Does the transmission monetary policy shocks change when inflation is high?

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Motivation

- Inflation was back in 2021-2023 and again 2026 after 40 years.
- Is the propagation of monetary policy shocks different in high inflation regime? Is monetary policy more or less powerful?
- Menu costs (Alvarez and Lippi, 2020): high inflation, more price changes. Monetary policy shocks have larger effects on inflation and smaller effects on real activity.
- Rational Inattention (Sims, 2010): higher inflation, more attention to inflation news. Larger effects on inflation expectations, less real effects of monetary policy shocks.
- Slanted-L (Benigno and Eggertsson, 2023): higher inflation state associated with higher production costs (higher vu ratio). Monetary policy shocks have larger effects on inflation and smaller effects on real activity.

Methodology and purpose of the paper

- Use a non-linear BVAR model to study state-dependent effects.
- Identify conventional monetary policy and liquidity shocks.
- Use US data from 1960 to 2023.
- **Compare the transmission of policy shocks in a high and low inflation regimes**.
- **Draw implications for existing theories of inflation/output trade-off**.

Results

- Conventional shocks produce a weaker peak effect but more persistent dynamics in the high inflation regime.
- Conventional shocks perceived as providing new information in the **low** inflation regime.
- Liquidity shocks more expansionary in the short term in the high inflation regime.
- Liquidity shocks perceived as providing new information in the **high** inflation regime.
- Evidence inconsistent with popular theories.

Relationship with the literature

- TBVAR: Alessandri and Mumtaz (2019), , De Santis et al. (2023), Castelnuovo et al. (2024), Rossi et al. (2024), Degasperi et al (2024), **Gargiulo et al. (2024)**.
- Nonlinear models. TVC-VAR: Canova and Gambetti (2009), Primiceri (2005); Markov switching: Sims and Zha, (2009); smooth transition VAR Ascari and Haber, (2021), TVC-IV Inoue et al (2024).
- Nonlinear effects: Ravn and Sola (1996), Weise (1999), Tenreyro and Thwaites (2016), Pellegrino (2021), Ascari and Haber (2021), DeBortoli et al. (2023), Benigno and Eggertsson (2023), Merikull and Rottner (2024).
- Signaling effects of monetary policy: Melosi (2017), Jarocinski (2020), Miranda Agrippino and Ricco (2021), Fisher et al. (2024).

US inflation

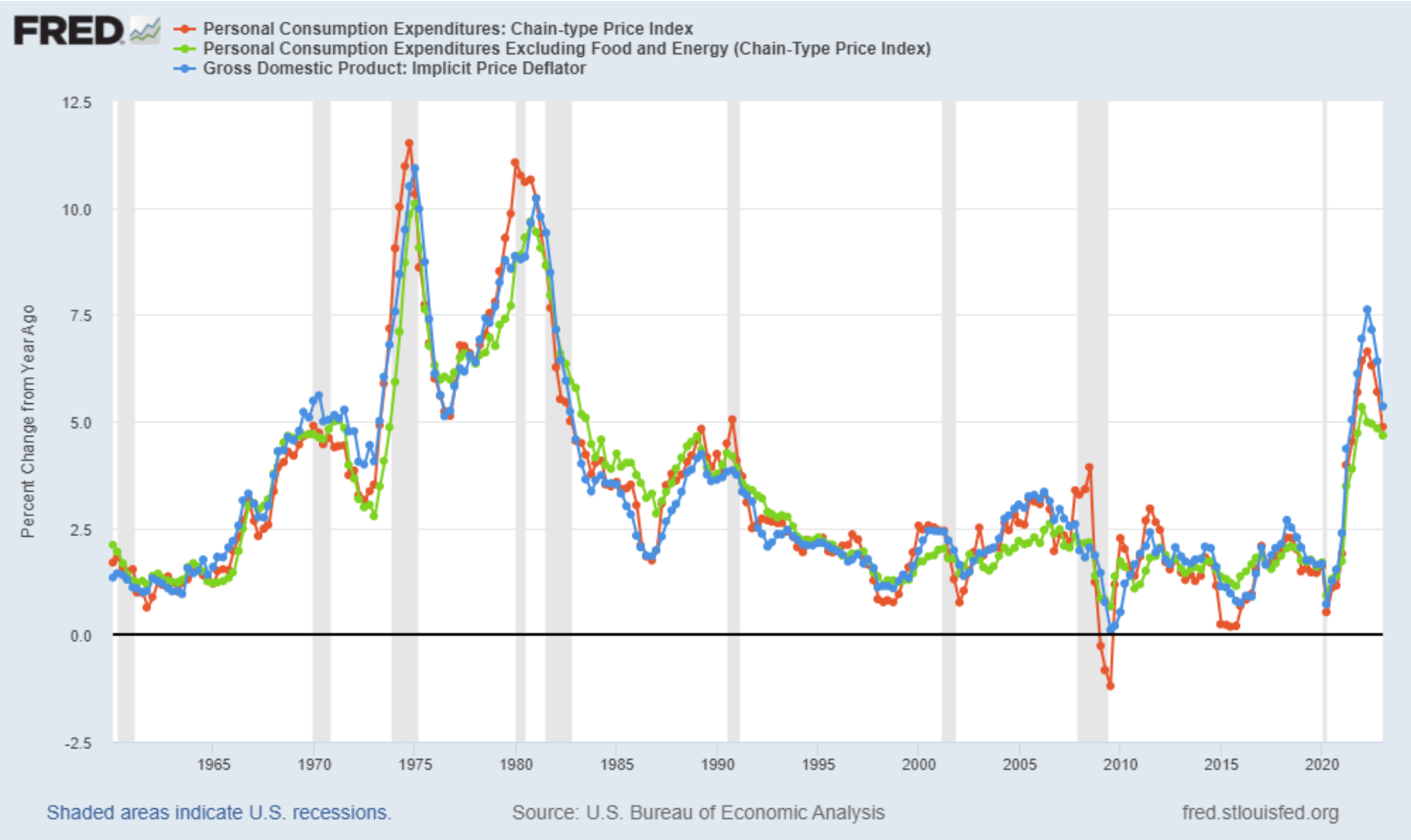
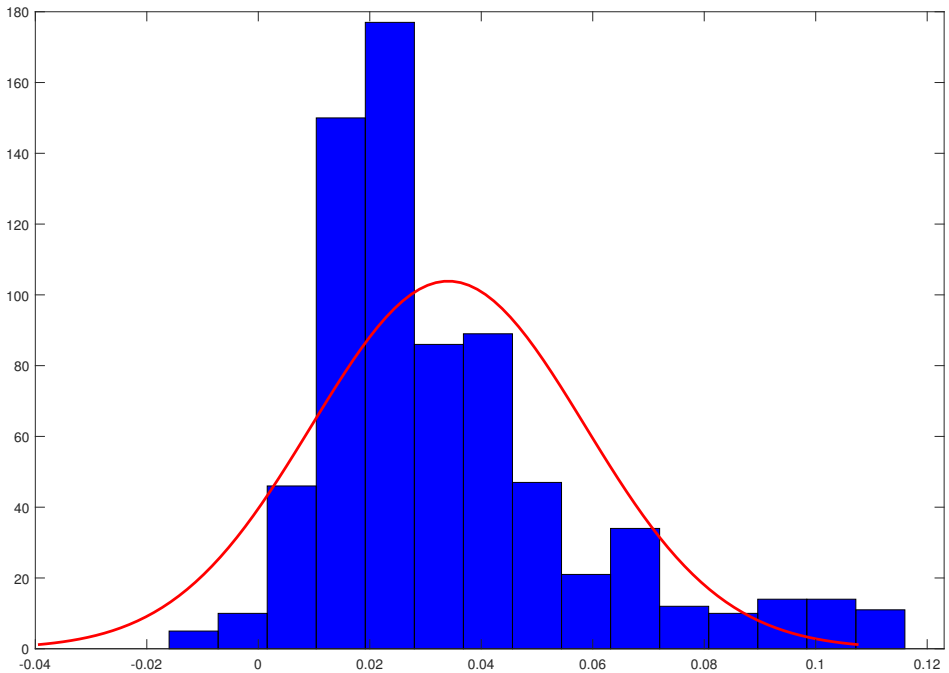


Figure: US Inflation (FRED Database): 1960-2023

US inflation distribution is non-normal

Figure: PCE Inflation: 1960-2023



Inflation Distribution

Mean and Median

0.0341 0.0263

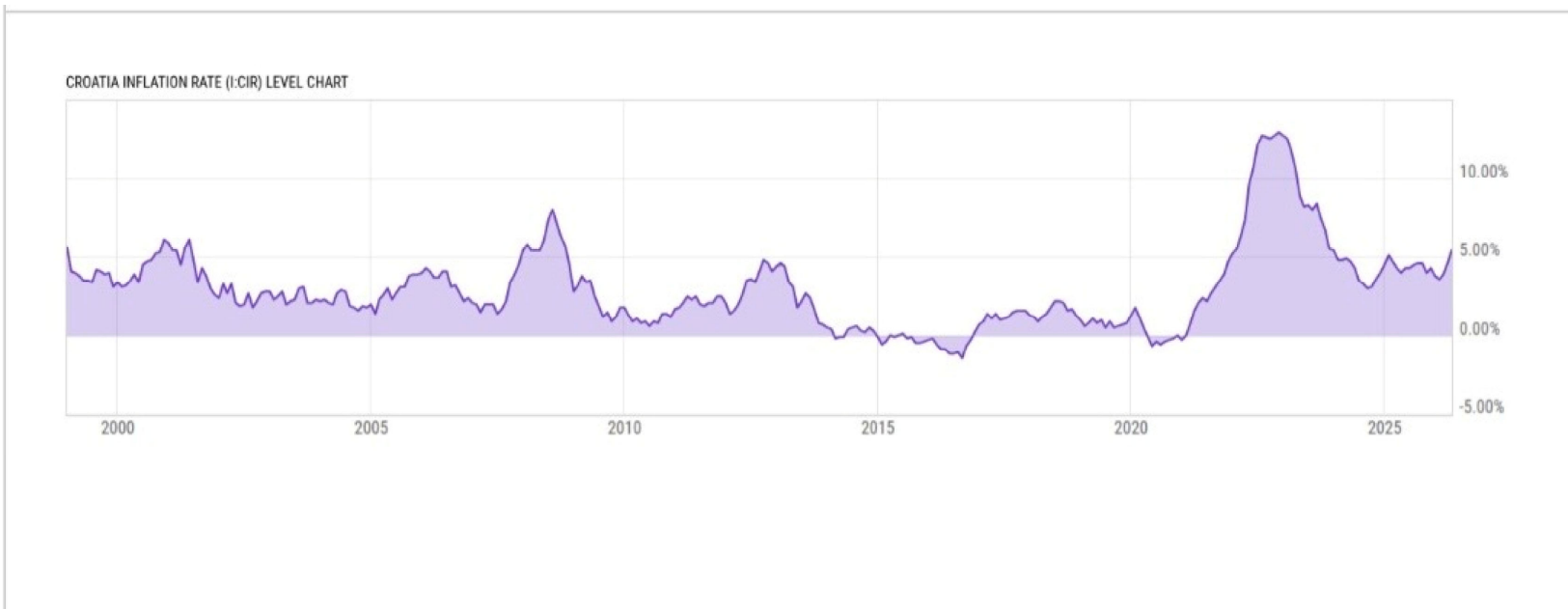
Skewness and Kurtosis

1.3395 4.6256

Inter-Quartile Range

0.0176 0.0438

Croatia inflation



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The Threshold-BVAR Model I

$$Z_t = \left(c_1 + \sum_{j=1}^{P} \beta_1 Z_{t-j} + \sum_{j=0}^{J} \gamma_1 ln\lambda_{t-j} + \Omega_{1t}^{1/2} e_t \right) \tilde{S}_t + \left(c_2 + \sum_{j=1}^{P} \beta_2 Z_{t-j} + \sum_{j=0}^{J} \gamma_2 ln\lambda_{t-j} + \Omega_{2t}^{1/2} e_t \right) \left(1 - \tilde{S}_t \right) \tag{1}$$

- $Z_t = (Y_t, P_t, U_t, R_t, YieldSlope_t, M_t, Pcom_t, SP500_t)'$.
- The regime indicator $\tilde{S}_t$ defined by

$$\tilde{S}_t = 1 \iff P_{t-d} \leq P^* \tag{2}$$

the delay d and the threshold level P^* are unknown parameters.

The Threshold-BVAR Model II

- The covariance matrix of e_t is:

$$\Omega_{it} = A_i^{-1} H_t (A_i^{-1})', \quad i = 1, 2 \tag{3}$$

where A_i are matrices such that

$$vec\,(A_i) = S_A \alpha_i + s_A$$

where S_A and s_A are matrices with 0's and 1's, see Canova and Perez Forero, 2015.

- The volatility H_t is defined by:

$$H_t = \lambda_t \Sigma \tag{4}$$

$$\Sigma = diag\left(\sigma_1^2, \ldots, \sigma_8^2\right) \tag{5}$$

$$ln\lambda_t = \mu + F\left(ln\lambda_{t-1} - \mu\right) + \eta_t \tag{6}$$

where η_t is an i.i.d. process with variance Q.

- λ_t is an unobservable scalar, see Carriero et al. (2016). Specification similar to a GARCH-M.

The Threshold-BVAR Model III

Variable	Conventional MP shock	Liquidity shock
Econ. Activity	0	0
PCE Inflation	≤ 0	0
Unemployment	0	0
Interest Rate	> 0	0 (24 periods)
Yield Curve Slope		≤ 0
Money Growth	< 0	> 0
Commodity Prices		
SP 500		

Table: Contemporaneous identification restrictions

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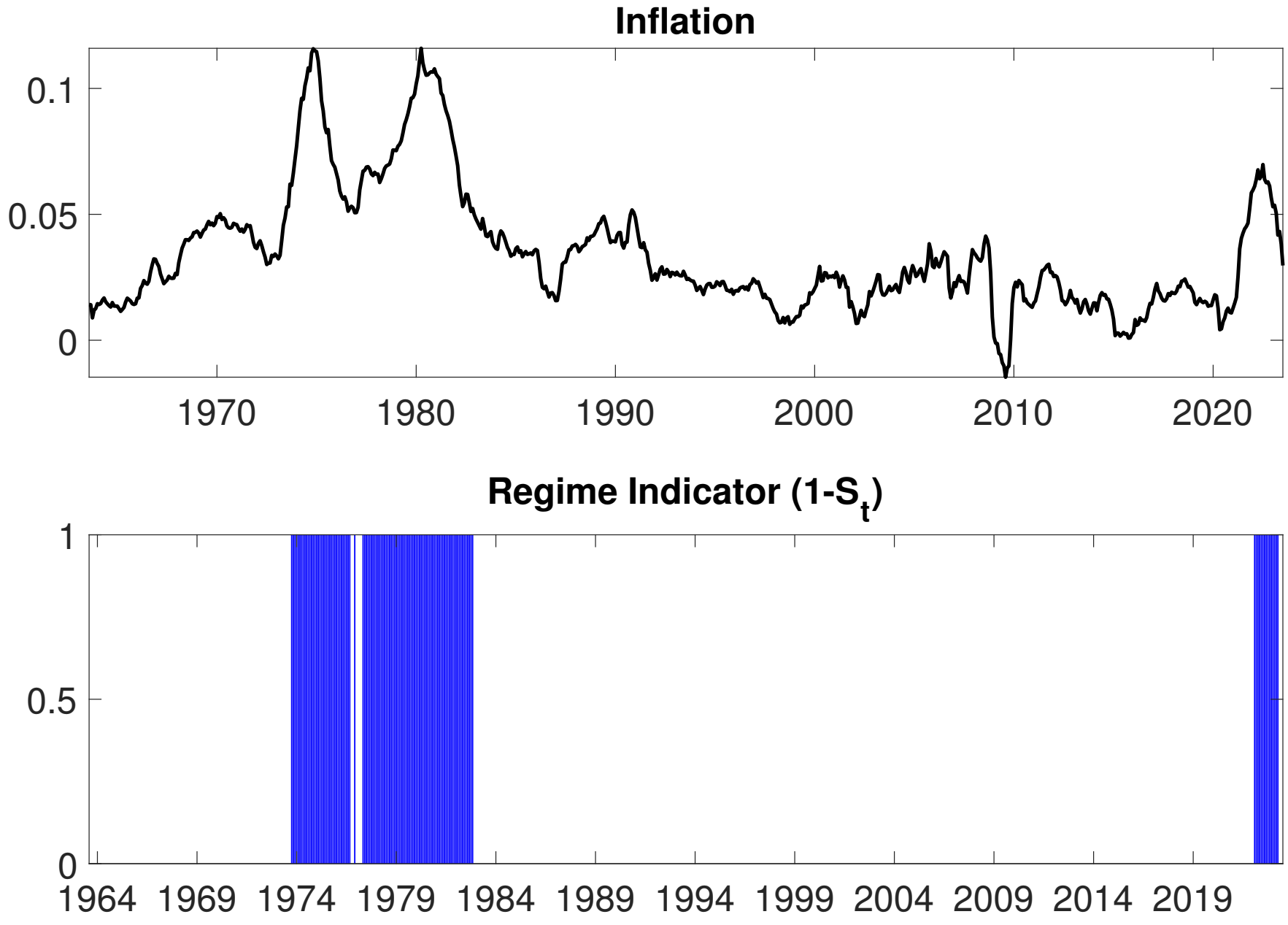
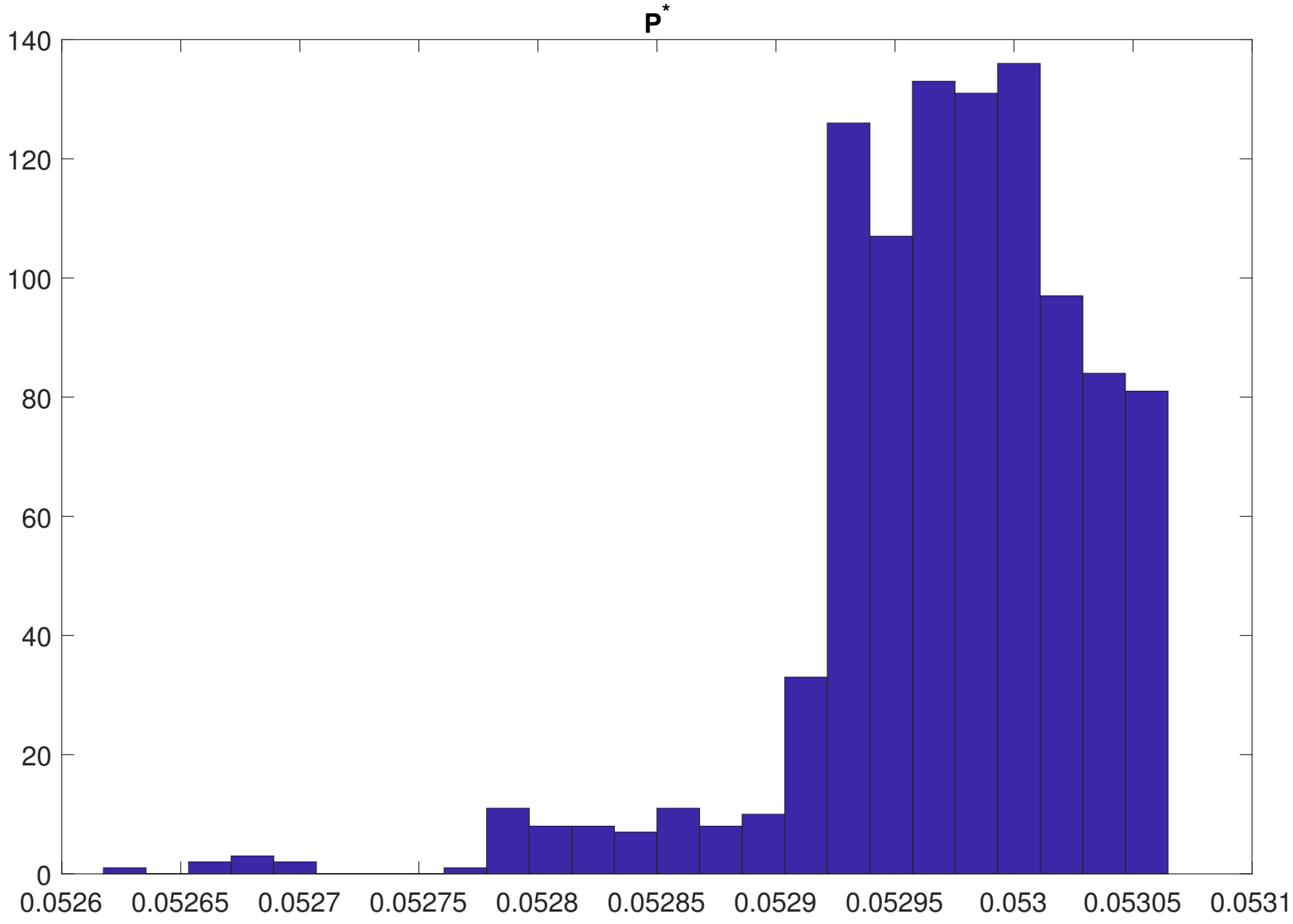
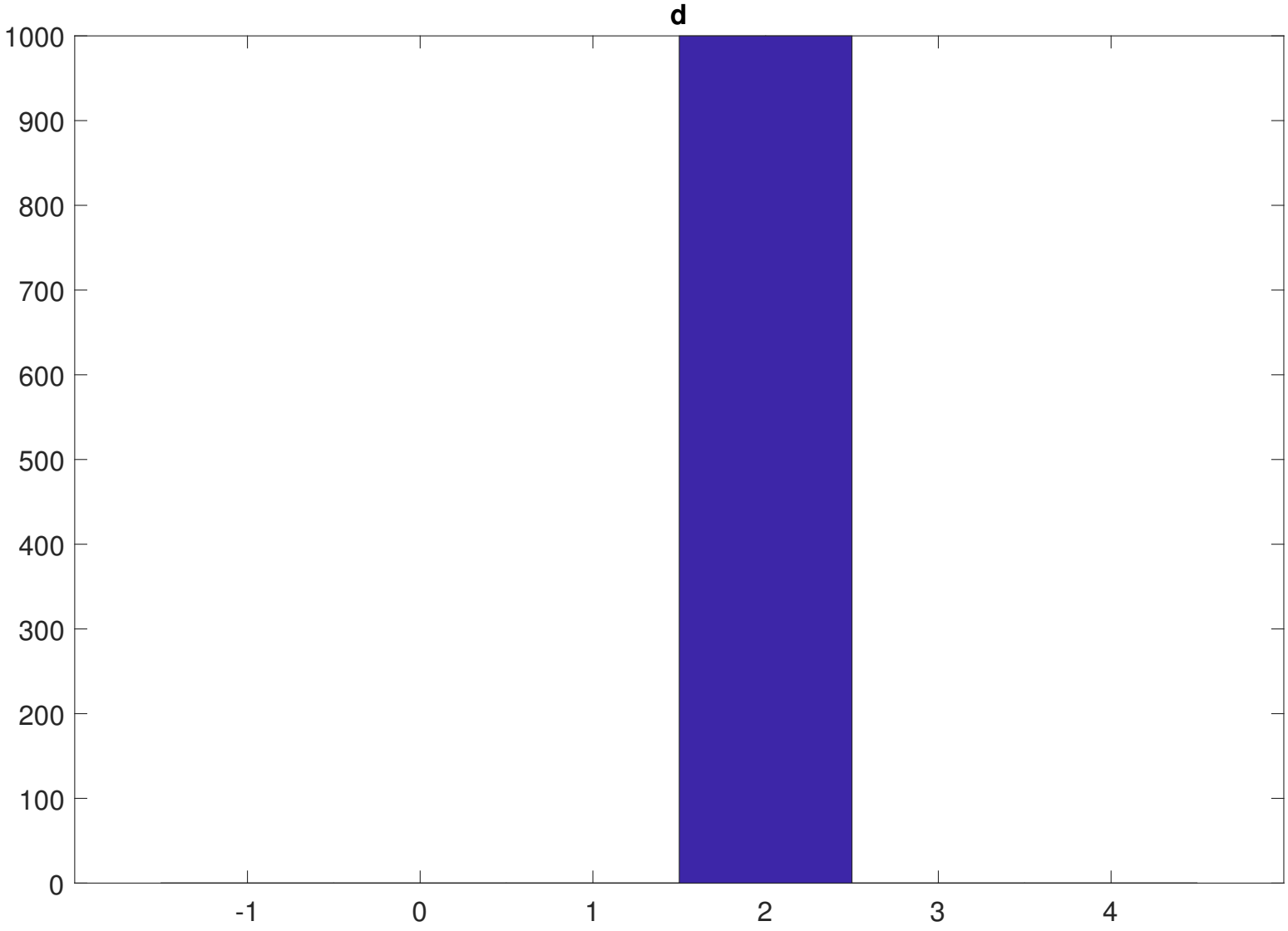
US inflation and the regime indicator



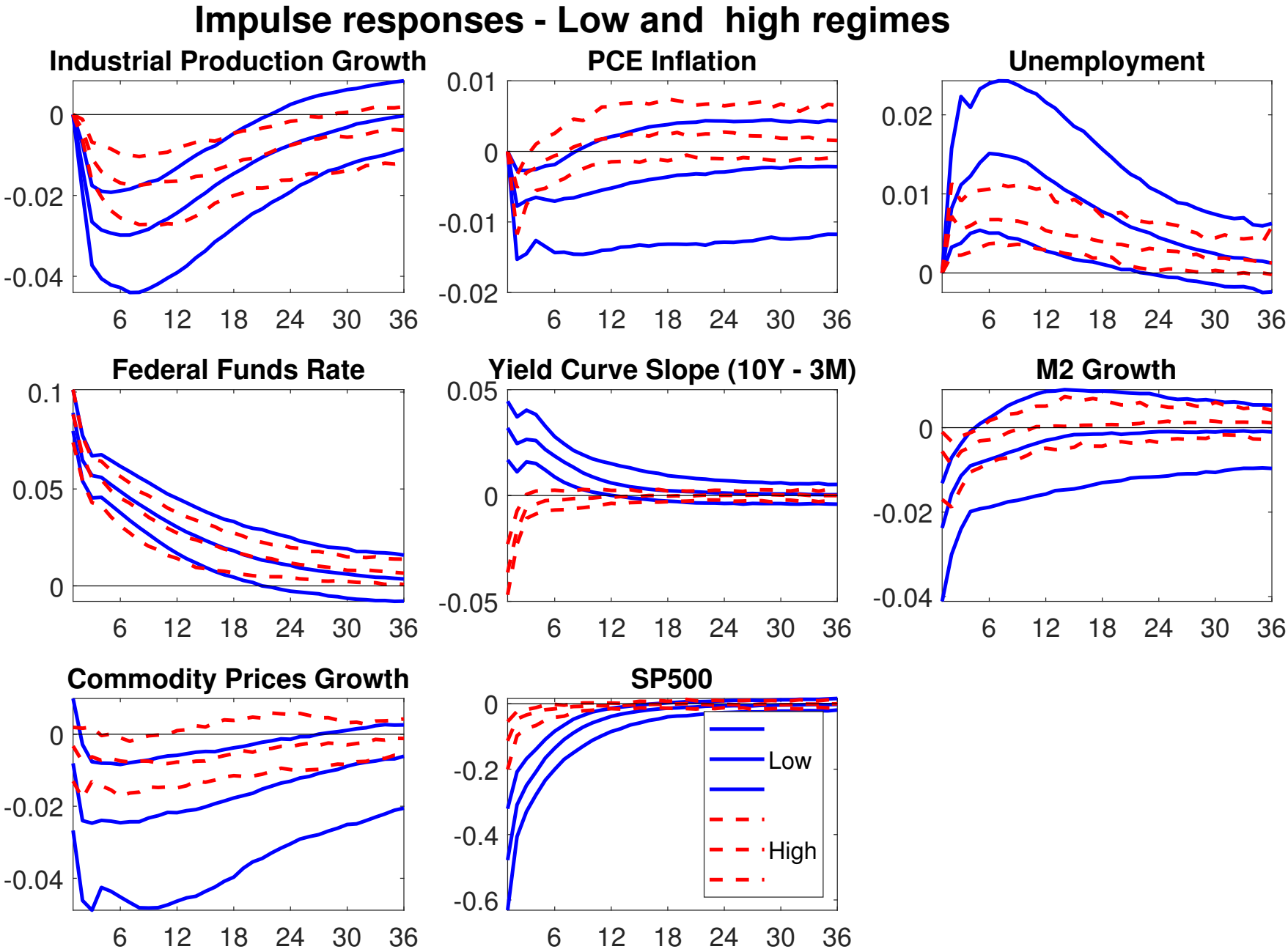
The posterior of the threshold parameter



The posterior of the delay parameter



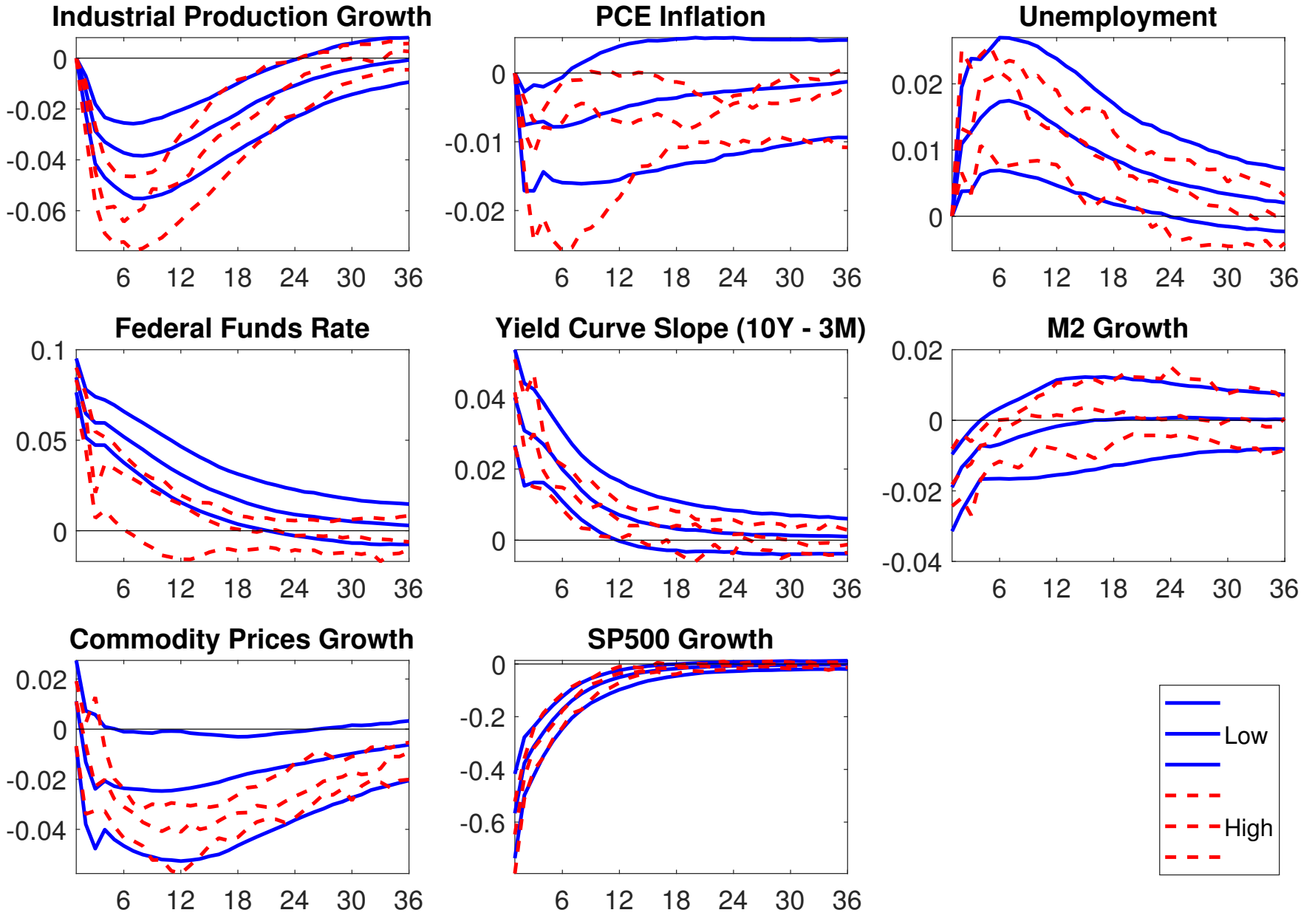
Dynamic responses: conventional shocks



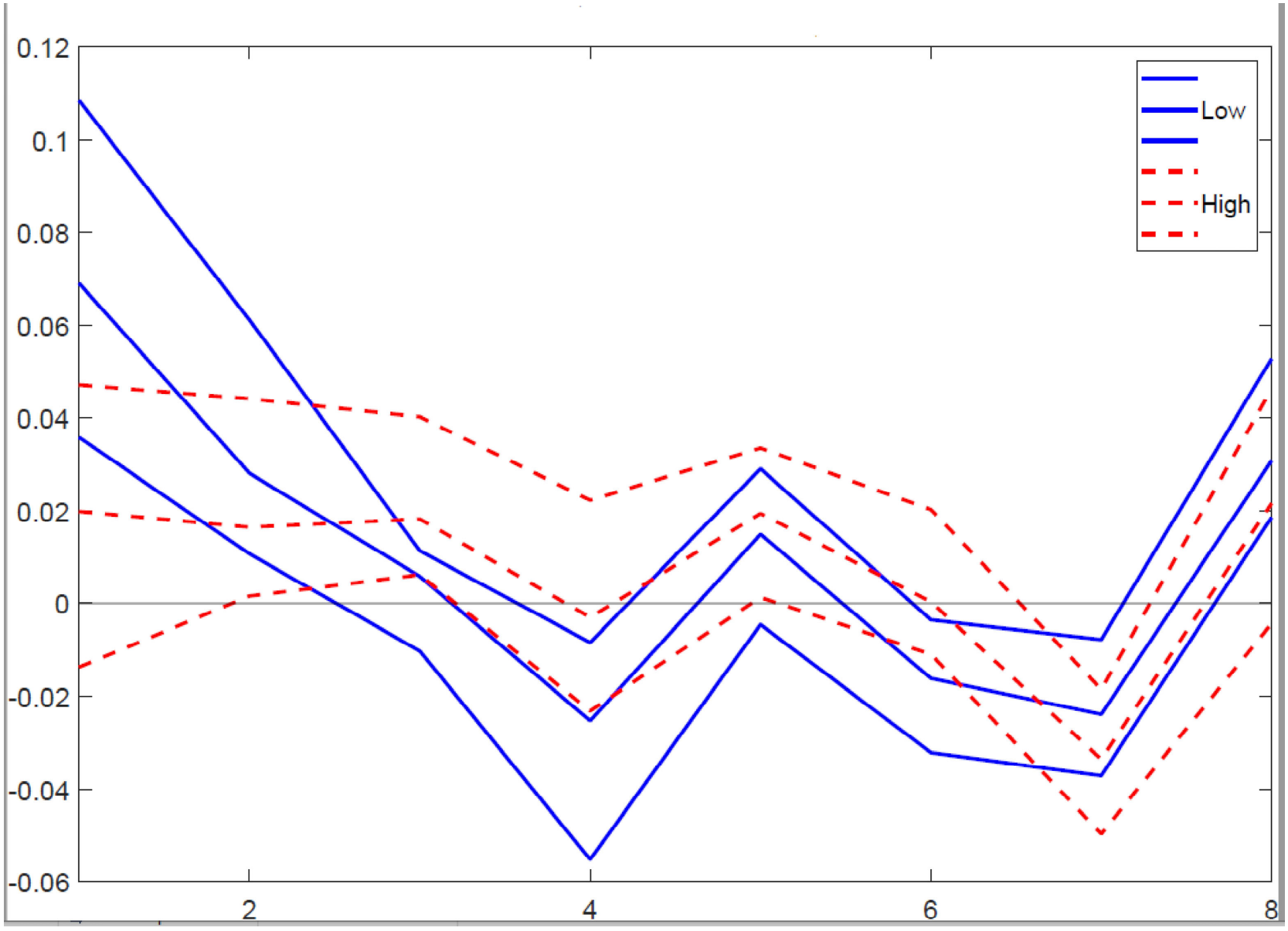
Interpretation

- Yield slope inversion in the low regime: signaling effect?
- Run a counterfactual: fix the response of the slope in low regime to be the same as in the high regime. Check the responses of production growth, unemployment and inflation. Are they similar?
- Do inflation expectations react more to conventional shocks in the low regime?

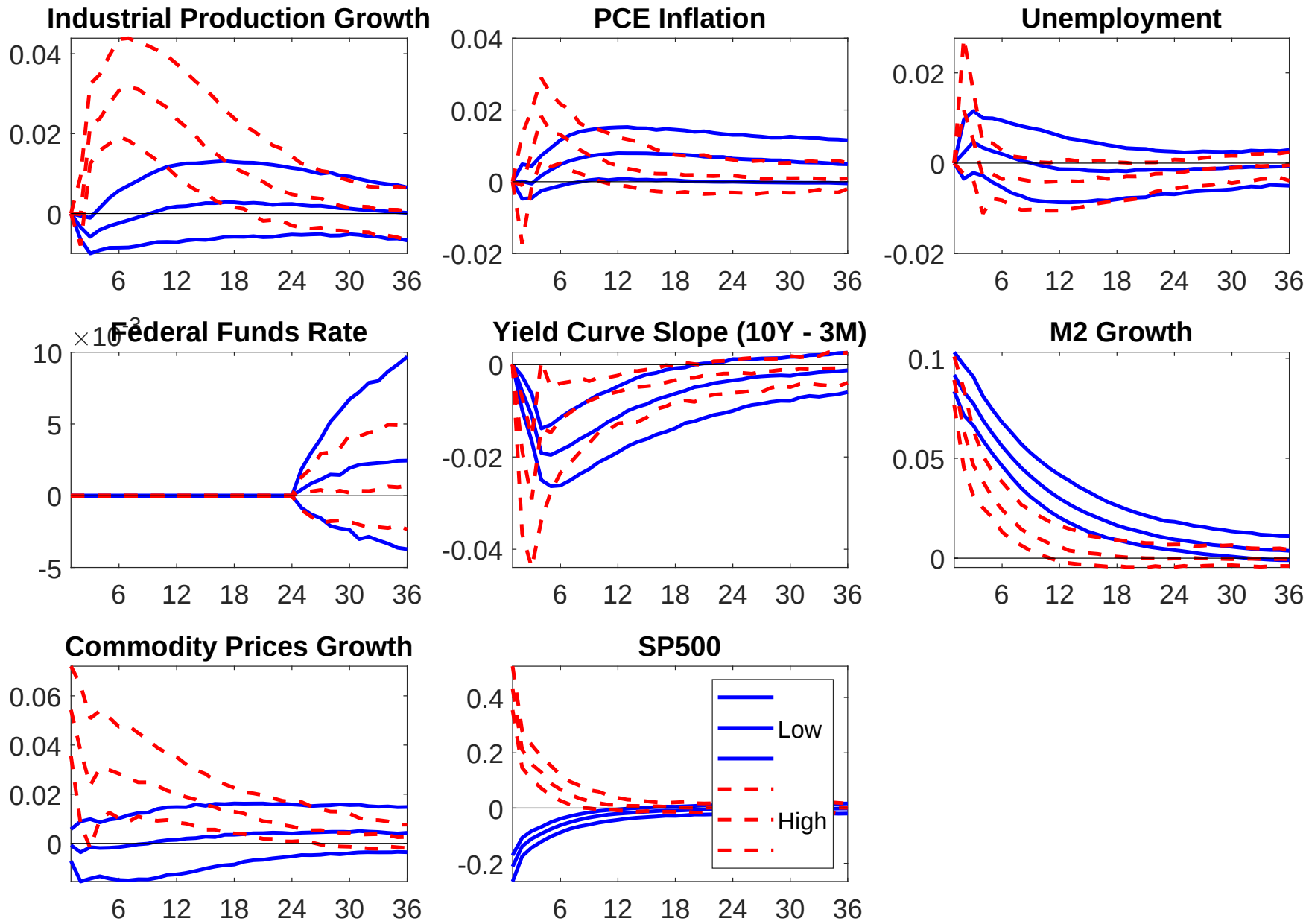
Counterfactual dynamic responses: conventional shocks



Inflation expectations dynamics: conventional shocks



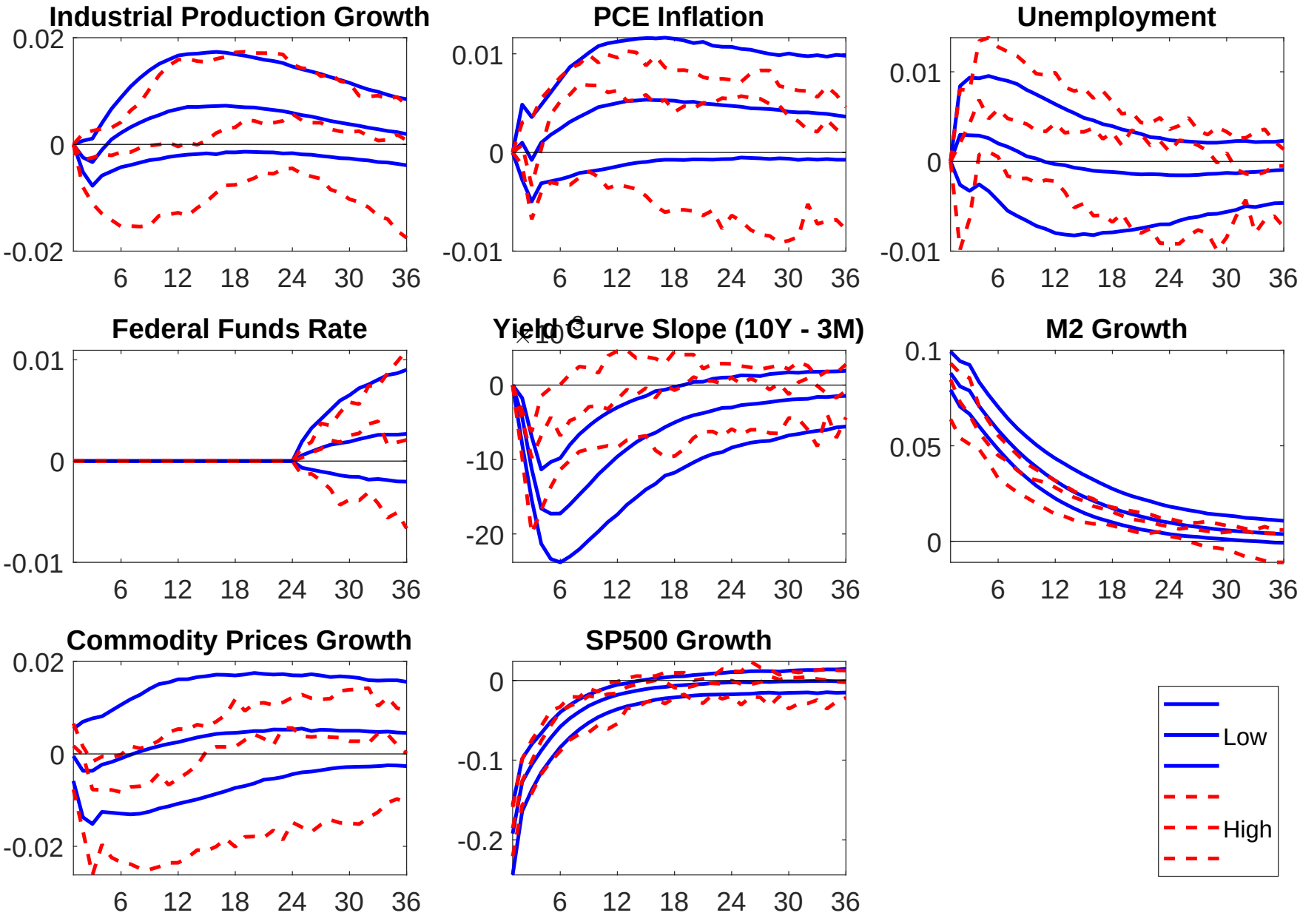
Dynamic responses: liquidity shocks



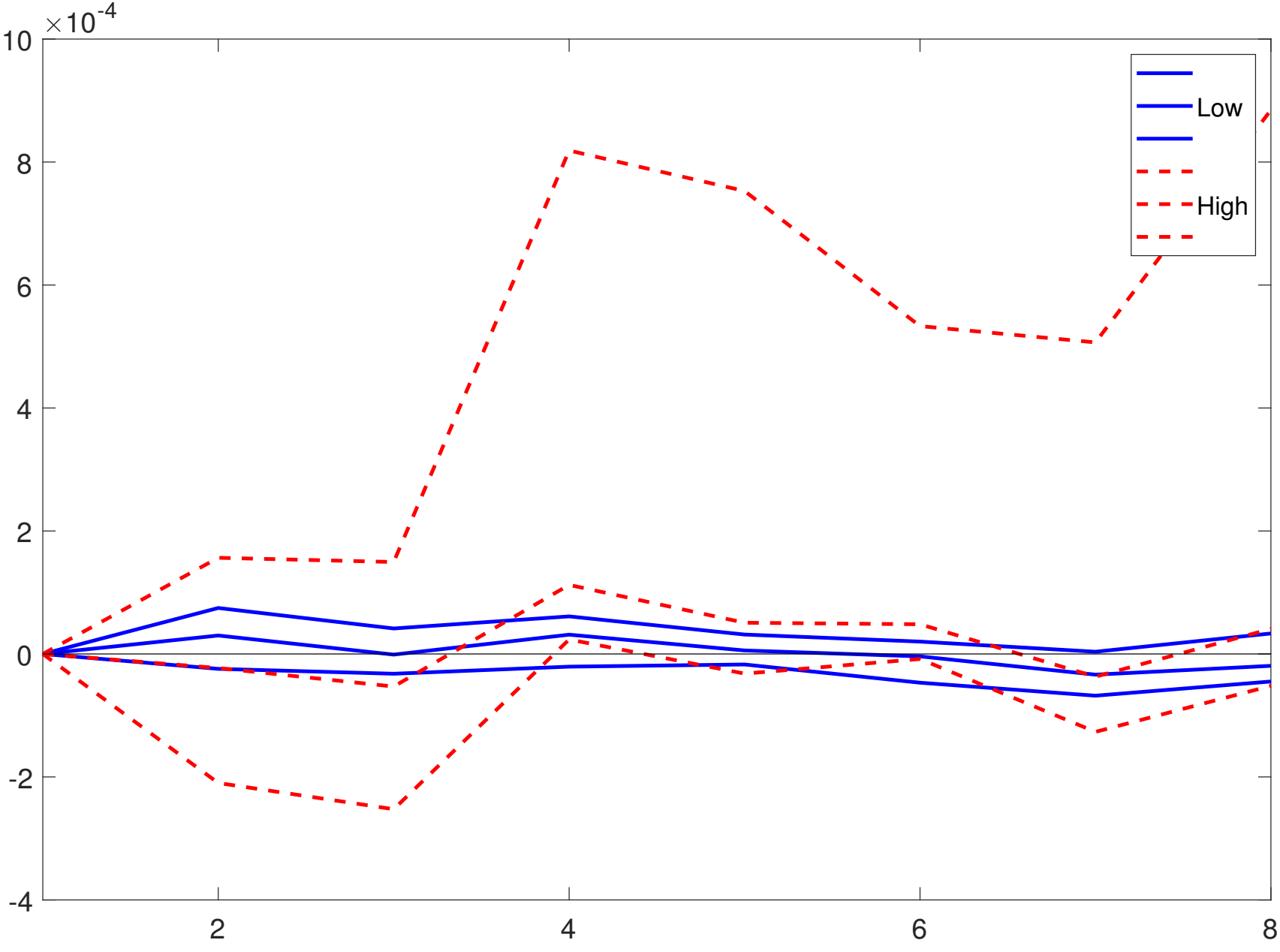
Interpretation

- SP500 inversion in high regime: signaling effect?
- Run a counterfactual: fix the response of SP500 in the high regime to be the same as in the low regime. Check the responses of production growth, unemployment and inflation. Are they similar?
- Net entry: do they respond more in high inflation regime?

Counterfactual dynamics responses: liquidity shocks

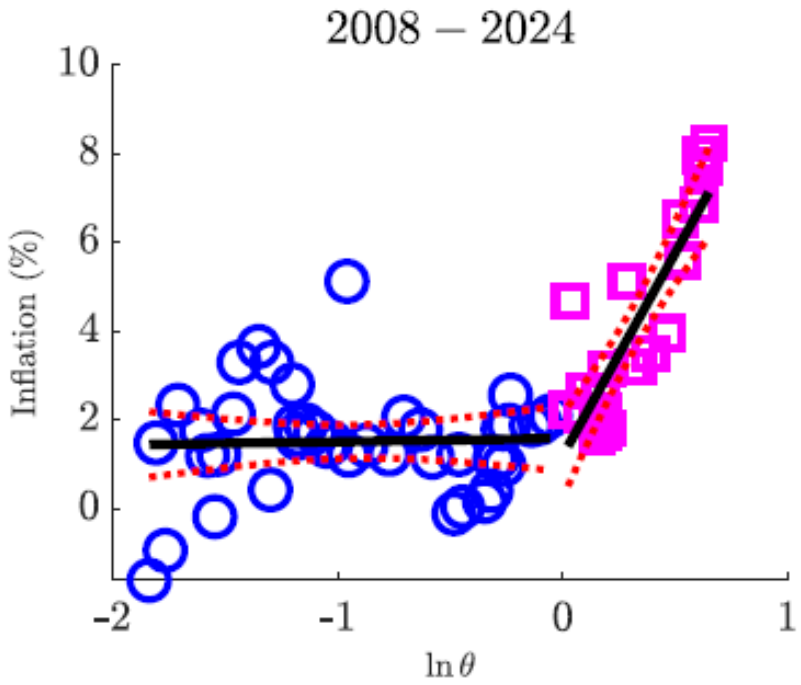


Dynamics of new entries: liquidity shocks

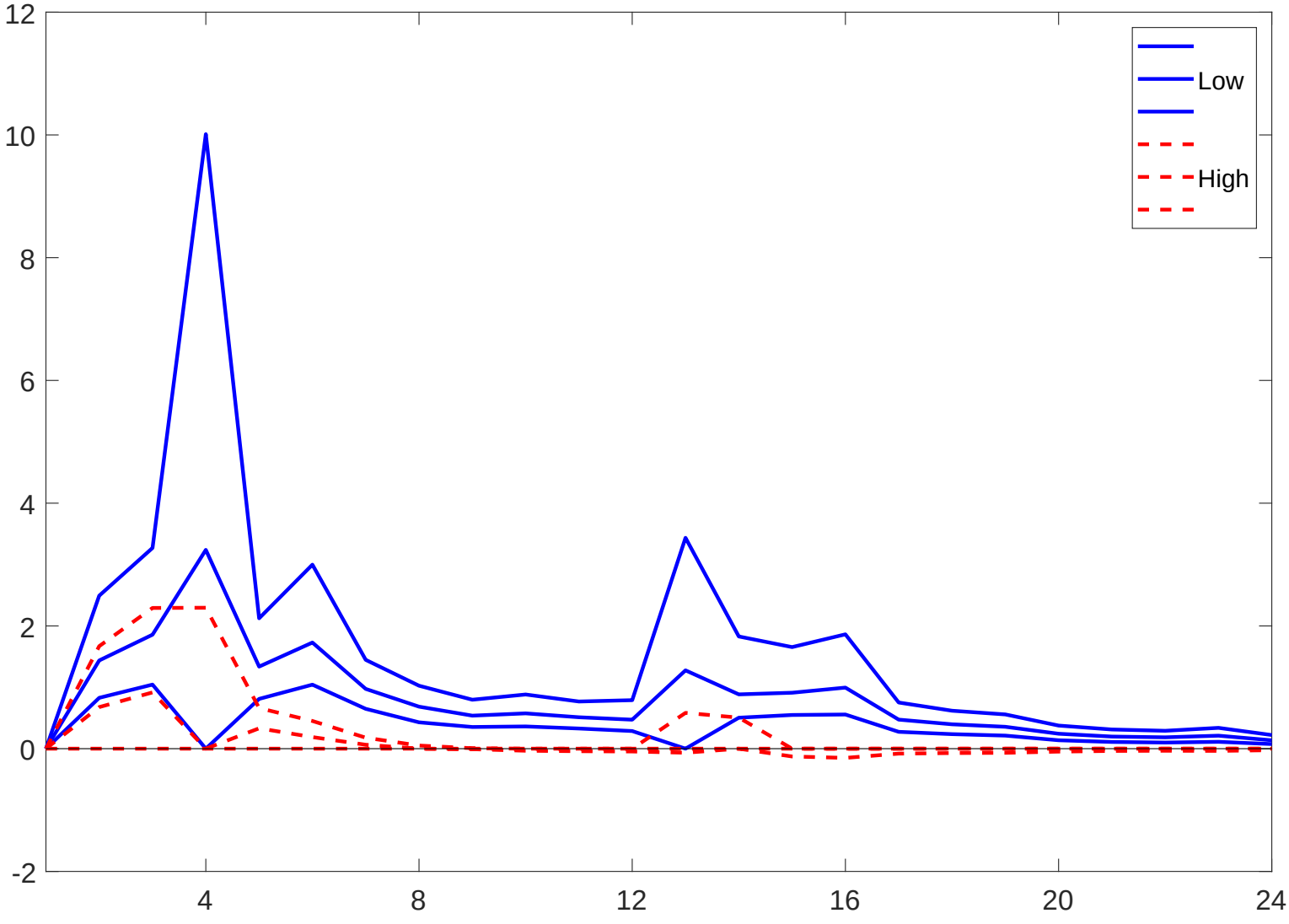


Evaluating PC slope theories

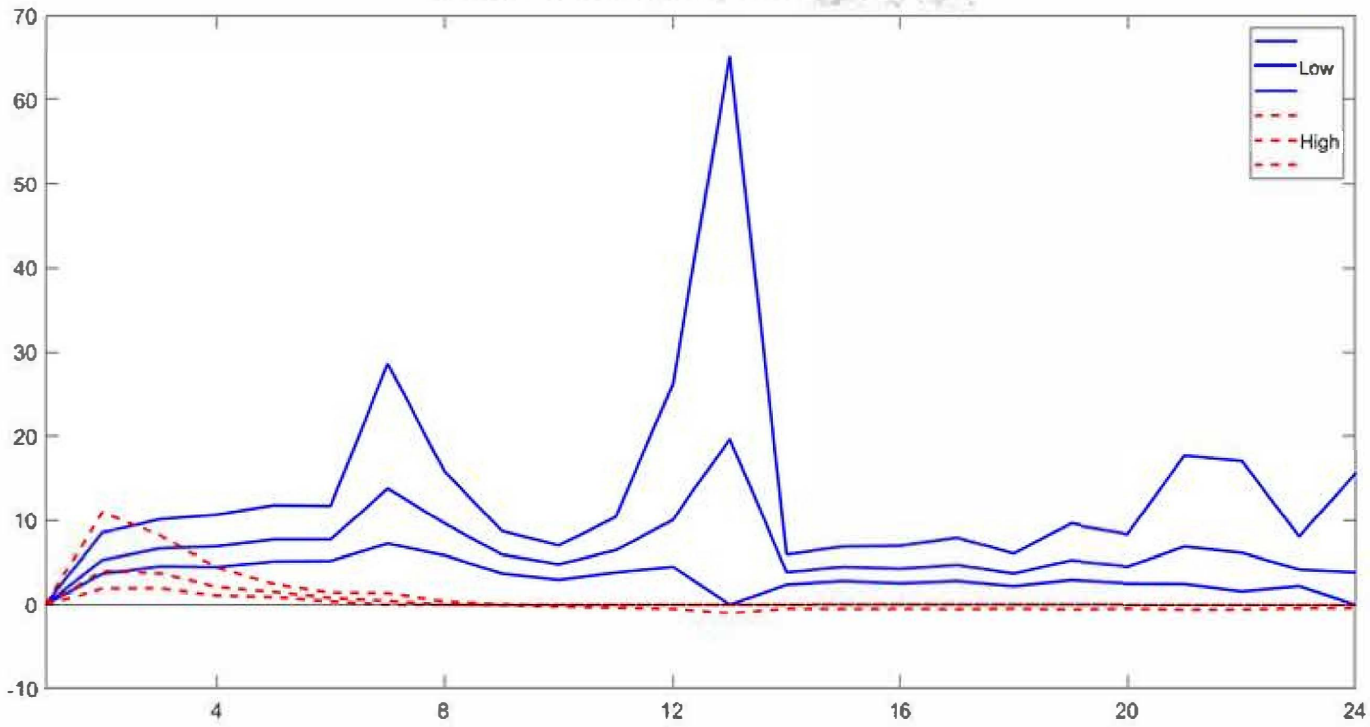
- Menu costs: PC slope steeper in high inflation regime.
- Rational inattention: inflation expectations more reactive to shocks in high inflation regime.
- Slanted-L: PC slope steeper if vu ratio (θ) is high.



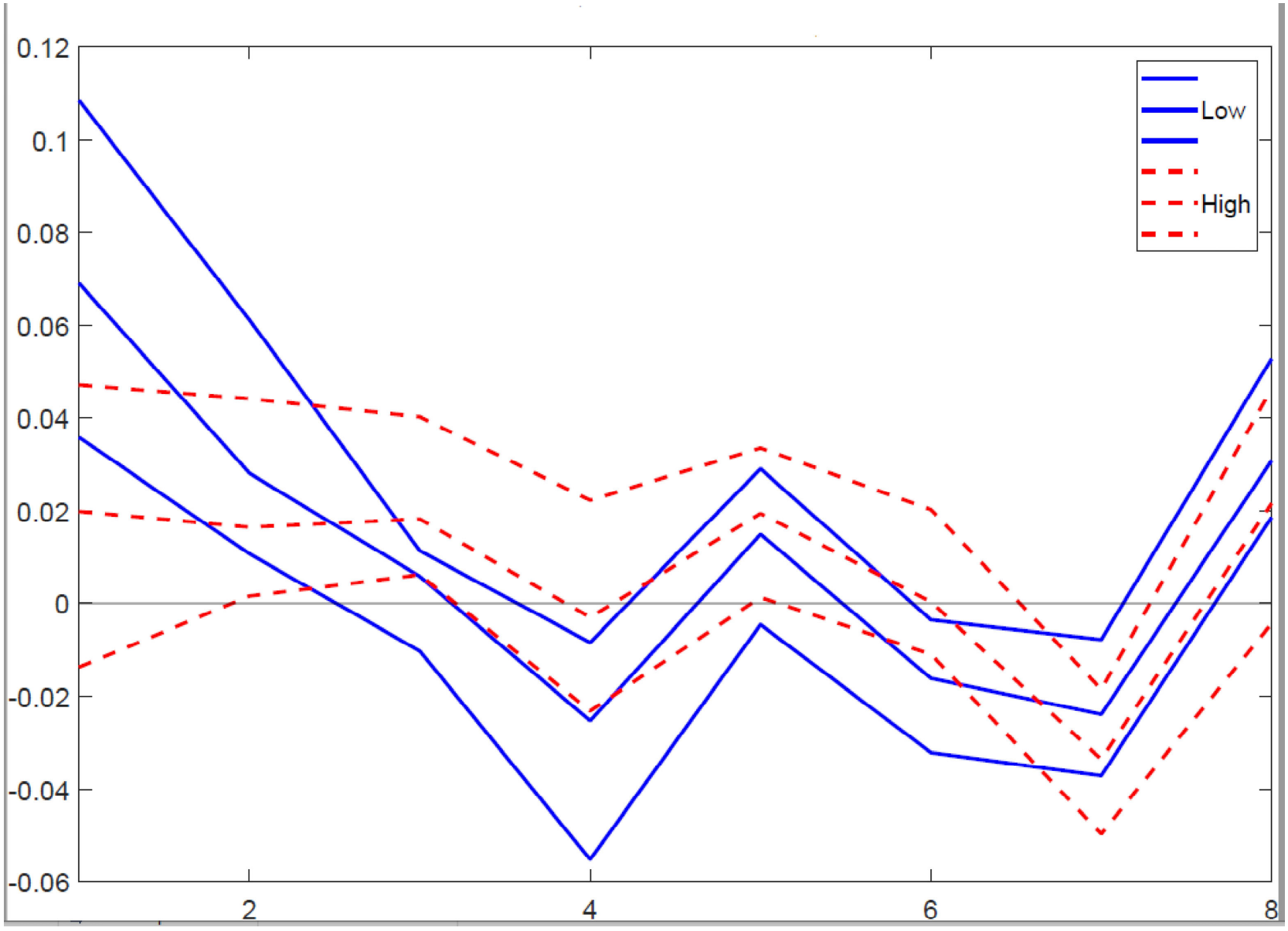
PC slope responses (labor share): conventional shocks



PC slope responses (vu ratio): conventional shocks



Inflation expectations responses: conventional shocks



Robustness

- Eliminating λ_t from the regressors: threshold and delay unchanged. IRFS insignificantly different across states.
- Sample 1984-2019. Threshold 3.3%. IRFs insignificantly different across states.
- Drop food and energy from PCE. IRFs patterns the same. Differences across states are smaller.
- Use WTI oil prices in place of commodity prices. IRFs pattern the same. Differences across states less significant.
- Four states model. Thresholds: 1.5, 3.3, 5.3 %. IRFs for top-bottom groups unchanged.
- Liquidity shocks with no constraints: short term rate responds positively and significantly immediately.

Conclusions

- Conventional monetary policy less powerful but have longer lasting effects in the high inflation regime.
- Bond markets perceive the shock differently.
- Liquidity shocks are more expansionary in the short term in the high inflation regime.
- Stock market perceive the shock differently.
- Evidence at odds with standard models of inflation. Consistent with asymetric informational effects.

The data

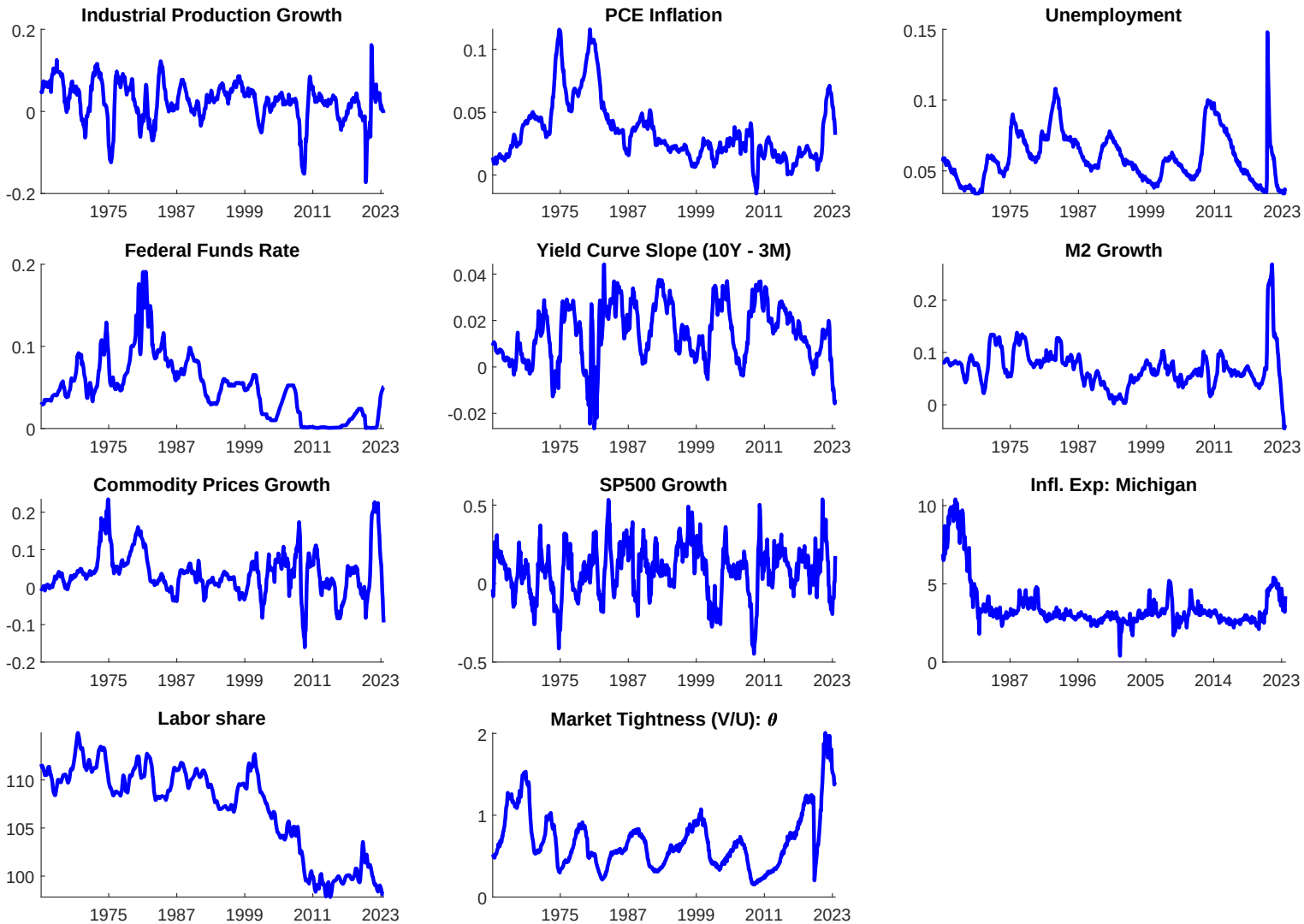
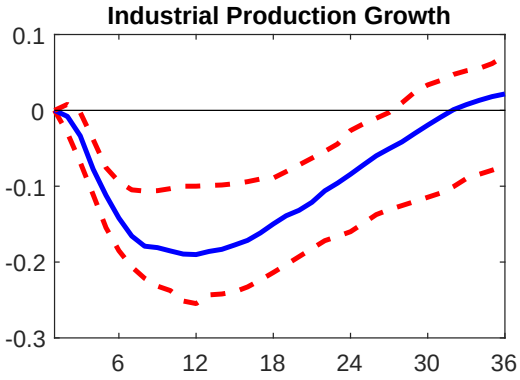
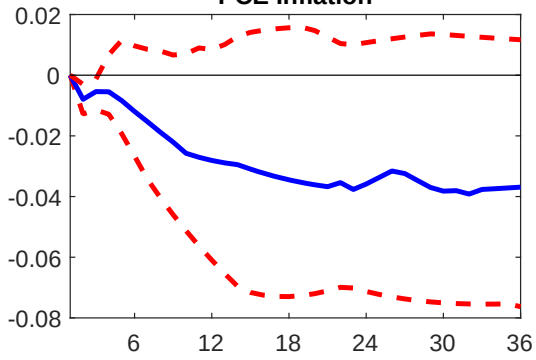
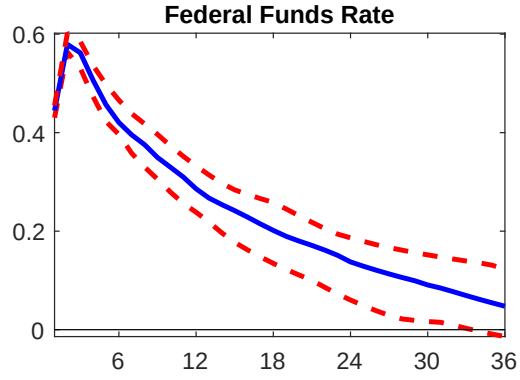


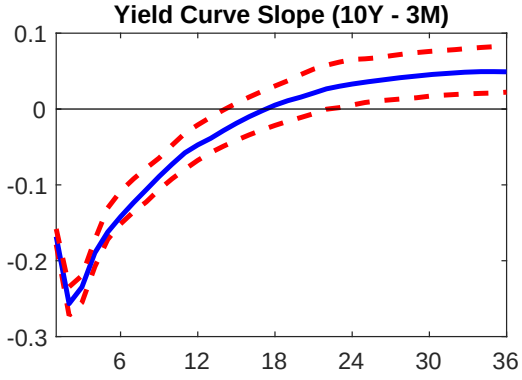
Figure: The US Data (FRED Database): 1960-2023

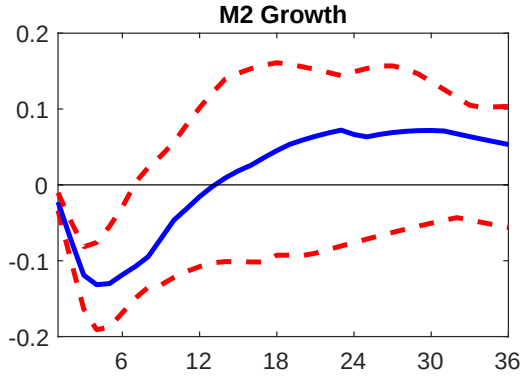
Linear model: contractionary conventional MP shocks

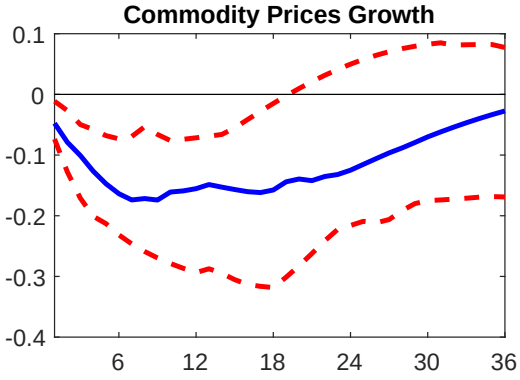


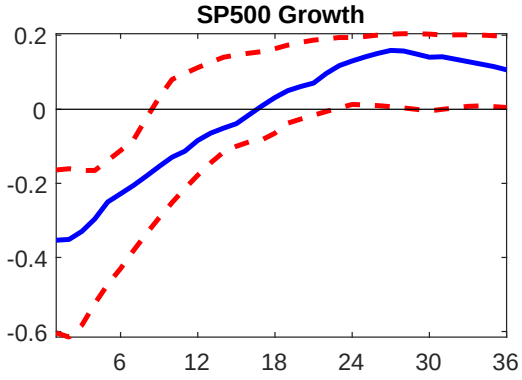




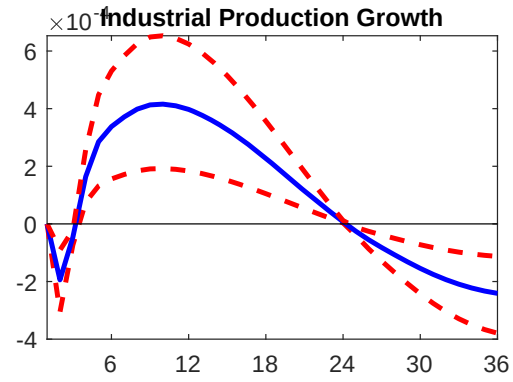


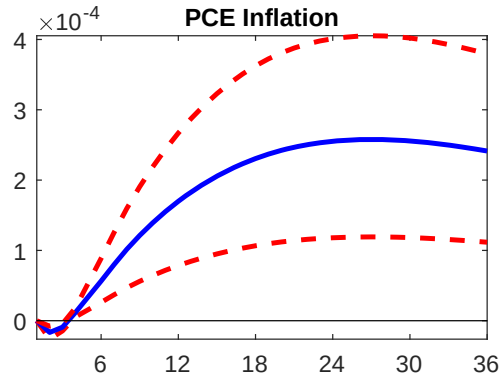


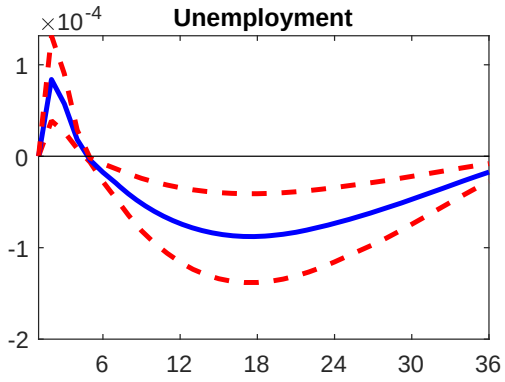


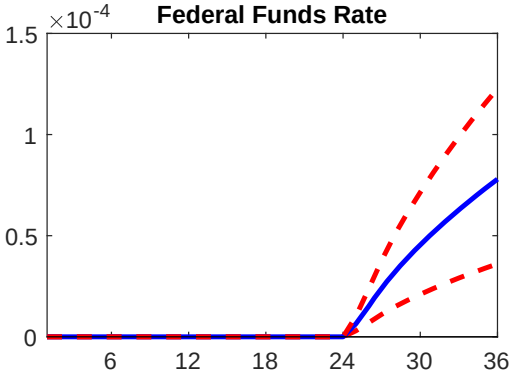


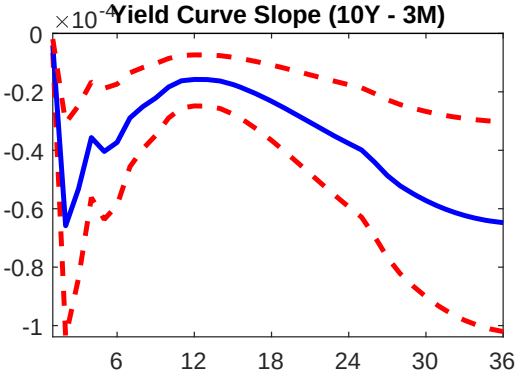
Linear model : expansionary liquidity shocks

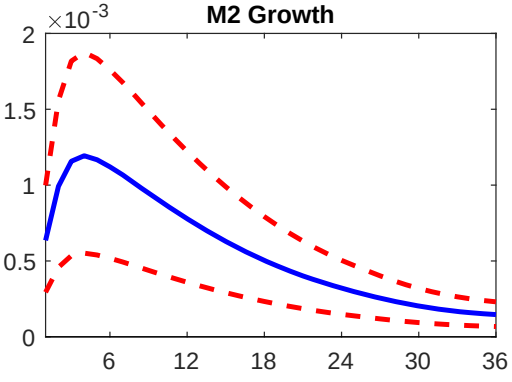


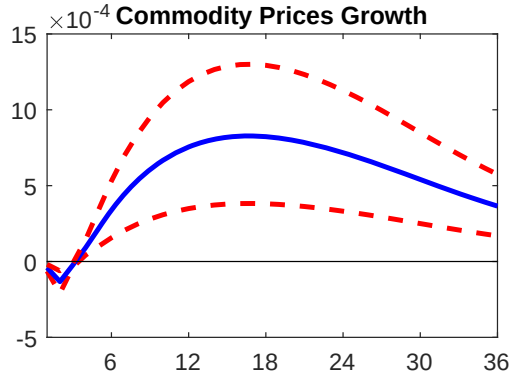


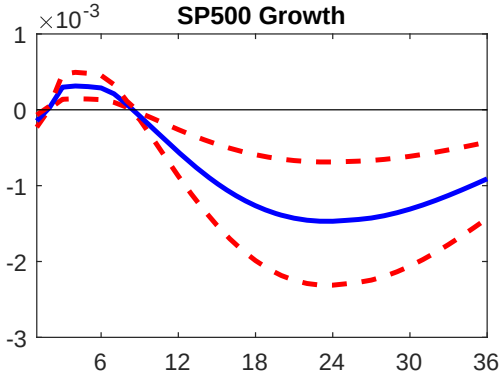




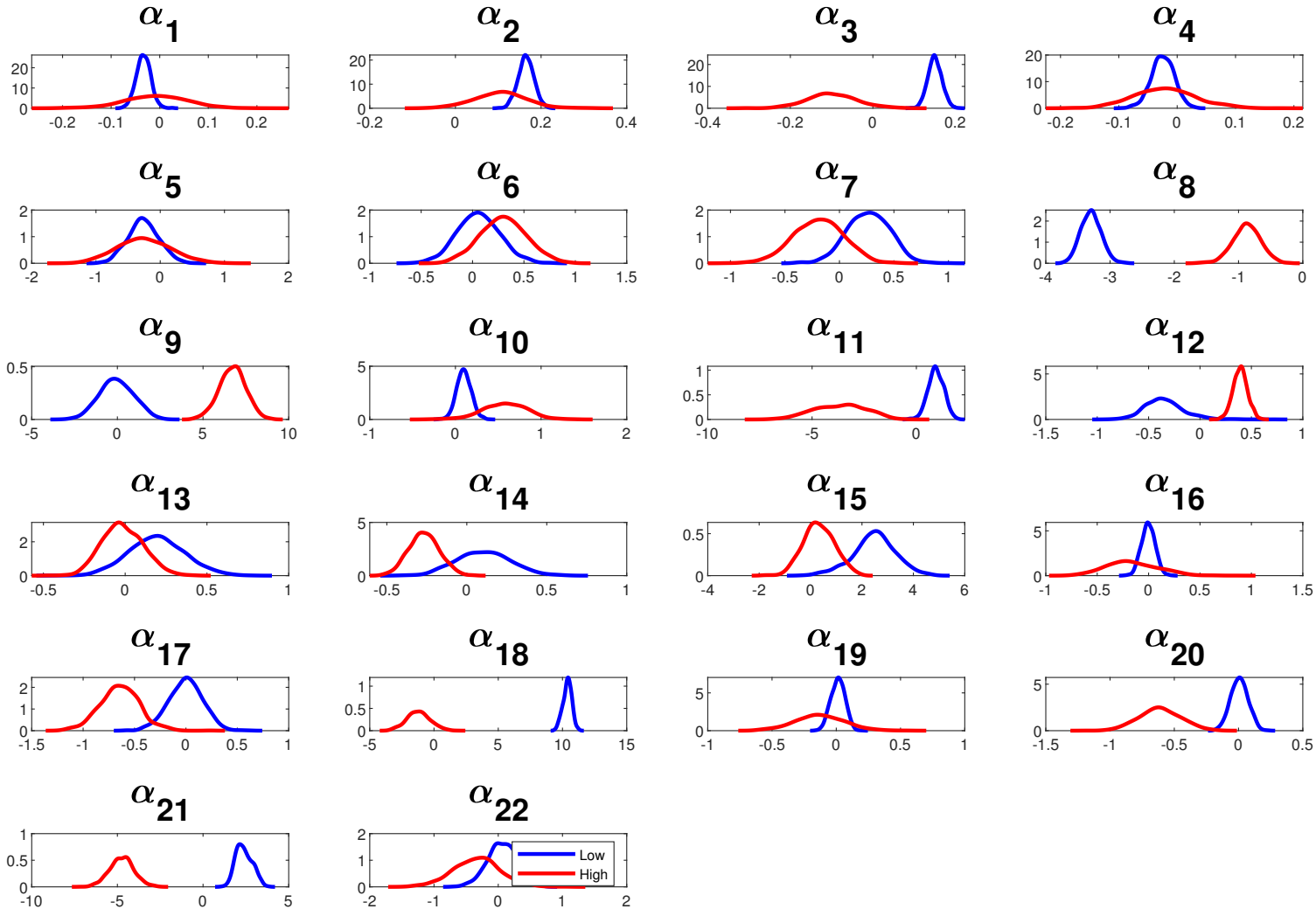




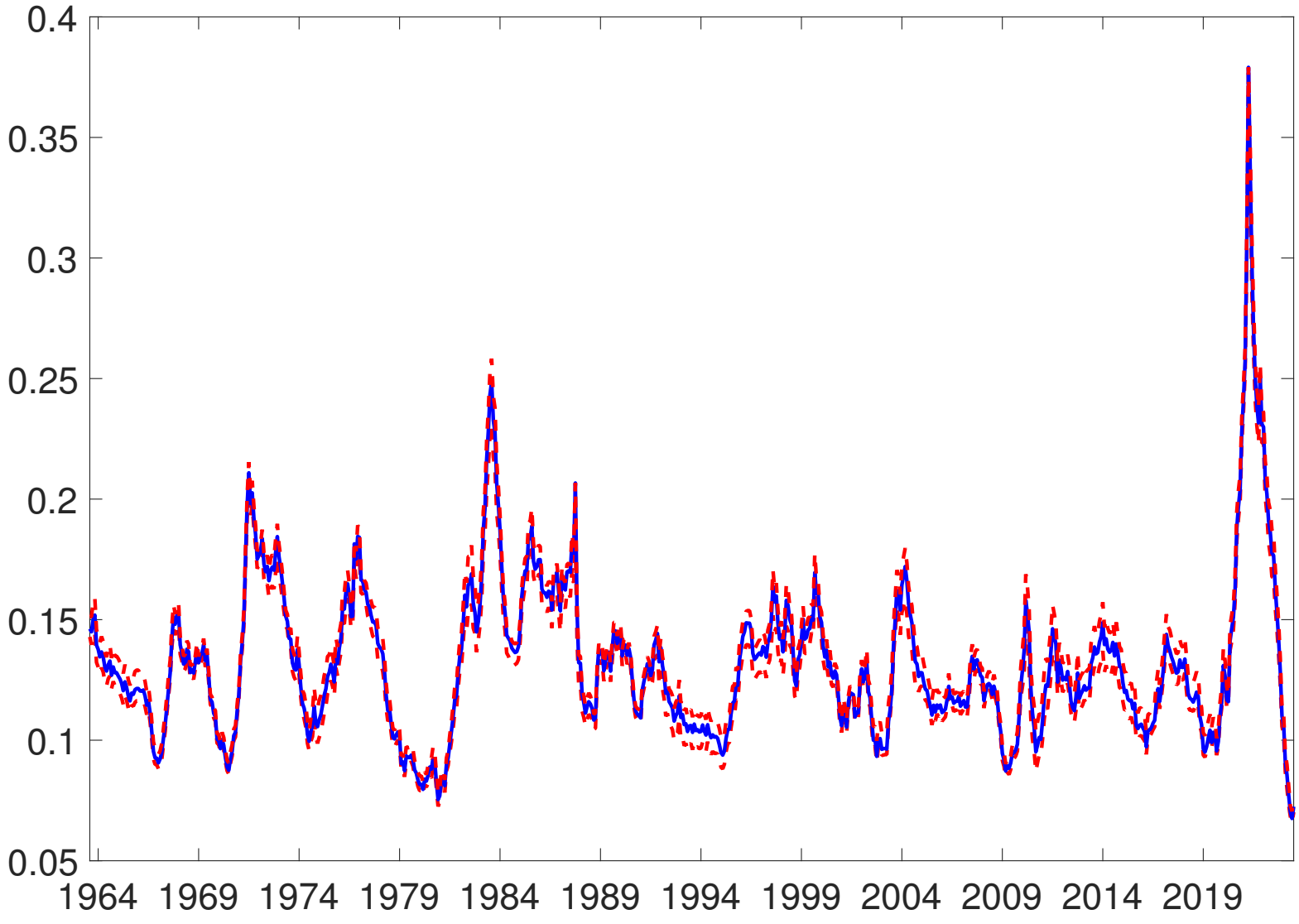




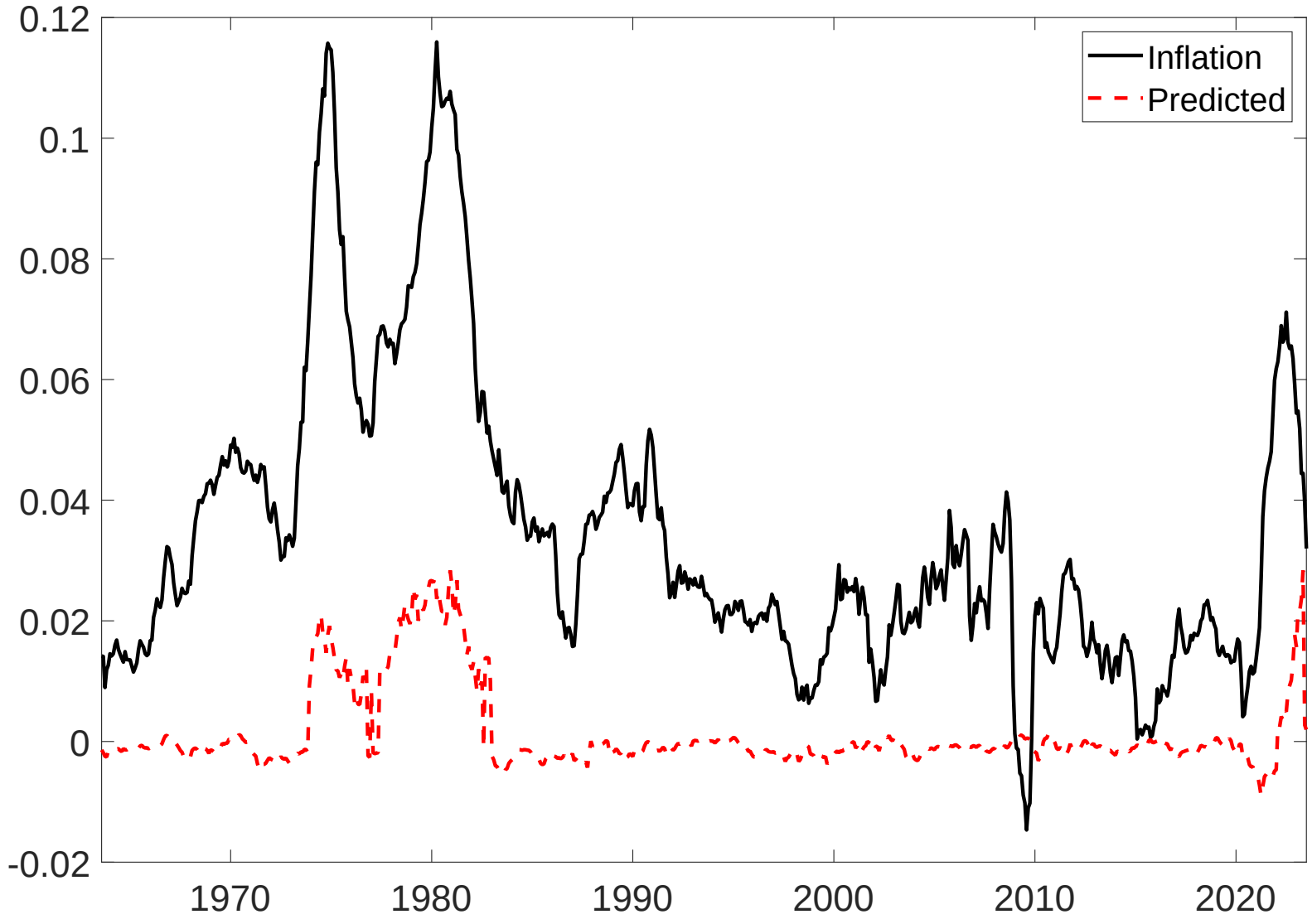
The posteriors of contemporaneous structural parameters



The uncertainty indicator λ_t



US inflation and λ_t based predictions



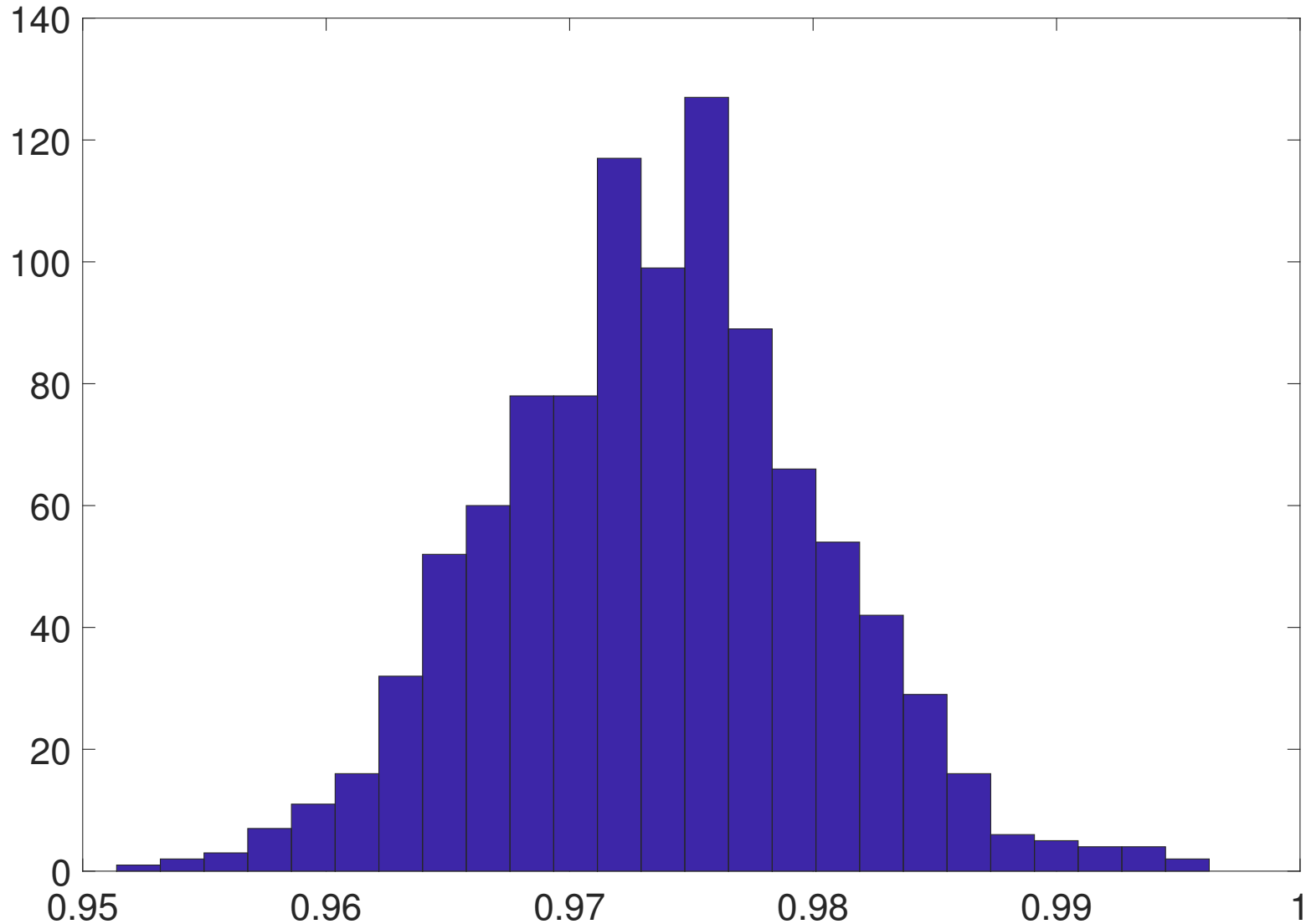


Figure: Posterior distribution persistence parameter F

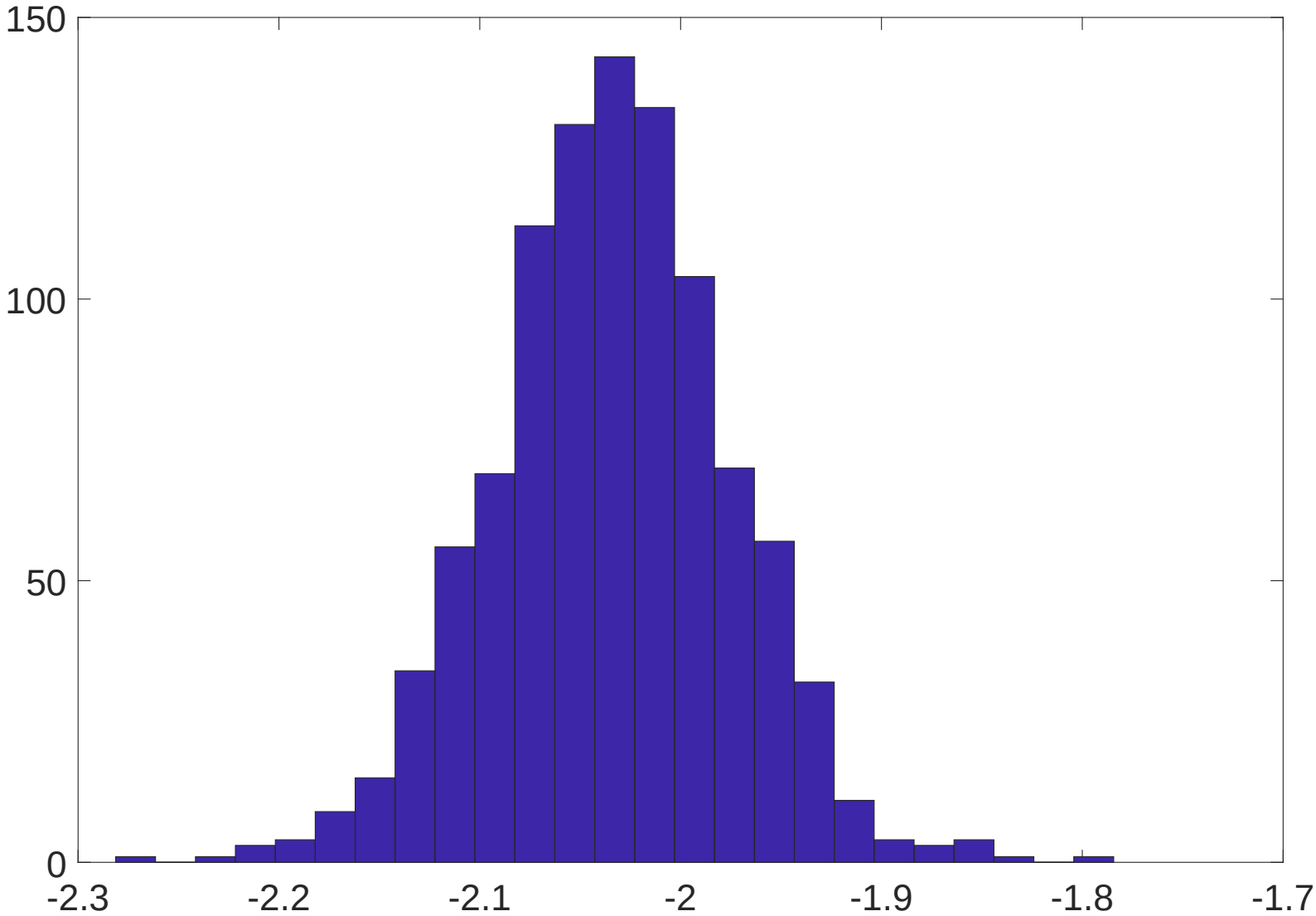


Figure: Posterior distribution mean parameter μ

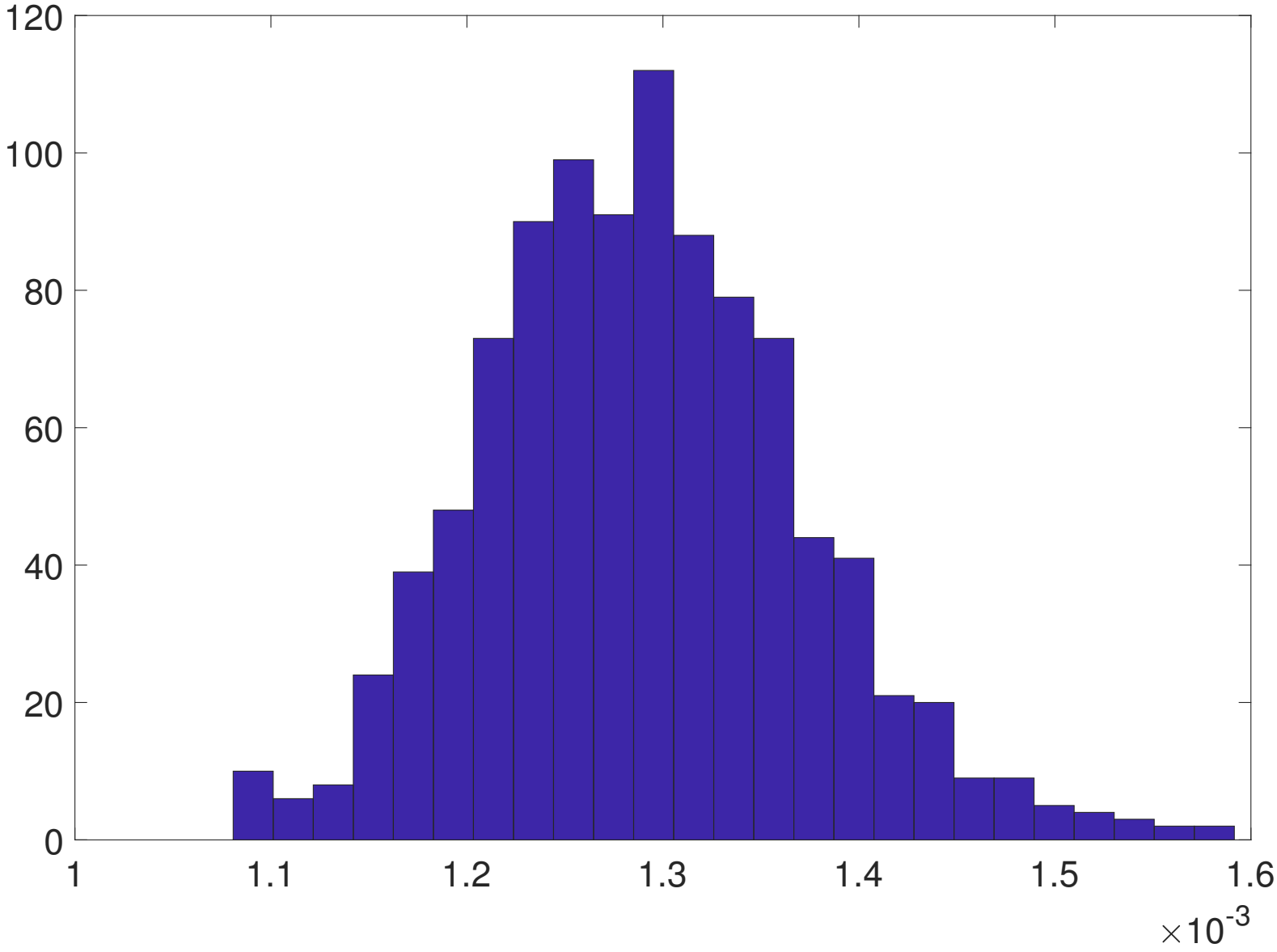
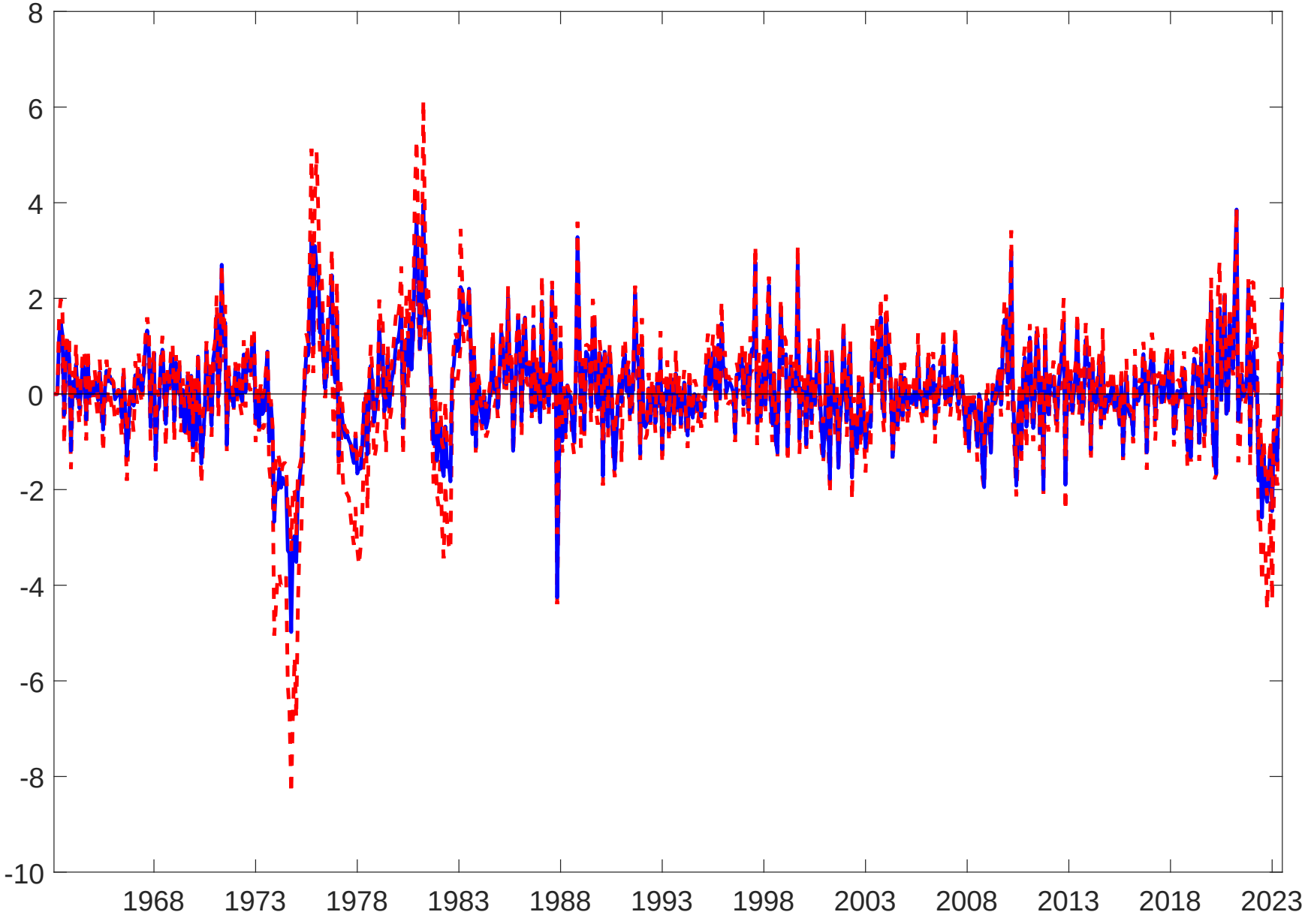


Figure: Posterior distribution variance parameter Q

Posterior of conventional monetary policy shocks



Posterior of liquidity shocks