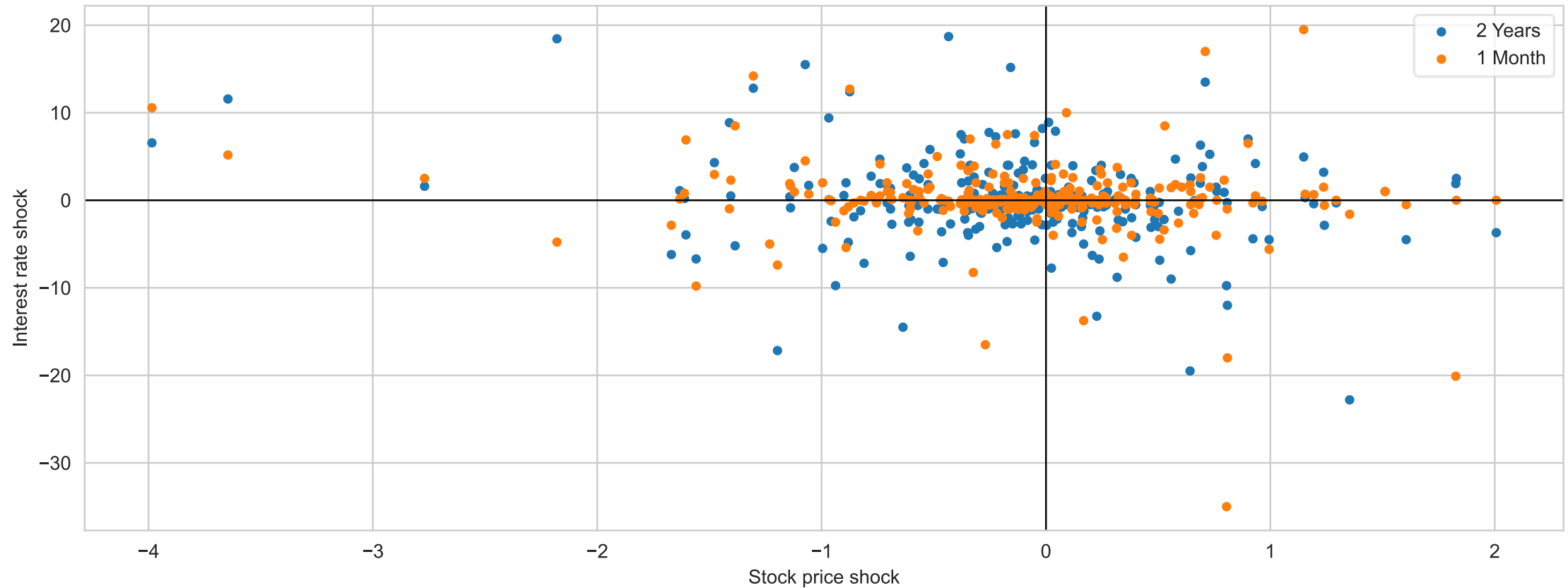


A glance on OIS surprises



Interest rate shocks defined as changes in the 1-month and 2-year OIS rates around monetary policy announcements (full Monetary Event window)

OIS shocks: the information rebus



Changes in the 2-year and 1-month OIS rates (bp) against concomitant changes in the Euro STOXX50 (%).

M/F consumption: margins

