Shock Transmissions in Different Inflation Regimes

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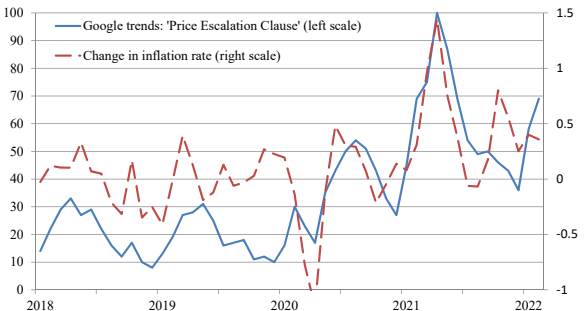
Do transmission dynamics change with inflation?

Google Trends Index: 'Price escalation clause'



Bundesbank Online Panel:

34% of sampled German firms report to use price escalation clauses from 2021 onward vs. **17%** before 2021

Motivation

Hypothesis among policy makers:
Fundamental changes in inflation dynamics in times of large swings in inflation

E.g., Philip Lane (November 2022): "Since the beginning of this year, many contacts also told us that prices would be increased more frequently."

Implication of more frequent price setting: changing pass through of shocks
$\rightarrow$ Important implication for inflation forecasting and monetary policy

We investigate the hypothesis about changes in inflation dynamics by

- identifying different regimes of inflation dynamics
- investigating different effects of cost shocks through stages of production

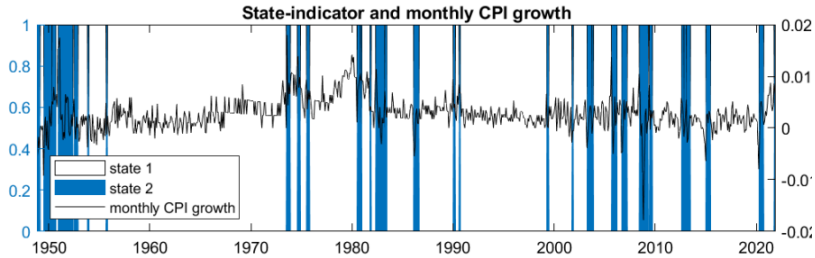
Determine inflation regimes with Markov-switching AR model

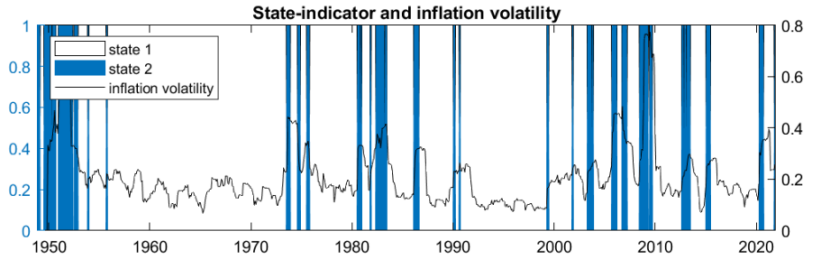
Aim: find different inflation dynamics without exogenously conditioning on specific variables

$$\Delta CPI_t = \begin{cases} \nu_1 + A_{1,1}\Delta CPI_{t-1} + \cdots + A_{1,4}\Delta CPI_{t-4} + e_{1,t}, & \text{if} \quad s_t = 1 \\ \nu_2 + A_{2,1}\Delta CPI_{t-1} + \cdots + A_{2,4}\Delta CPI_{t-4} + e_{2,t}, & \text{if} \quad s_t = 2 \end{cases}$$

ΔCPI_t ... CPI in log differences

States depend on inflation volatility



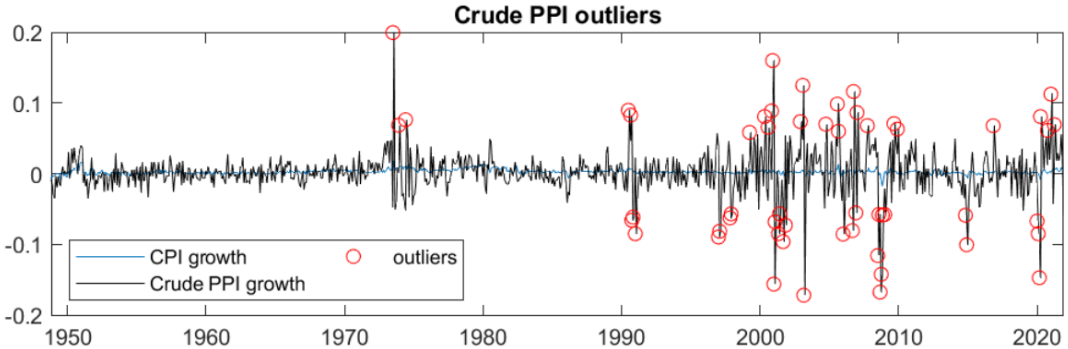


Identify IRFs with local projections and instrument Z_t

$$x_t = \mu_{FS} + \beta_{FS} Z_t + \sum_{l=1}^{n} \delta_{FS,l}^T W_{t-l} + \epsilon_t$$

$$y_{t+h} = \mu_{2S,h} + \beta_{LPIV,h} \hat{x}_t + \sum_{l=1}^{n} \delta_{2S,l}^T W_{t-l} + u_{t+h}.$$

Identify PPI shocks with exceptional data movements



Interact fitted values $\hat{x}_t$ with state-indicator H_t

$$y_{t+h} = \mu_{2S,h} + H_t(\beta^1_{LPIV,h}\hat{x}_t + \sum_{l=1}^{n} \delta^T_{2S,l,1} W_{t-l}) + (1 - H_t)(\beta^2_{LPIV,h}\hat{x}_t + \sum_{l=1}^{n} \delta^T_{2S,l,2} W_{t-l}) + u_{t+h}$$

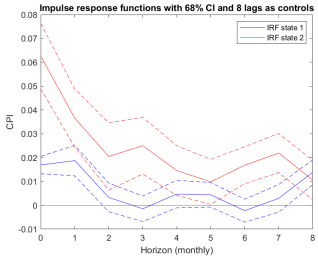
Sample length: 1948M10 to 2021M12

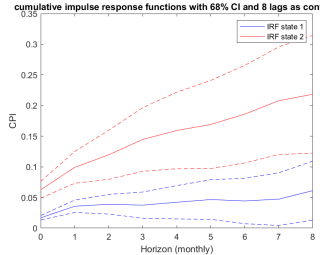
US Data: CPI, Crude, Intermediate & Finished PPI and IP

Controls: $W_t = \{Z_t, \Delta IP_t, \Delta CPI_t, \Delta PPI_t\}$

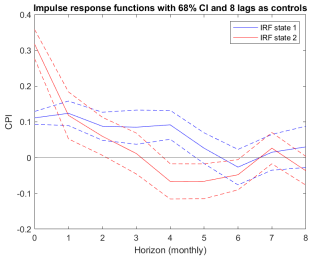
State-dependent effects of PPI shocks on CPI

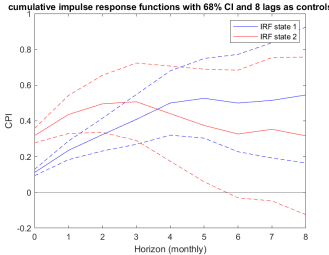
Crude PPI



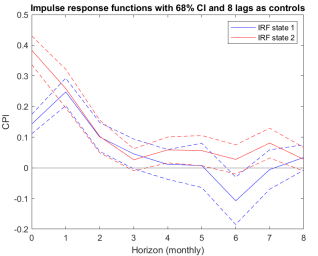


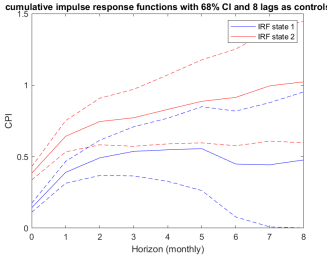
Intermediate PPI





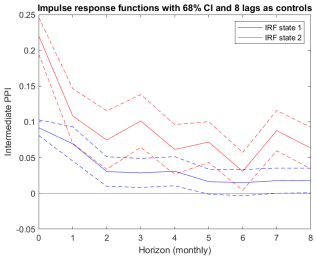
Finished PPI

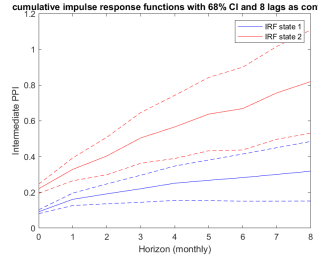




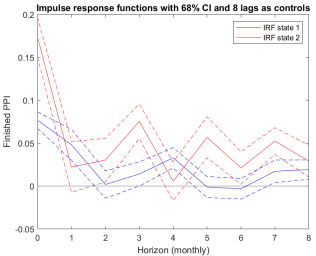
Lagging price changes in downstream production stages

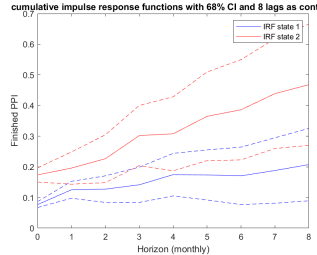
Crude → Intermediate PPI



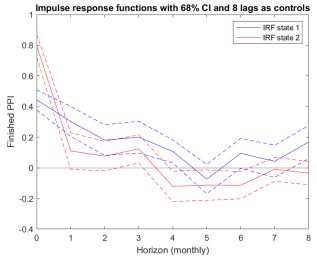


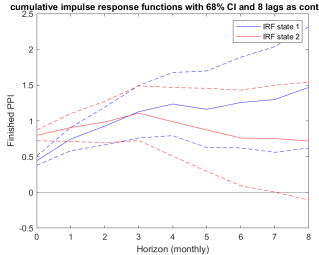
Crude → Finished PPI





Intermediate → Finished PPI



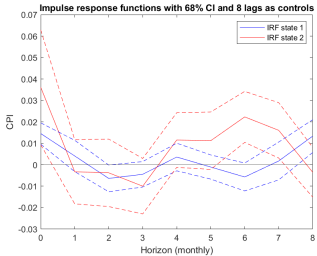


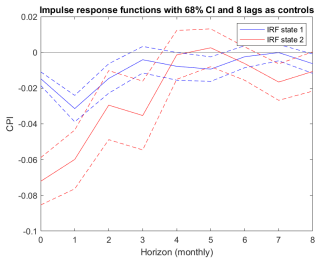
Differentiating between positive and negative shocks

$$
\begin{aligned}
y_{t+h} =& \hat{\mu}_{2S,h} + H_t(\beta^1_{LPIV,h,-}\hat{x}_{t,-} + \beta^1_{LPIV,h,+}\hat{x}_{t,+} + \sum_{l=1}^{n} \delta^T_{2S,l,1} W_{t-l}) \\
&+ (1 - H_t)(\beta^2_{LPIV,h,-}\hat{x}_{t,-} + \beta^2_{LPIV,h,+}\hat{x}_{t,+} + \sum_{l=1}^{n} \delta^T_{2S,l,2} W_{t-l}) + u_{t+h}
\end{aligned}
$$

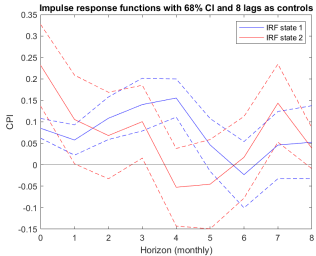
Asymmetric effects of positive vs. negative shocks

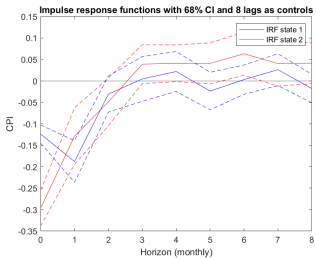
Crude PPI



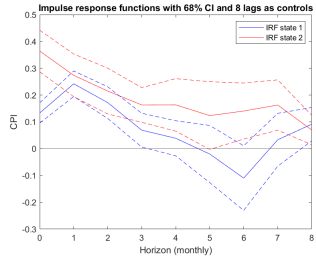


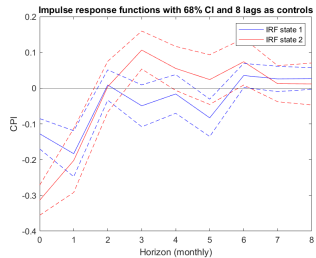
Intermediate PPI





Finished PPI



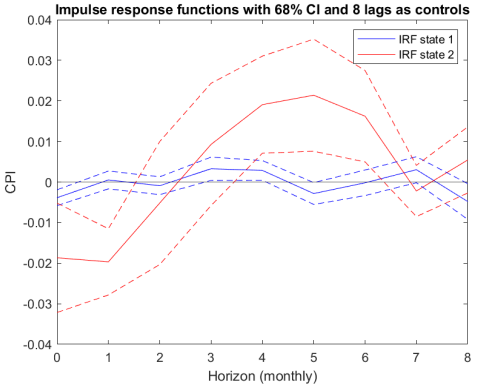


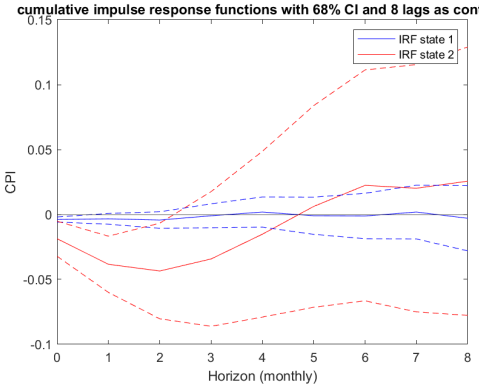
Estimating the effect of a monetary policy shock

$$y_{t+h} = \mu_h + H_t(\beta_h^1 shock_t + \sum_{l=1}^{n} \delta_{l,1}^T W_{t-l})$$
$$+(1 - H_t)(\beta_h^2 shock_t + \sum_{l=1}^{n} \delta_{l,2}^T W_{t-l}) + u_{t+h}$$

$shock_t$: Jarociński & Karadi (2020) monetary policy shock series (1990M1 - 2019M6)

Less effective monetary policy in high volatility regime





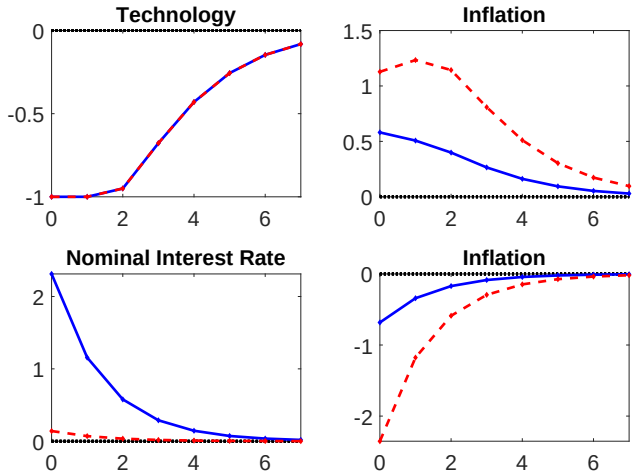
Pay attention to current and future inflation regimes

- Differing effects of producer price & monetary policy shocks on consumer prices depending on inflation volatility
- In this regime, monetary policy not more effective in steering inflation in medium term, rather adds to inflation volatility

$\rightarrow$ Large CPI swings need to be prevented to avoid transition to a regime of quickly & strongly passed-on cost shocks

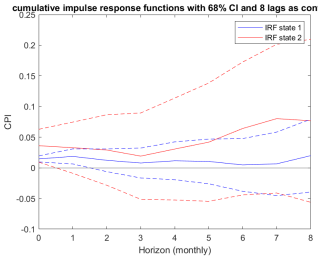
Appendix

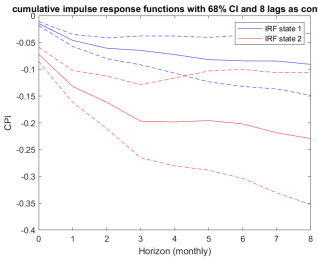
NK Model


Technology
0
-0.5
-1
0
2
4
6
Inflation
1.5
1
0.5
0
0
2
4
6
Nominal Interest Rate
2
1
0
0
2
4
6
Inflation
0
-1
-2
0
2
4
6

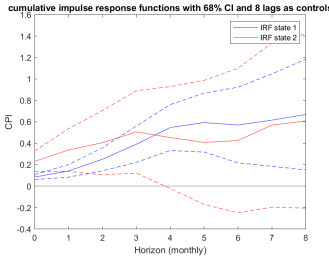
Cumulative IRFs of positive and negative shocks

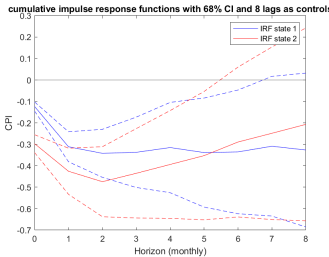
Crude PPI



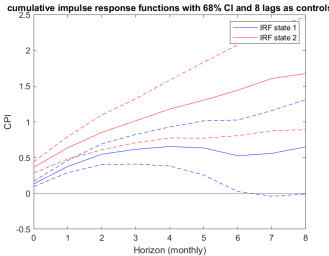


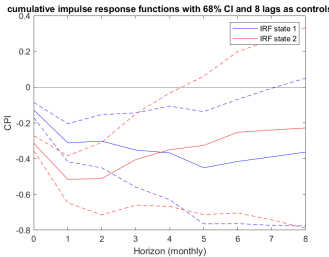
Intermediate PPI



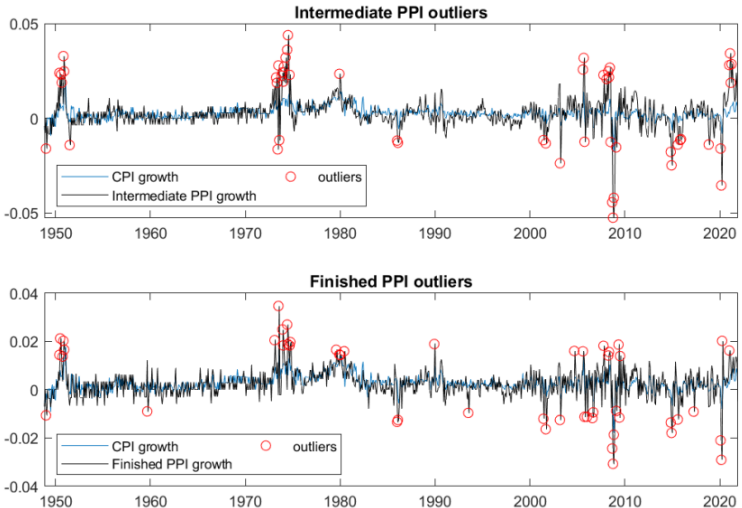


Finished PPI



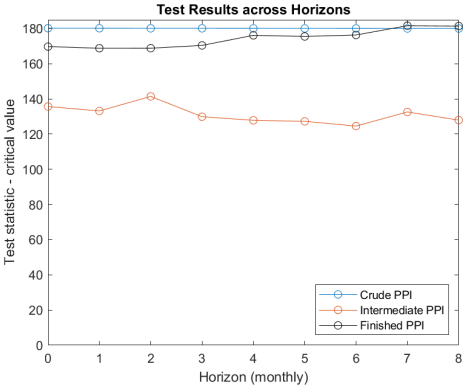


Outlier in Intermediate & Finished PPI

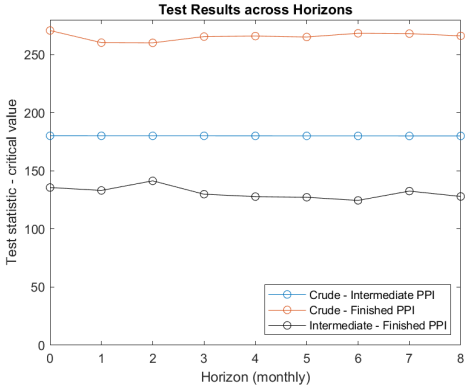


Weak instrument test (Lewis & Mertens, 2022)

Effect on CPI



Intermediate effect



PPI data details

SOP Code	Title	FD-ID Code	Title
SOP1000	Crude materials	ID62	Unprocessed goods for intermediate demand
SOP2000	Intermediate materials, supplies and components	ID61	Processed goods for intermediate demand
SOP3000	Finished goods	FD49207	Finished goods

Table: Variable description of Crude (SOP1000), Intermediate (SOP2000) and Finished (SOP3000) PPI. More information available here: https://www.bls.gov/ppi/fd-id/ppi-stage-of-processing-to-final-demand-intermediate-demand-aggregation-system-index-concordance-table.htm

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