Do monetary policy shocks affect financial uncertainty? A non-Gaussian proxy SVAR approach

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Introduction

Monetary policy and financial uncertainty: why do we care?

- Uncertainty (Bloom, 2009; Jurado et al., 2015; Ludvigson et al., 2021) and monetary policy (Christiano et al., 1999; Gürkaynak et al., 2005; Bauer and Rudebusch, 2014; Jarociński and Karadi, 2020) matter in explaining business cycles and other economic developments.
- Fluctuations in uncertainty are often assumed to be exogenous wrt to other economic fundamentals, i.e. economic uncertainty responds solely to 'uncertainty' shocks $\rightarrow$ **Is it really the case? Certainly not.**
- Economic postulate recently challenged notably by Ludvigson et al. (2021) and Carriero et al. (2021) who opened the door for uncertainty to be endogenous to other economic fundamentals.
- Studies focusing directly on this interconnection are scarce (Bekaert et al., 2013; Mumtaz and Theodoridis, 2020) with no direct focus on **unconventional monetary policies**.

Contributions

- We study the links between monetary policy (MP) shocks, financial uncertainty, and macro-financial conditions for the EA.
- In the spirit of Ludvigson et al. (2021), we let uncertainty be endogenous in a SVAR setting.
- Both MP shocks affect financial uncertainty (captured by VSTOXX) but in a different way.
- We develop a novel identification strategy to identify and distinguish (i.e. label) the respective effects of (un)conventional monetary policy shocks.
- This is done by using an instrument (proxy) and non-Gaussianity of the data.
- This framework provides a solution to the 'shock-labeling' problem encountered in statistically identified SVARs.

Non-Gaussian proxy SVAR

- Let us assume the K-dimensional VAR (p) process of the form

$$y_t = \mu + A_1 y_{t-1} + ... + A_p y_{t-p} + u_t, \tag{1}$$
$$= \mu + A_1 y_{t-1} + ... + A_p y_{t-p} + B\varepsilon_t, \tag{2}$$

where $y_t = (y_{1t}, ..., y_{Kt})'$ is a vector of observable variables at a point in time, u_t are the serially uncorrelated reduced form residuals ($\mathbb{E}(u_t) = 0$ and $\text{Cov}(u_t) = \Sigma_u$) with

$$u_t = B\varepsilon_t, \tag{3}$$
$$\text{Cov}(\varepsilon_t) = I_K. \tag{4}$$

- How to uniquely identify B and structural shocks ε_t? $\rightarrow$ follow Lanne et al. (2017) and assume that those structural shocks are non-Gaussian.
- Problem: the identified shocks have certain statistical properties, but there is no guarantee that they have economically meaningful properties

$\rightarrow$ **"shock labeling" issue**.

Non-Gaussian proxy SVAR

Using an instrument to label MP innovations

- Let us assume an instrument w_t correlated with both conventional (ε_t^c) and unconventional (ε_t^u) MP shocks

$$w_t = \beta^c \varepsilon_t^c + \beta^u \varepsilon_t^u + \eta \nu_t \tag{5}$$

with η scaling for the orthogonal measurement error $\nu_t \sim \mathcal{N}(0, \sigma_m^2)$ and (

$$|\beta^c| < |\beta^u|. \tag{6}$$

- We assume that unconventional shocks affect relatively more the instrument than conventional shocks.
- E.g. (long) German bond yields surprises around MP announcements (Altavilla et al., 2019).
- Postulate motivated by a large body of literature (Gürkaynak et al., 2005; Gagnon et al., 2011; Campbell et al., 2012; Wright, 2012; Joyce et al., 2020; Inoue and Rossi, 2021)
- (6) is our labeling rule for distinguishing MP innovations.

Non-Gaussian proxy SVAR

Assumptions

- Ordering MP shocks first in ε_t, the relation between w_t and the vector of structural shocks ε_t is

$$w_t = \beta\varepsilon_t + \eta\nu_t, \tag{7}$$

  where ε_t is the $K \times 1$ vector of structural shocks, $\beta = (\beta_1, ..., \beta_K)$ is a $1 \times K$ parameters vector.

- The instrument is valid for capturing and labeling MP innovations if it satisfies the relevance and exogeneity conditions:

$$\beta_3, ..., \beta_K = 0, \tag{8}$$

$$\beta_1, \beta_2 \neq 0, \tag{9}$$

$$|\beta_1| > |\beta_2|. \tag{10}$$

Estimation

- By including the instrument internally in the model, one can rewrite the model

$$z_t = \delta + \Gamma_1 z_{t-1} + ... + \Gamma_p z_{t-p} + e_t, \tag{11}$$

with $z_t = (y_t, w_t)'$ being a $(K+1) \times 1$ vector of variables.

- The relation between errors e_t and structural shocks of the augmented model (μ_t) becomes:

$$e_t = D\mu_t, \tag{12}$$

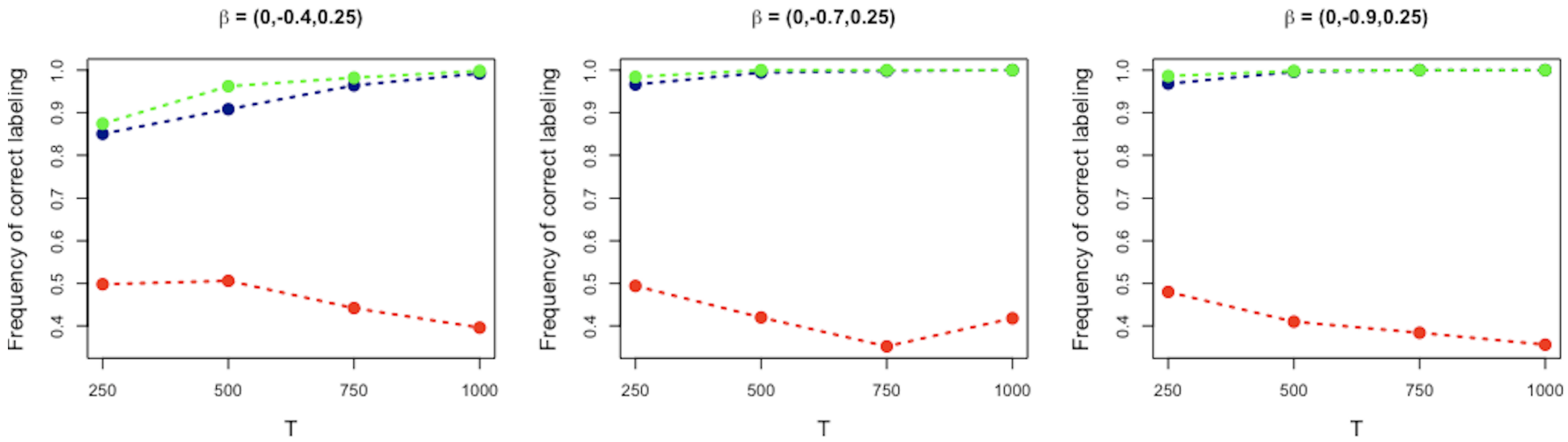
$$= \begin{pmatrix} B_{(K\times K)} & 0_{(K\times 1)} \\ \beta_{(1\times K)} & \eta \end{pmatrix} \begin{pmatrix} \varepsilon_t \\ \nu_t \end{pmatrix}. \tag{13}$$

- Under assumptions (8) to (10), one can impose zero restrictions on β and label the shocks economically.
- This requires testing internally relevance and exogeneity conditions through LR tests and label the shocks according to the β estimates.

Simulation

Labeling performance

Figure: Labeling performance of MP shocks: Gaussian (red), Chi-square (blue) and Student (green) distributed shocks.



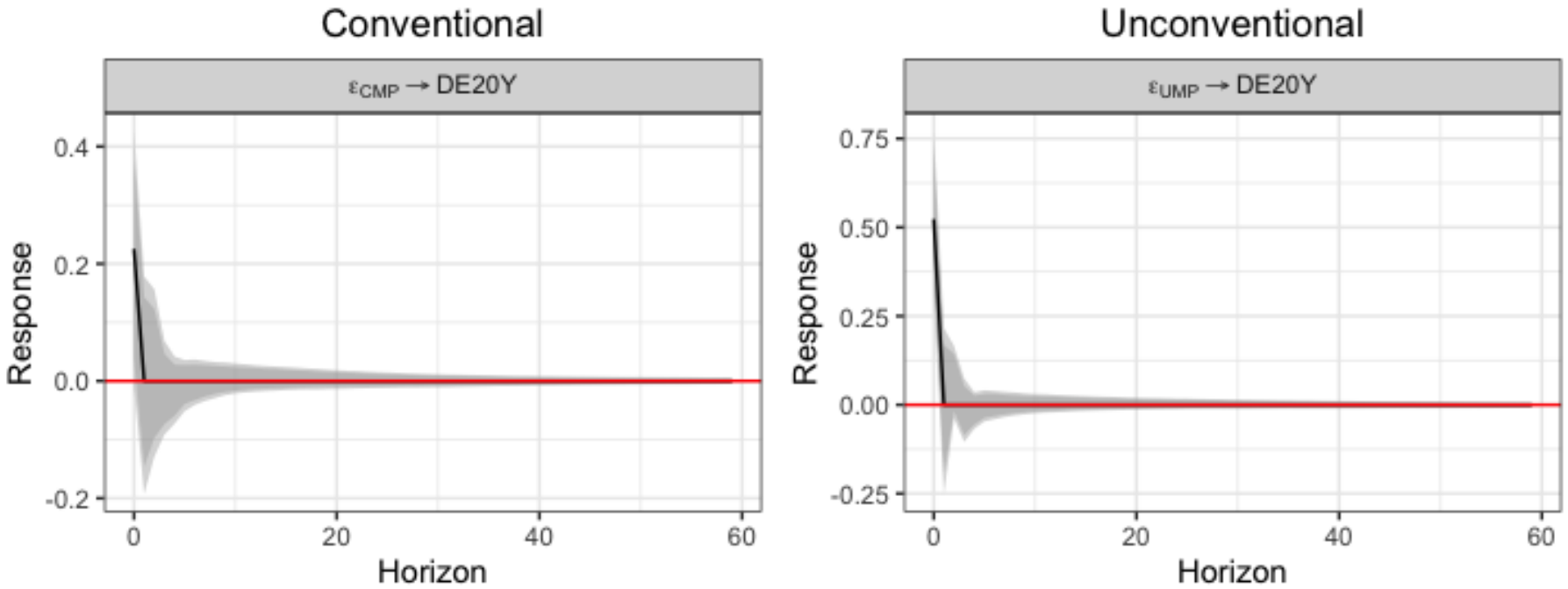
Data

- Sample period: from January 1999 to January 2020 ($T = 253$).
- Instruments (w_t): high-frequency reactions of German bond yields to MP announcements for different maturities (DE10Y, DE20Y, DE30Y), directly taken from EA-MPD of Altavilla et al. (2019).
- Financial uncertainty: VSTOXX index
- Observed macro & financial variables (y_t):
  - industrial production
  - a price index (HICP)
  - a nominal exchange rate (EUR/USD)
  - 10y EA Government bond yields
  - EURO STOXX 50
  - short rate measure (2y German yield)

Results

With 20Y German bond yield surprises

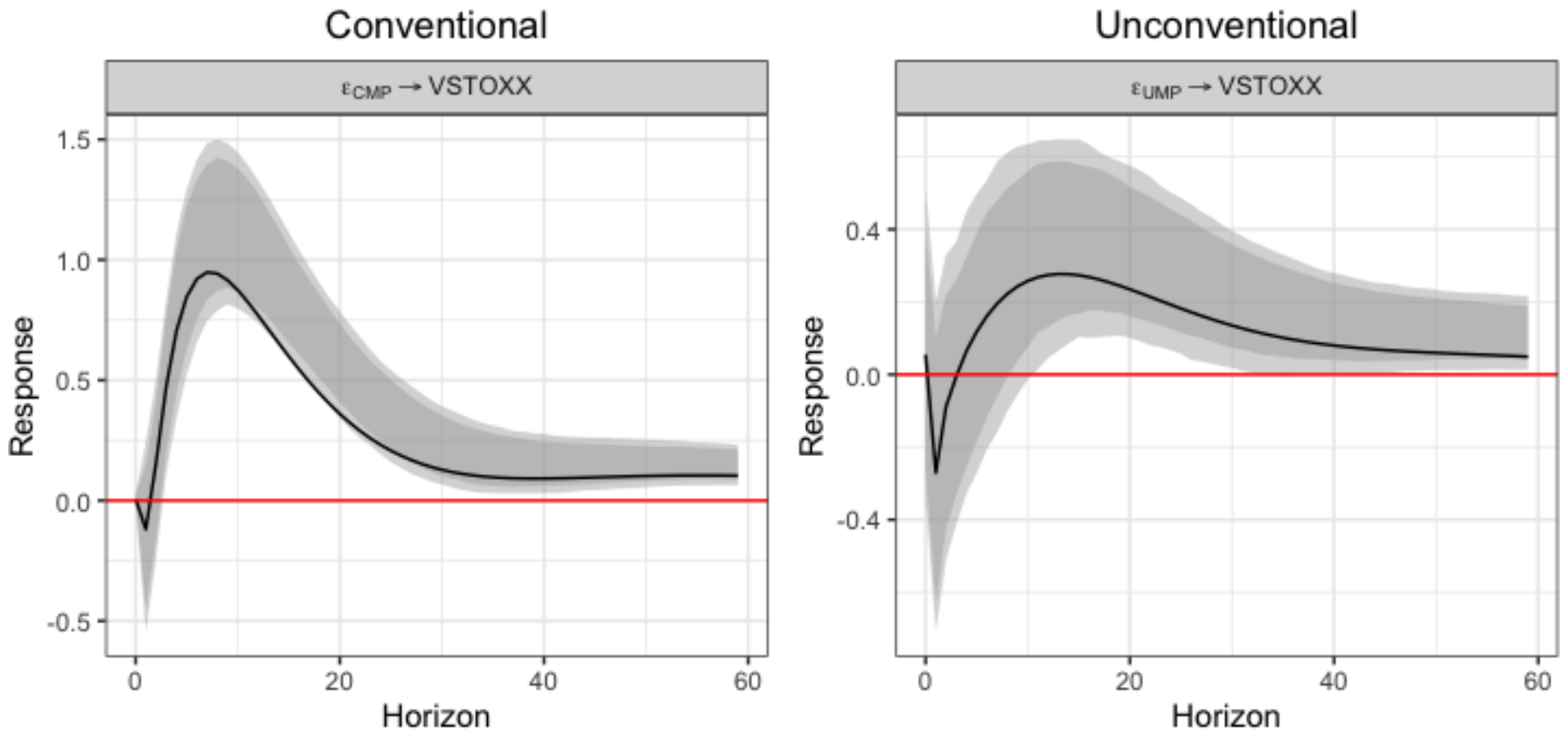
Figure: Responses of the instrument w_t to conventional (left) and unconventional (right) contractionary MP shocks.



Results

VSTOXX responses

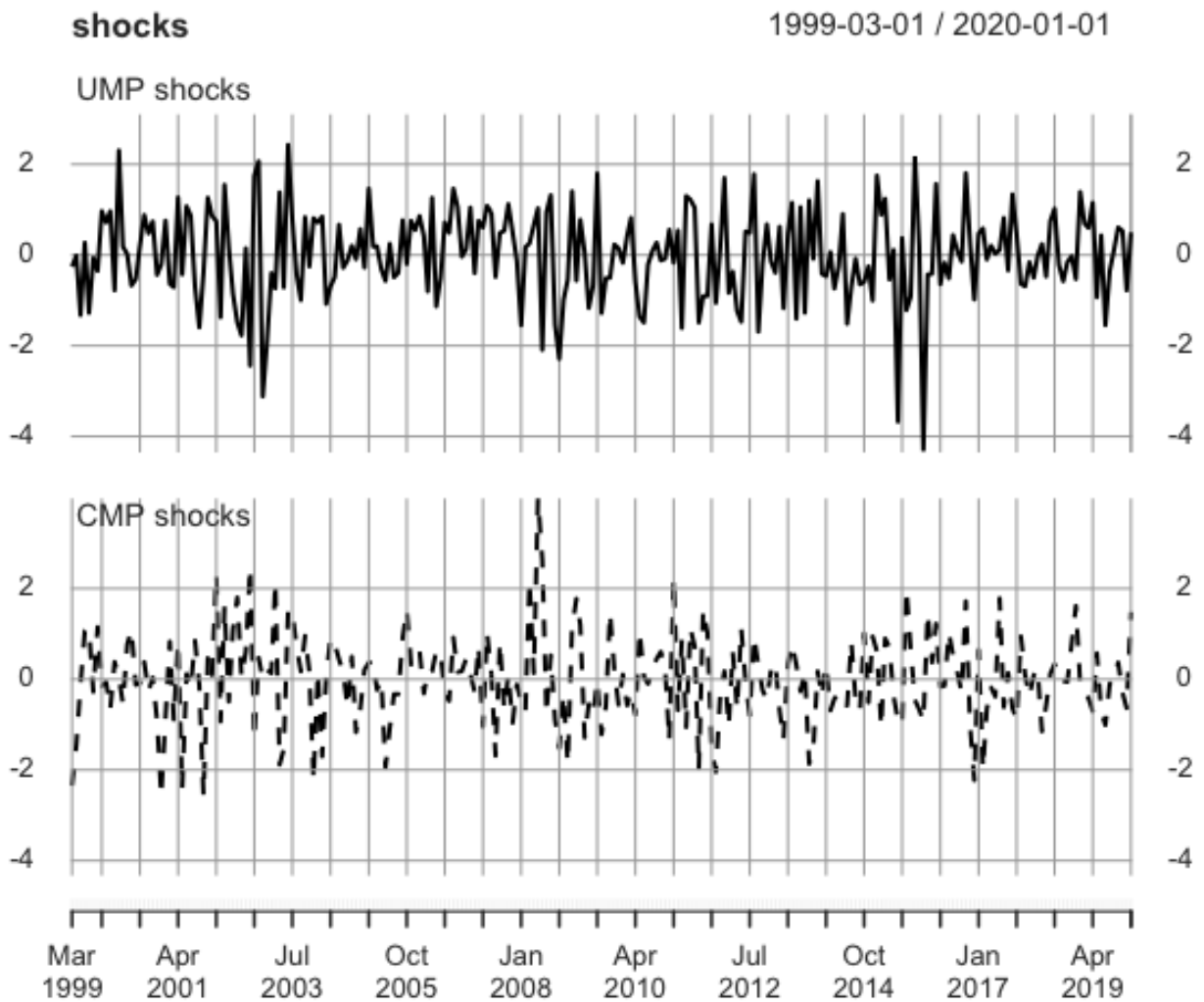
Figure: Responses of financial uncertainty (VSTOXX) to conventional (left) and unconventional (right) contractionary MP shocks.



Labeling of shocks: Confirmatory analysis

Time series

Figure: Shocks over time



Labeling of shocks: Confirmatory analysis

Rolling variance

Figure: Variance (in rolling window) of UMP and CMP shocks

Conclusion

- Monetary policy affects the degree of uncertainty of financial markets.
- Results in line with Bekaert et al. (2013): contractionary MP shocks increase uncertainty.
- Discrepancy in the effects: conventional shocks affect more uncertainty than unconventional ones.
- Although lower in magnitude, the effects of UMP shocks on financial uncertainty seem to be more persistent.
- Results are in line with the postulate of endogenous uncertainty made by Ludvigson et al. (2021).
- Those results raise new questions on both MP pass-through as well as ECB's role in preserving the stability of the financial system.

Thank you!

Results with different instruments I

DE30Y

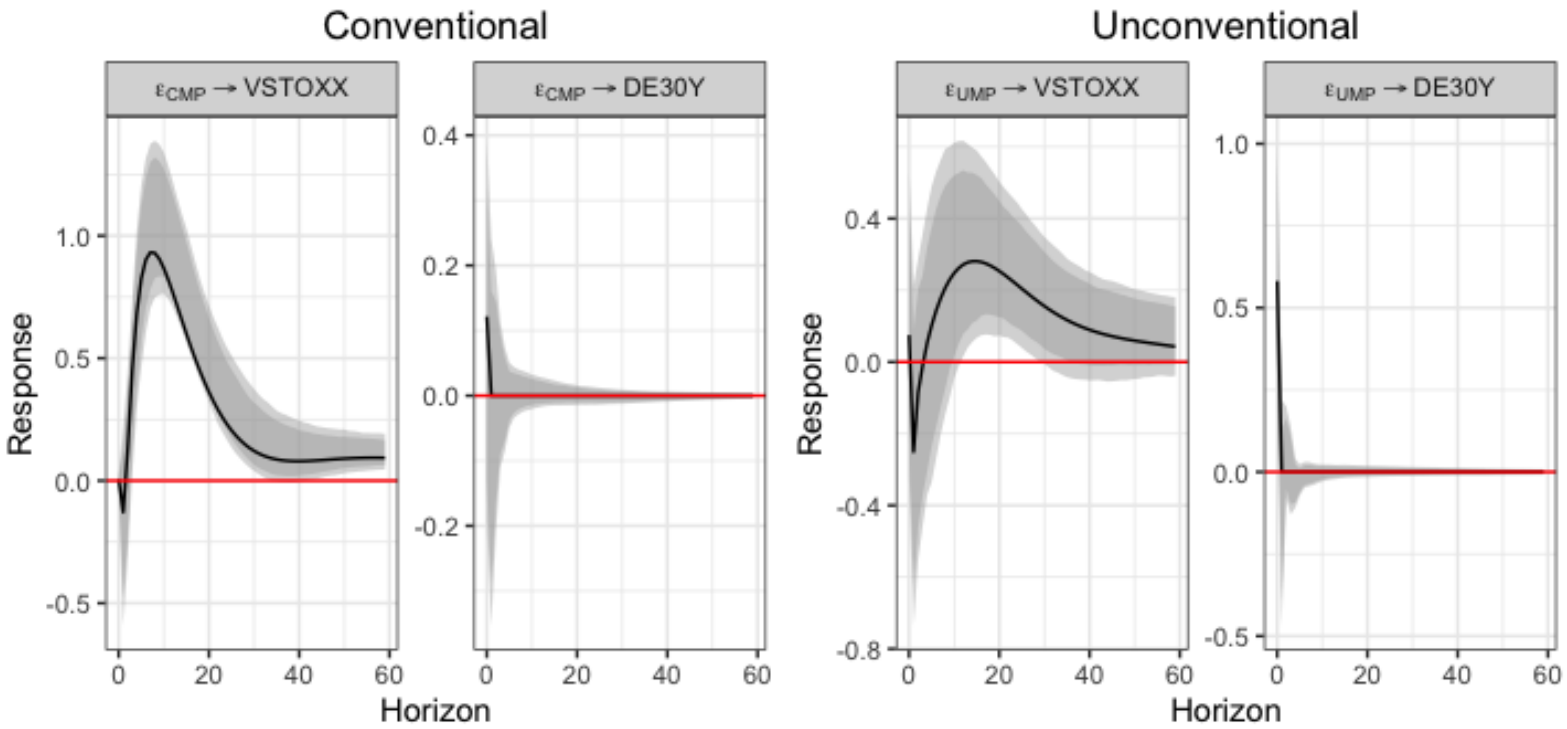


Figure: Responses of financial uncertainty (VSTOXX) with DE30Y as instrument

Results with different instruments II

DE10Y

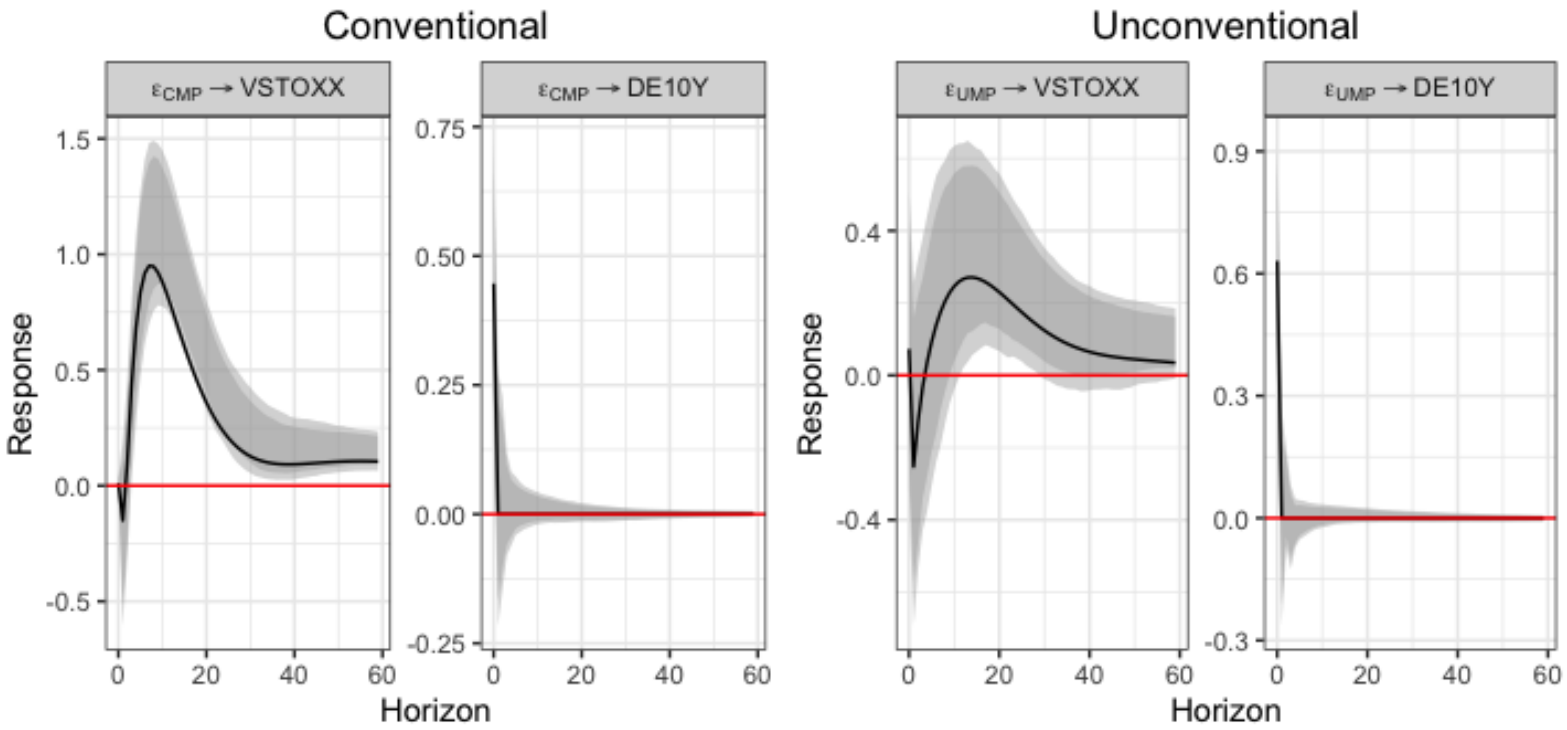
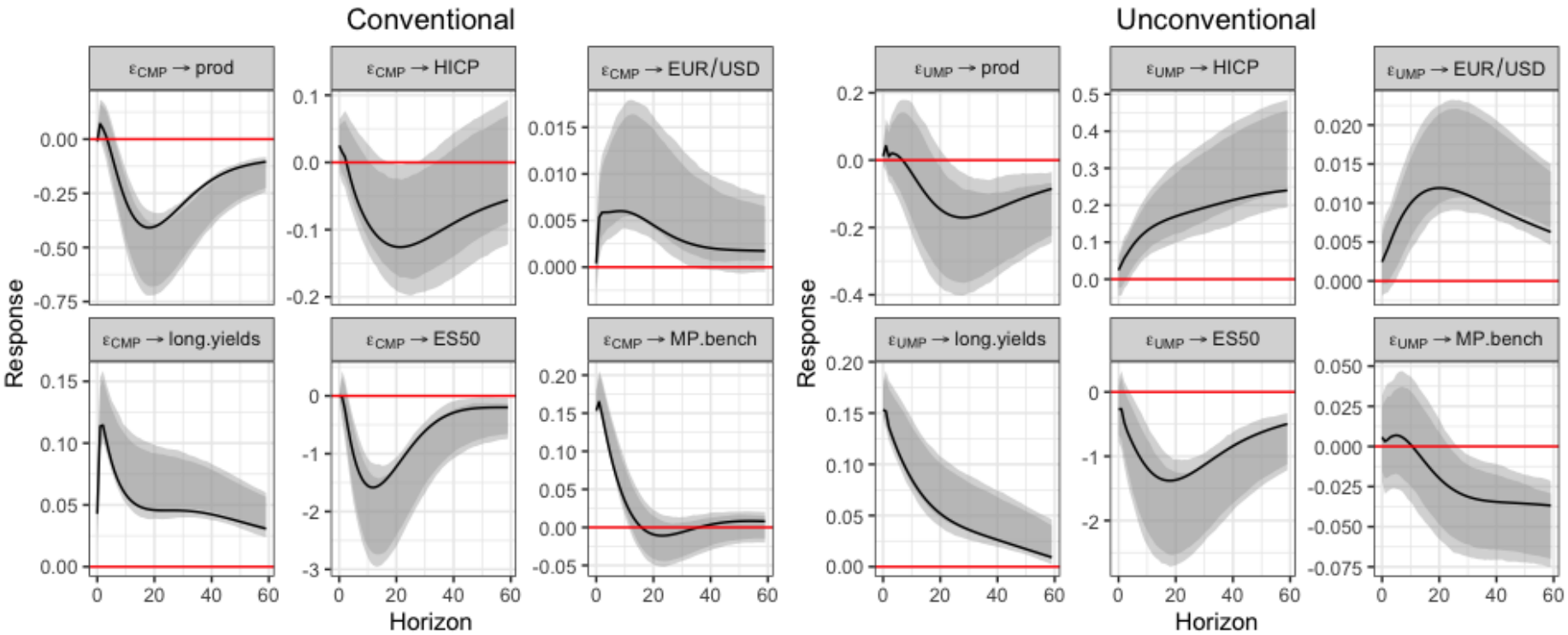


Figure: Responses of financial uncertainty (VSTOXX) with DE10Y as instrument

Responses of other variables

Figure: Responses of macro and financial variables to MP shocks



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