Central banking in times of high geopolitical risk

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Broad Motivation

FINANCIAL TIMES

Federal Reserve warns of growing geopolitical risks to global financial system

US central bank says Middle East conflict and war in Ukraine threaten 'spillovers' to markets

Policymaking in a new risk environment

Speech by Christine Lagarde, President of the ECB, at the 30th Dubrovnik Economic Conference

Dubrovnik, 14 June 2024

WORLD ECONOMIC FORUM

Kristalina Georgieva stressed the need for leaders prepare for a range of scenarios, especially given technological change and geopolitical shifts.

Motivation

Fed Financial Stability Report (April 2024)

A worsening of global geopolitical tensions could lead to broad adverse spillovers

Conflict in the Middle East and Russia's ongoing war against Ukraine pose risks to global economic activity, including the possibility of sustained disruptions to energy and commodity markets and global value chains. Further escalation of geopolitical tensions or policy uncertainty could reduce economic activity, boost inflation, and heighten volatility in financial markets. The global

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$\Rightarrow$ Therefore, GPR may alter the economy in ways that may have important implications for the conduct of monetary policy.

Research Question:

Does the transmission of monetary policy change when GPR is high?

Related Literature

Geopolitical risk

- Caldara and Iacoviello (2022) construct the GPR index and find that a shock to GPR is contractionary (and inflationary: Caldara et al., 2024).
- Bondarenko et al. (2024) constructs a country-specific GPR index that captures a local rather than a Western perspective on GPR.
- The effect of a shock to GPR depends on the underlying mechanism, macro vs energy supply (Pinchetti, 2024), and the size/type of the shock (Brignone et al., 2024).

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U.S. Monetary Policy and nonlinearities

- *state of the business cycle*: Tenreyro and Thwaites (2016), Barnichon and Matthes (2018), Debortoli et al. (2023),
- *high financial uncertainty*: Aastveit et al. (2017), Pellegrino (2021)
- *large shocks & high trend inflation regime*: Ascari and Haber (2022)
- ...

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Overview

- **Econometric model:** Nonlinear Proxy-SVAR (Debortoli et al., 2023; Forni et al., 2023a)
  - Nonlinearity: interaction of the *MP shock* with the GPR index of Caldara and Iacoviello (2022)
- **Proxy:** Monetary policy surprises of Miranda-Agrippino and Ricco (2021):
  - extended by Degasperi and Ricco (2021) up to 2018m12.
- **Sample:** 1979m7–2019m12 (United States)
  - alternative sample ending in 2023m12.
- **Specification:**
  - GS1, IP, CPI, UNEMP, CRB and EBP (or Baa-Aaa)
  - Lag length $\rightarrow$ information criteria (aic, bic, hqc)

Econometric Methodology

The model (VARX) takes the following form:

$$x_t = \mu + \tilde{A}(L)x_{t-1} + \overbrace{\underbrace{\tilde{\alpha}(L)u_t}_{\text{Linear term}} + \underbrace{\tilde{\beta}(L)d_t u_t}_{\text{Nonlinear term}} + \tilde{\psi}(L)d_t}^{\text{Exogenous components}} + e_t \qquad (1)$$

where u_t is the monetary policy shock and d_t is the GPR index.

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where u_t is the monetary policy shock and d_t is the GPR index.

WARNING Direct estimation of the VARX in (1), or Local Projections, is unfeasible because the *MP shock* u_t is not observable:

- First-step $\Rightarrow$ identification of the shock (using the proxy)

Identification strategy

The identification procedure is based on Debortoli et al. (2023) and relies on two assumptions:

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- **I test this assumption** using a test proposed by Forni et al. (2023b).

Econometric Methodology: step by step

I. Estimate the VARX in (1) omitting the exogenous term with OLS to obtain consistent estimates of the reduced-form residuals $\hat{\varepsilon}_t$.

[2] where $\alpha(L) = \tilde{A}(L)^{-1}\tilde{\alpha}(L)$ and $\beta(L) = \tilde{A}(L)^{-1}\tilde{\beta}(L)$.

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I. Estimate the VARX in (1) omitting the exogenous term with OLS to obtain consistent estimates of the reduced-form residuals $\hat{\varepsilon}_t$.

II. First-stage (proxy identification):

$$z_t = \hat{\lambda}' \hat{\varepsilon}_t + \hat{\eta}_t \tag{2}$$

following Forni et al. (2023b), I find the *absolute* shock as:

- $\hat{u}_t = \hat{\lambda}' \hat{\varepsilon}_t / \text{std}(\hat{\lambda}' \hat{\varepsilon}_t)$

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IV. Impulse responses:[2]

$$IRF(u_t = \bar{u}) = \alpha(L)\bar{u} + \beta(L)d_t\bar{u}$$

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Invertibility test (informational sufficiency)

- The **invertibility test** is based on the theoretical result that if the shock is non-invertible, then it is a function of current and future VAR residuals (Forni et al., 2023b).

$$z_t = \sum_{k=0}^{r} \lambda_k' \hat{\varepsilon}_{t+k} + \eta_t \tag{4}$$

- F-test where $H_0 : \lambda_1 = \lambda_2 = \cdots = \lambda_r = 0$ against the alternative that at least one of the coefficients is nonzero.

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	Number of leads r					
	$r = 1$	$r = 2$	$r = 3$	$r = 4$	$r = 5$	$r = 6$
p-value	0.502	0.596	0.383	0.184	0.298	0.111

Table: *The table shows the p-values for each regression including the current value and up to r leads of the Wold residuals. Values above the confidence level (1%, 5%, 10%) indicates that the shock is invertible.*

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Monetary Policy and Geopolitical Risk

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▸ Plot of the GPR index

Normal Times $\Rightarrow d_{t,p50}$:

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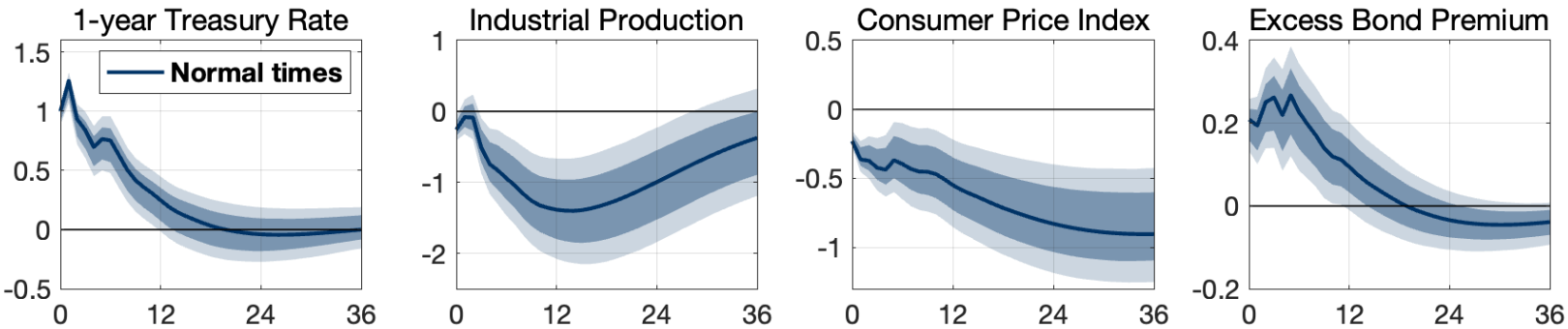
High-GPR Regime $\Rightarrow d_{t,p95}$:

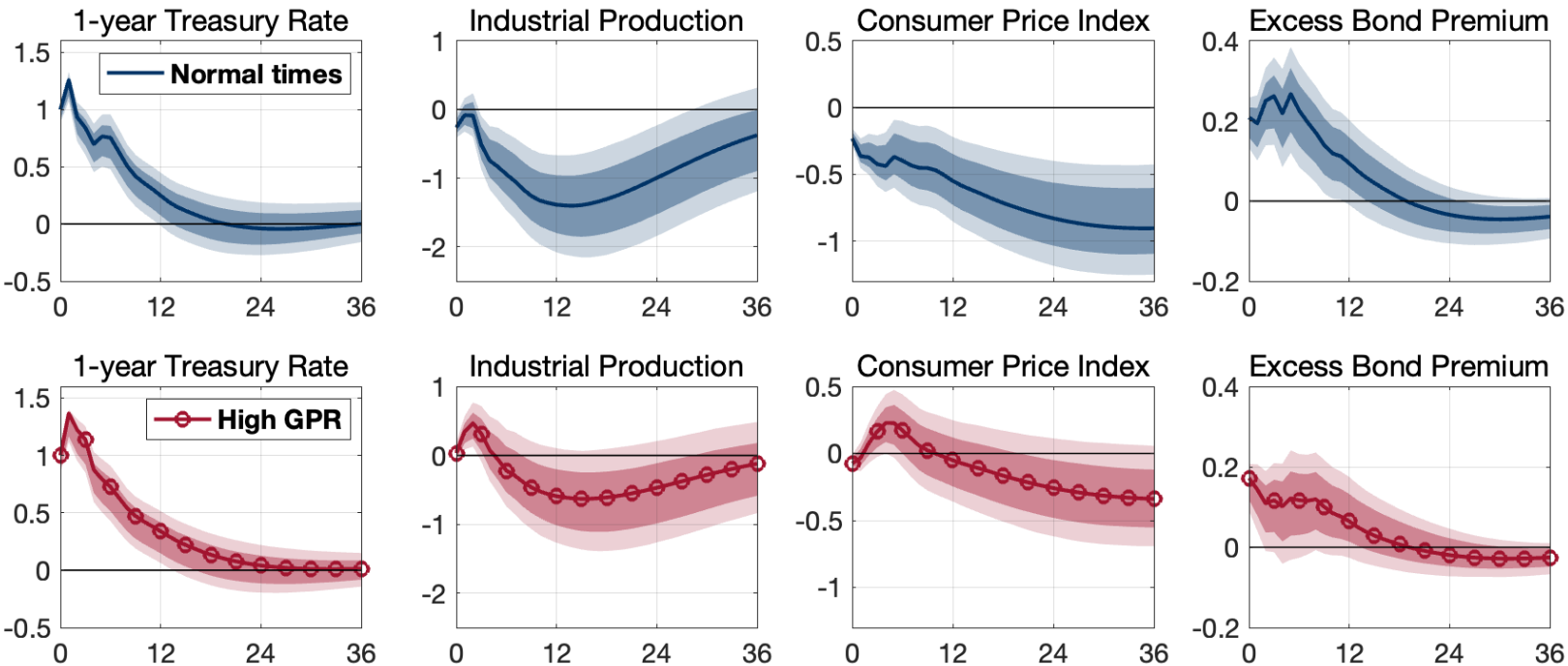
- Impulse responses are equal to $\alpha(L)\bar{u} + \beta(L)d_{t,p95}\bar{u}$.

Monetary Policy and Geopolitical Risk



▸ IRFs: Baa-Aaa ▸ Full IRFs ▸ Plot: shock and GPR ▸ IRFs: Exp. inflation

Monetary Policy and Geopolitical Risk



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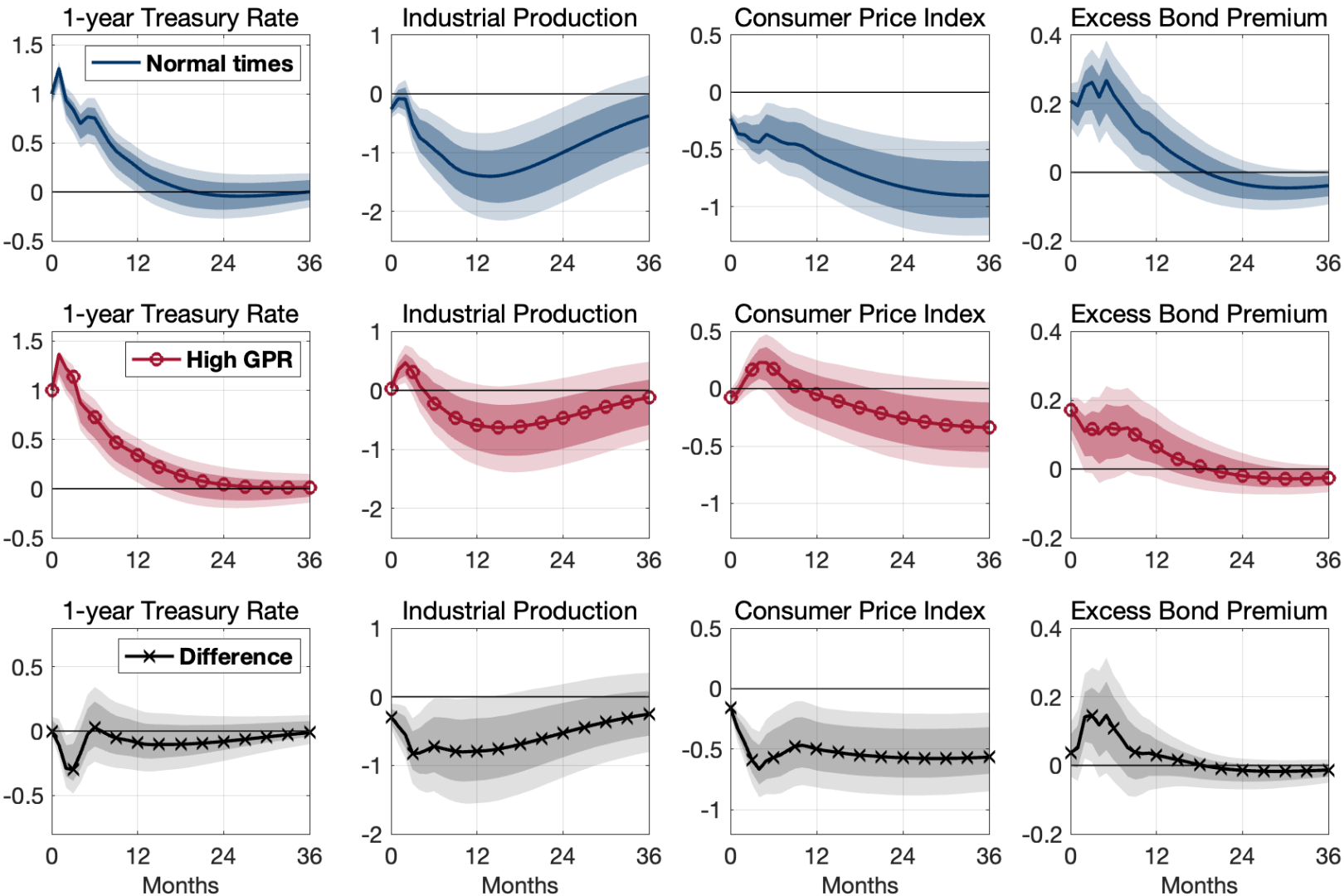

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Robustness checks

- **Shock identification:**
  - Jarociński and Karadi (2020) and Bauer and Swanson (2023) ▸ IRFs
- **Estimation sample**:
  - remove the ZLB period ▸ IRFs
  - sample up to 2023m12 ▸ IRFs
- **The role of the business cycle:**
  - Run a race against recession periods. ▸ Test
- **Local projections:** ▸ IRFs

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Disentangling the GPR index

- Many GPR $\Rightarrow$ news of future oil supply disruptions ▸ oil futures data

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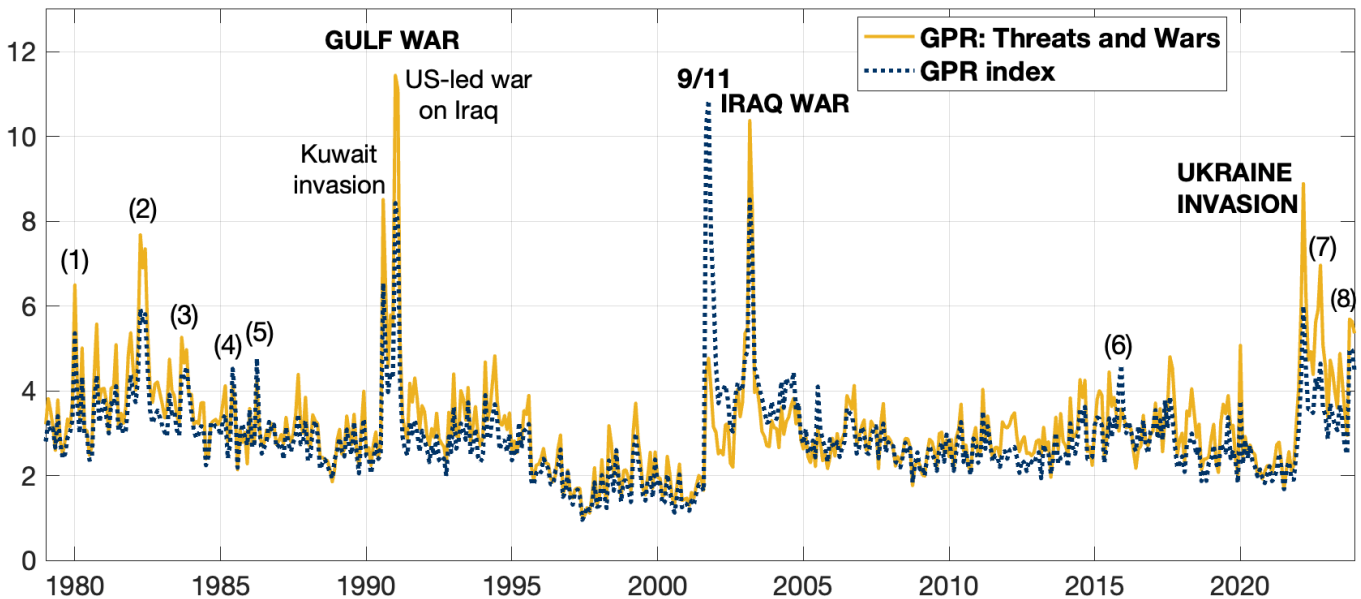
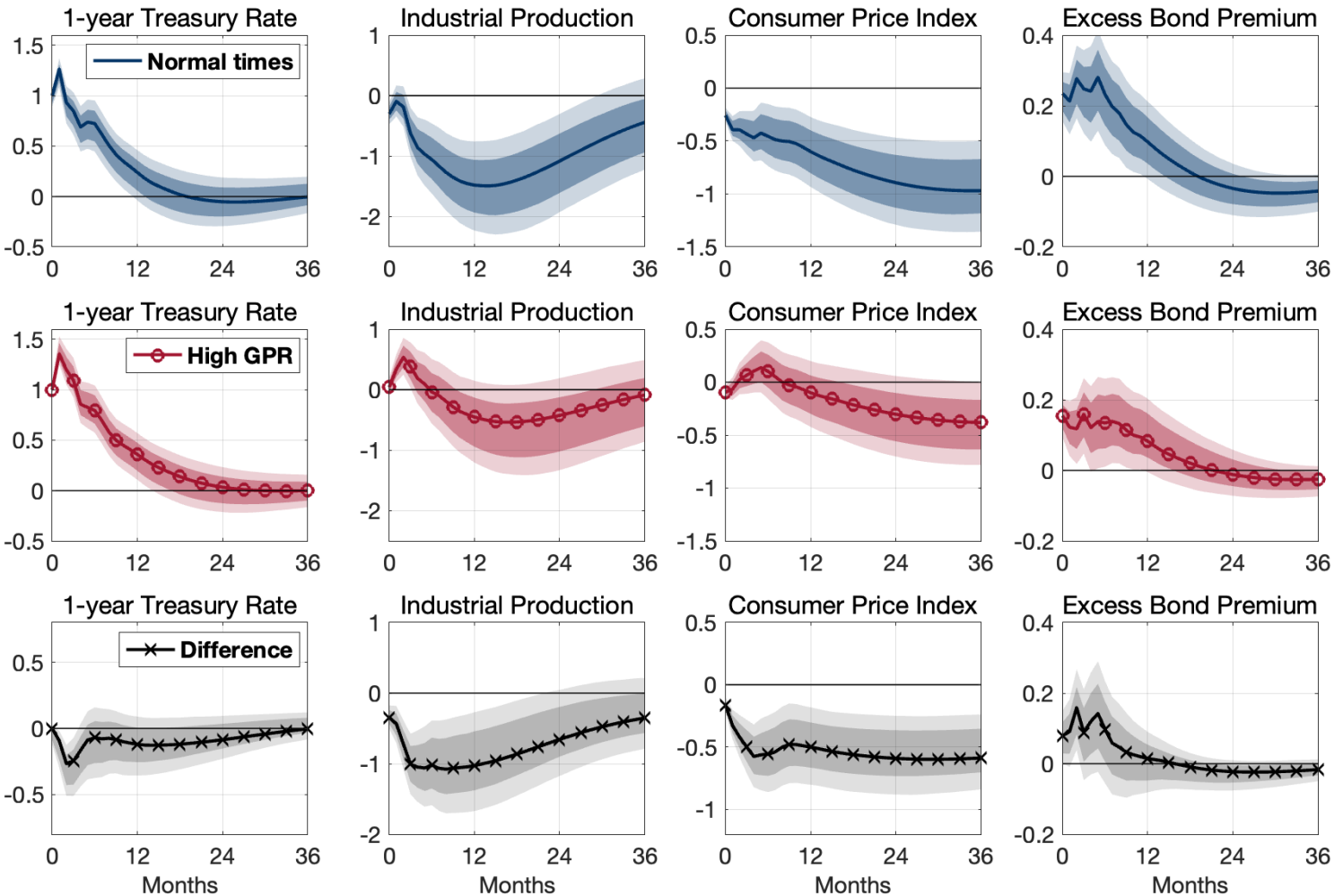


Figure: (1) January 1980: US-Soviet tensions as the Soviet Union invaded Afghanistan in December 1979; (2) April 1982: Falkland war; (3) September 1983: Nuclear war scare; (4) June 1985: Hijacking of TWA Flight 847; (5) April 1986: US bombing of Libya; (6) November 2015: Paris terrorist attack; (7) October 2022: Crimea bridge attack and Russia strikes on Ukraine's energy infrastructure; (8) October 2023: Hamas Terrorist attack and Israeli invasion of Gaza.

Monetary Policy and GPR *Threats and Wars*



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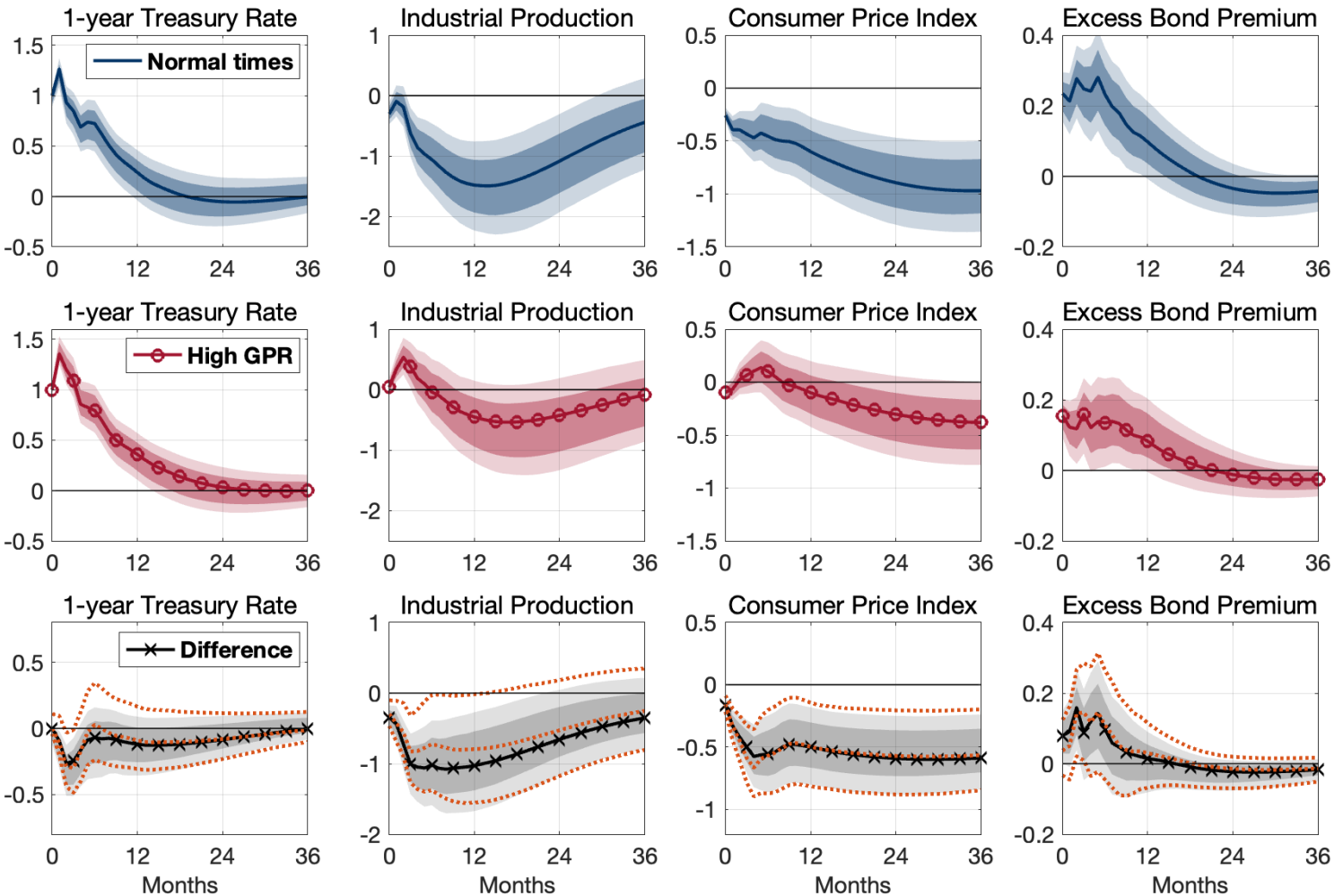

⇒ Dotted lines are the difference of the baseline responses.

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The Role of Fiscal Policy

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All else equal, the lower fiscal backing would make monetary policy less effective in bringing down inflation (Smets and Wouters, 2024).

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$\Rightarrow$ I estimate a quarterly VAR with fiscal variables (defense spending, non-defense spending, tax revenues, and public debt.)

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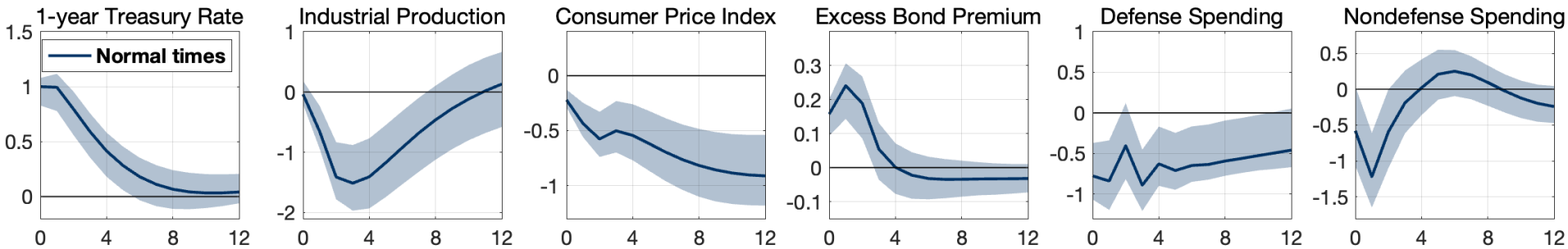

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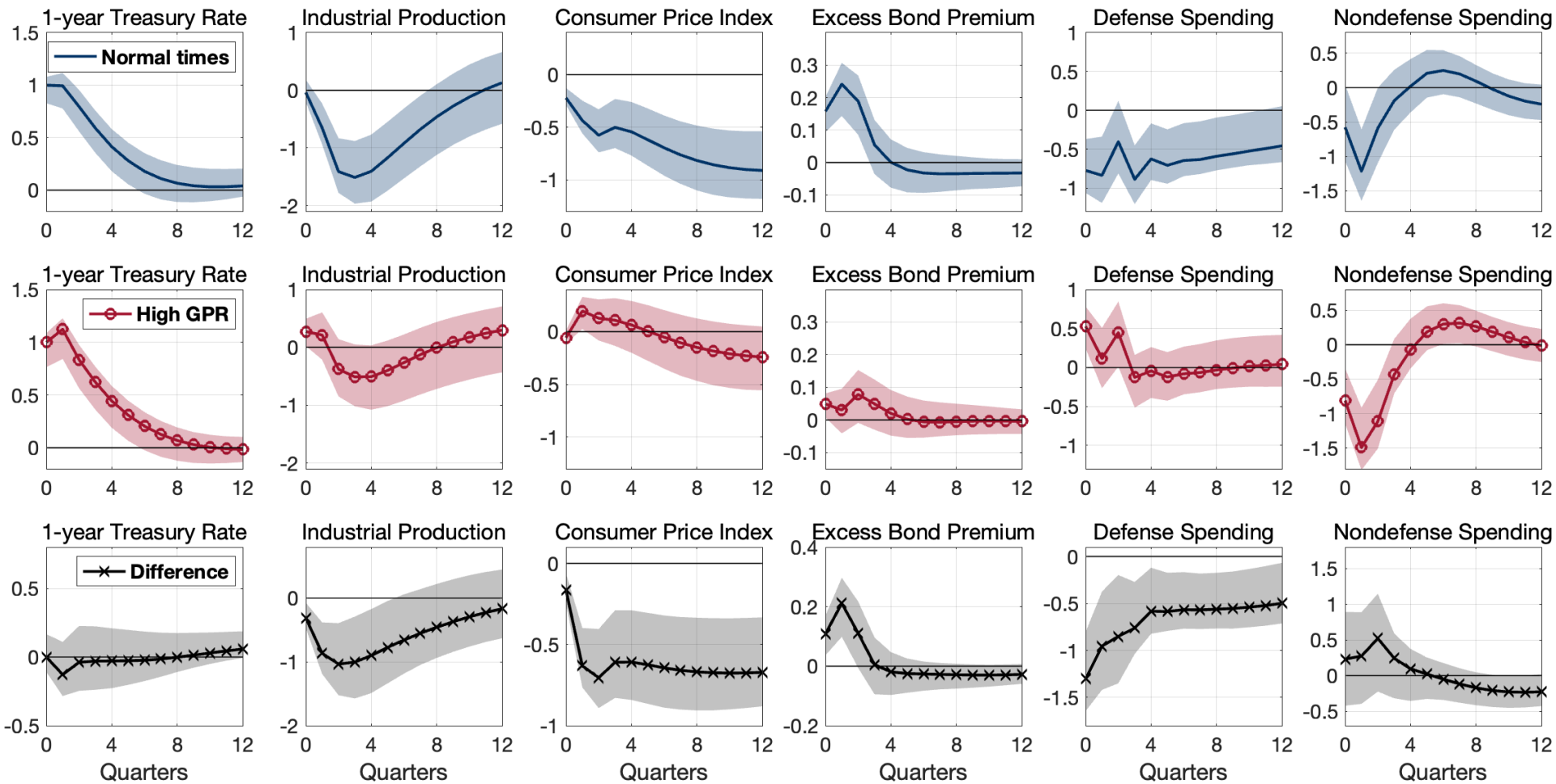

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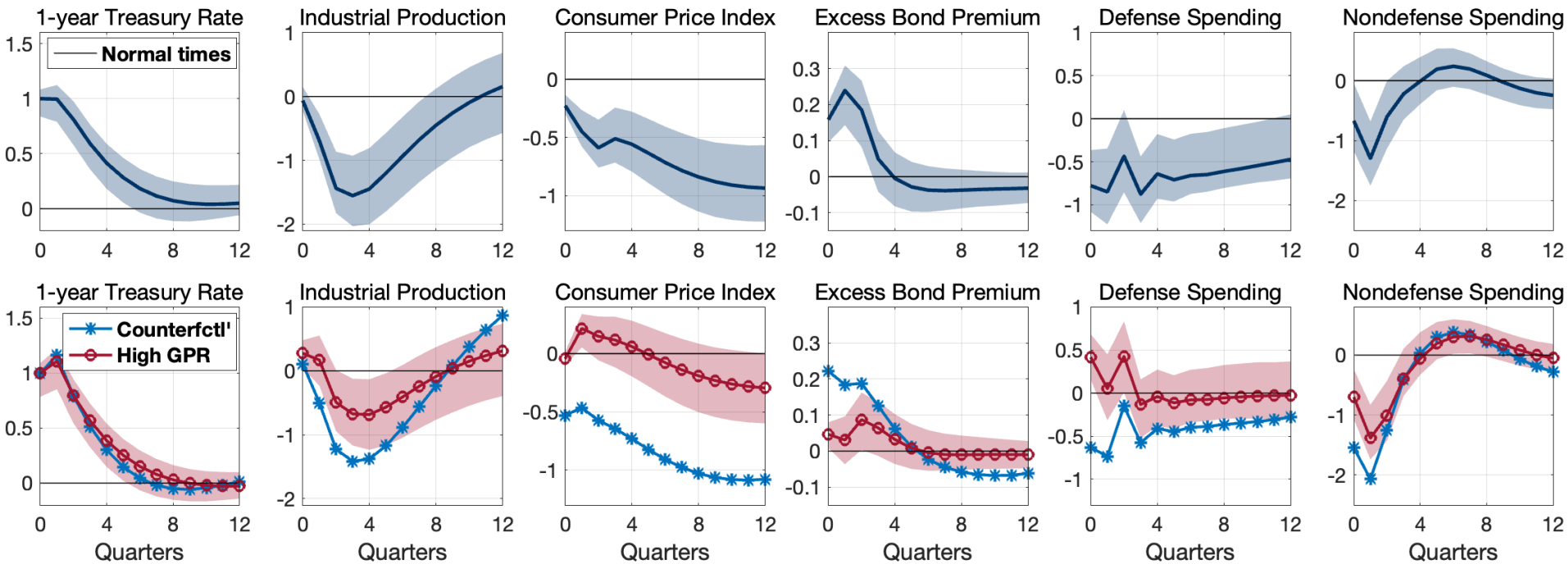
- **Short-horizon shock**: Blanchard-Perotti shock identified following Caldara and Kamps (2017) under general rules.
- **Longer-horizon (news) shock**: sum of revisions of expectations about future government spending from the Survey of Professional Forecasters (see Forni and Gambetti, 2016)

Policy Counterfactual: Result

Counterfactual for the High GPR regime



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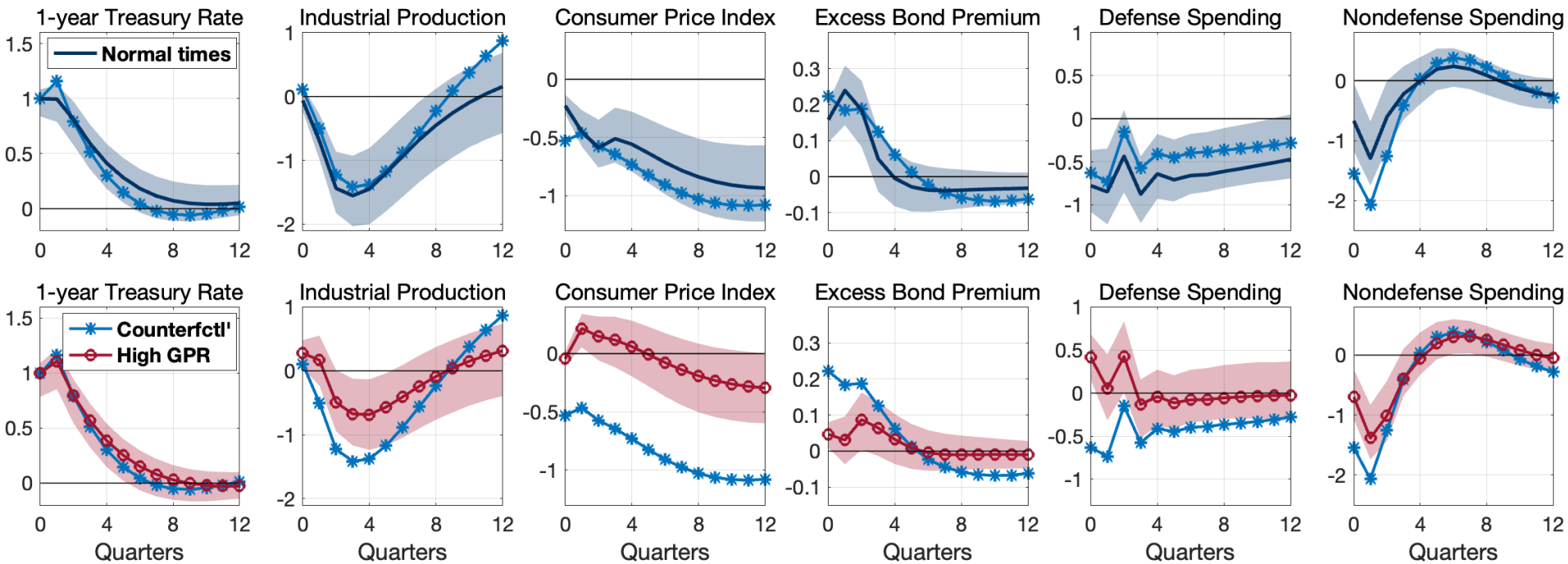

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Policy Experiments: Monetary Tightening

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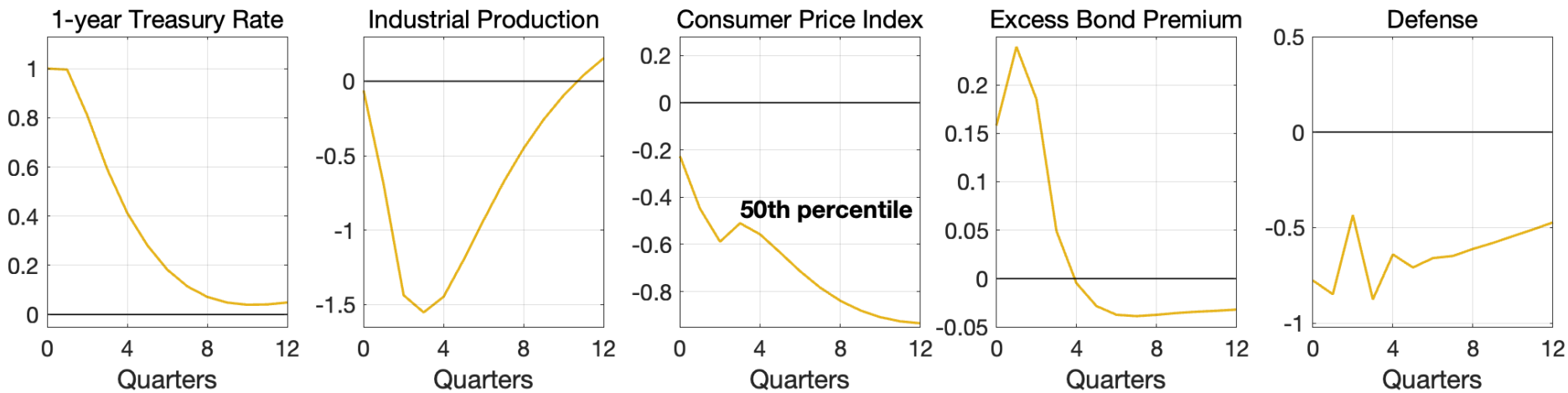

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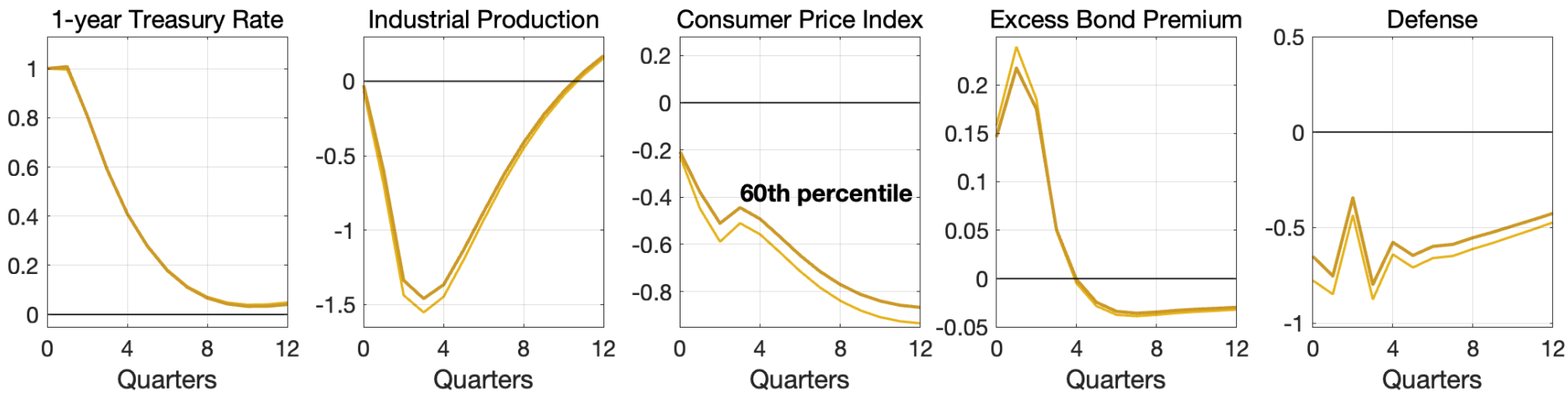

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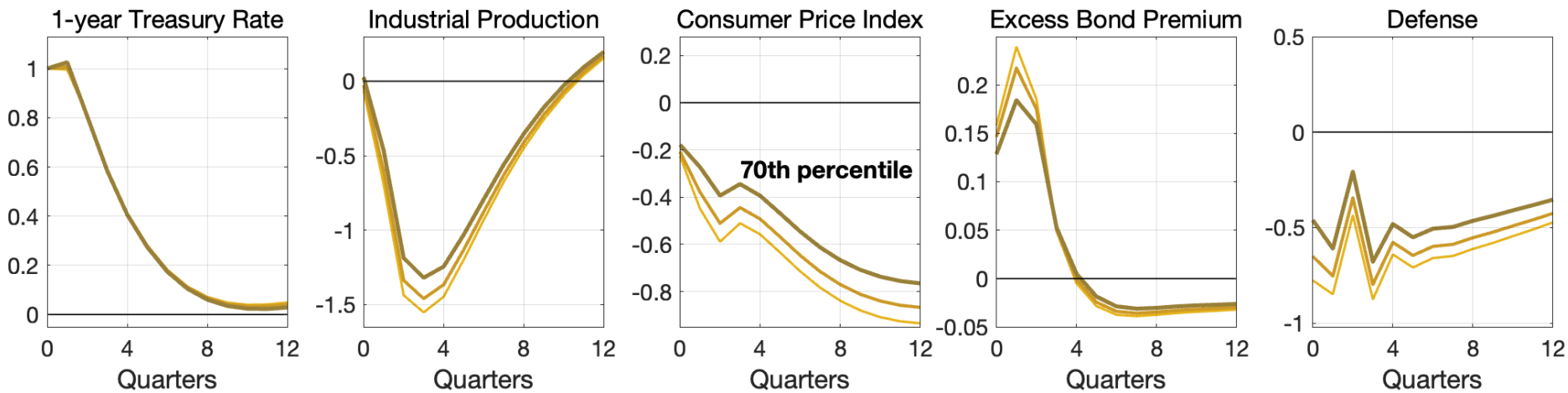

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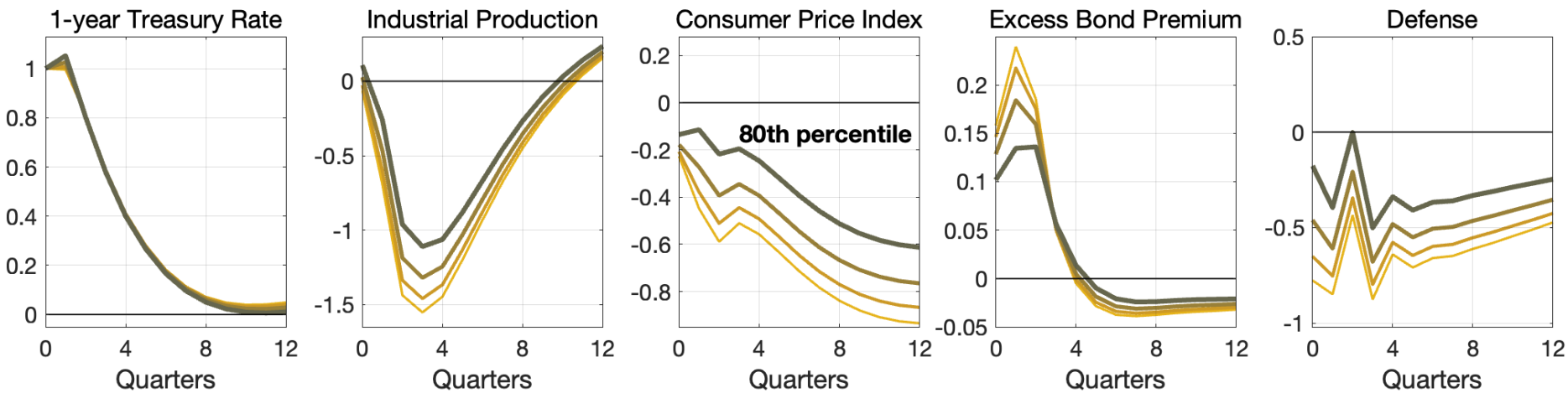

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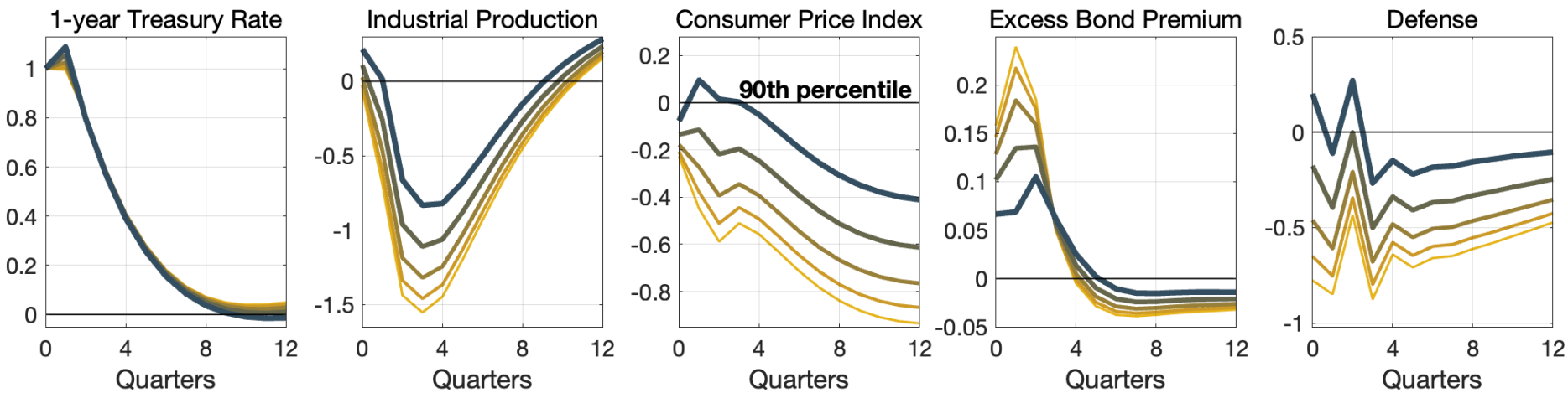

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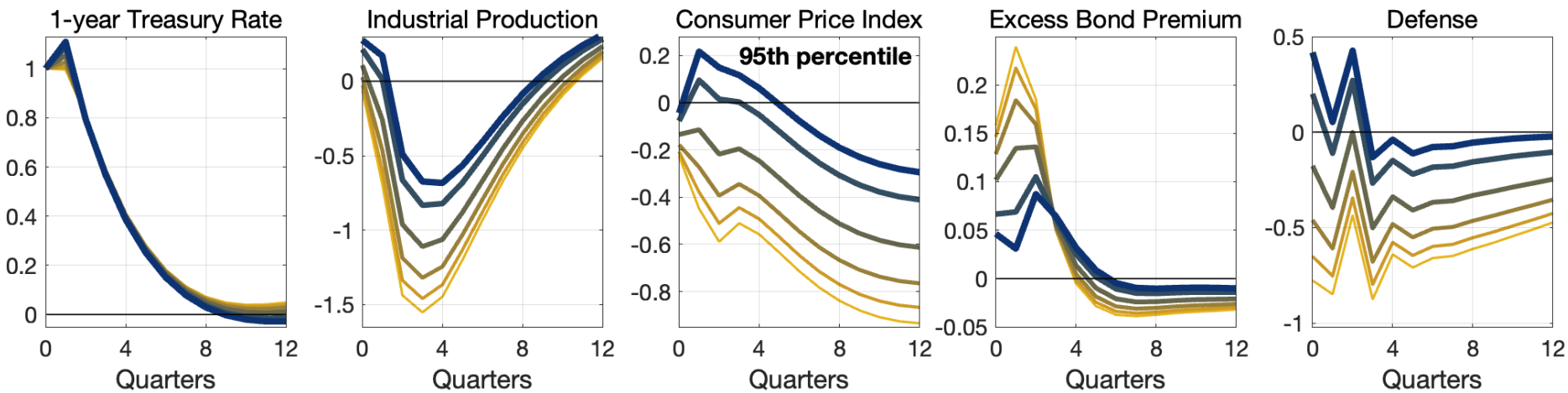

Figure: Monetary tightening at the 50th, 60th, 70th, 80th, 90th, and 95th percentiles of the index. Thicker and darker lines correspond to higher percentiles of the index.

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Concluding Remarks

(1) Geopolitical risk may alter the economy in ways that may have important implications for the conduct of monetary policy:

- I study the transmission of monetary policy in periods of high geopolitical risk.

Concluding Remarks

(1) Geopolitical risk may alter the economy in ways that may have important implications for the conduct of monetary policy:

- I study the transmission of monetary policy in periods of high geopolitical risk.

(2) Novel empirical evidence:

- a **monetary tightening** becomes less effective as geopolitical risk increases.

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- the more limited fiscal backing is key to rationalize the lower effectiveness of monetary policy in times of high geopolitical risk.

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The End

References I

Aastveit, K. A., Natvik, G. J., and Sola, S. (2017). Economic uncertainty and the influence of monetary policy. *Journal of International Money and Finance*, 76:50–67.

Alquist, R. and Kilian, L. (2010). What do we learn from the price of crude oil futures? *Journal of Applied econometrics*, 25(4):539–573.

Ascari, G. and Haber, T. (2022). Non-linearities, state-dependent prices and the transmission mechanism of monetary policy. *The Economic Journal*, 132(641):37–57.

Baker, S. R., Bloom, N., and Davis, S. J. (2016). Measuring economic policy uncertainty. *The quarterly journal of economics*, 131(4):1593–1636.

Barnichon, R. and Matthes, C. (2018). Functional approximation of impulse responses. *Journal of Monetary Economics*, 99:41–55.

References II

Bauer, M. D. and Swanson, E. T. (2023). A reassessment of monetary policy surprises and high-frequency identification. *NBER Macroeconomics Annual*, 37(1):87–155.

Bondarenko, Y., Lewis, V., Rottner, M., and Schüler, Y. (2024). Geopolitical risk perceptions. *Journal of International Economics*, page 104005.

Bouscasse, P. and Hong, S. (2023). Monetary-fiscal interactions in the united states.

Breitenlechner, M., Geiger, M., and Klein, M. (2024). The fiscal channel of monetary policy.

Brignone, D., Gambetti, L., and Ricci, M. (2024). Geopolitical risk shocks: When the size matters.

Caldara, D., Conlisk, S., Iacoviello, M., and Penn, M. (2024). Do geopolitical risks raise or lower inflation. *Federal Reserve Board of Governors*.

References III

Caldara, D. and Iacoviello, M. (2022). Measuring geopolitical risk. *American Economic Review*, 112(4):1194–1225.

Caldara, D. and Kamps, C. (2017). The analytics of svars: a unified framework to measure fiscal multipliers. *The Review of Economic Studies*, 84(3):1015–1040.

Clarida, R., Gali, J., and Gertler, M. (1999). The science of monetary policy: a new keynesian perspective. *Journal of economic literature*, 37(4):1661–1707.

Debortoli, D., Forni, M., Gambetti, L., and Sala, L. (2023). Asymmetric monetary policy tradeoffs. *CEPR Press DP18438*.

Degasperi, R. and Ricco, G. (2021). Information and policy shocks in monetary surprises.

Eusepi, S. and Preston, B. (2018). Fiscal foundations of inflation: imperfect knowledge. *American Economic Review*, 108(9):2551–2589.

References IV

Forni, M., Franconi, A., Gambetti, L., and Sala, L. (2023a). Asymmetric transmission of oil supply news. *CEPR Press DP18704*.

Forni, M. and Gambetti, L. (2016). Government spending shocks in open economy vars. *Journal of International Economics*, 99:68–84.

Forni, M., Gambetti, L., and Ricco, G. (2023b). External instrument svar analysis for noninvertible shocks. *CEPR Press DP17886*.

Jarociński, M. and Karadi, P. (2020). Deconstructing monetary policy surprises—the role of information shocks. *American Economic Journal: Macroeconomics*, 12(2):1–43.

Jurado, K., Ludvigson, S. C., and Ng, S. (2015). Measuring uncertainty. *American Economic Review*, 105(3):1177–1216.

Kaplan, G., Moll, B., and Violante, G. L. (2018). Monetary policy according to hank. *American Economic Review*, 108(3):697–743.

References V

Kilian, L. and Murphy, D. P. (2014). The role of inventories and speculative trading in the global market for crude oil. *Journal of Applied econometrics*, 29(3):454–478.

McKay, A. and Wolf, C. K. (2023). What can time-series regressions tell us about policy counterfactuals? *Econometrica*, 91(5):1695–1725.

Miranda-Agrippino, S. and Ricco, G. (2021). The transmission of monetary policy shocks. *American Economic Journal: Macroeconomics*, 13(3):74–107.

Pellegrino, G. (2021). Uncertainty and monetary policy in the us: A journey into nonlinear territory. *Economic Inquiry*, 59(3):1106–1128.

Pinchetti, M. (2024). Geopolitical risk and inflation: The role of energy markets.

Smets, F. and Wouters, R. (2024). Fiscal backing, inflation and us business cycle.

References VI

Sterk, V. and Tenreyro, S. (2018). The transmission of monetary policy through redistributions and durable purchases. *Journal of Monetary Economics*, 99:124–137.

Tenreyro, S. and Thwaites, G. (2016). Pushing on a string: Us monetary policy is less powerful in recessions. *American Economic Journal: Macroeconomics*, 8(4):43–74.

Geopolitical Risk index: Caldara and Iacoviello (2022)

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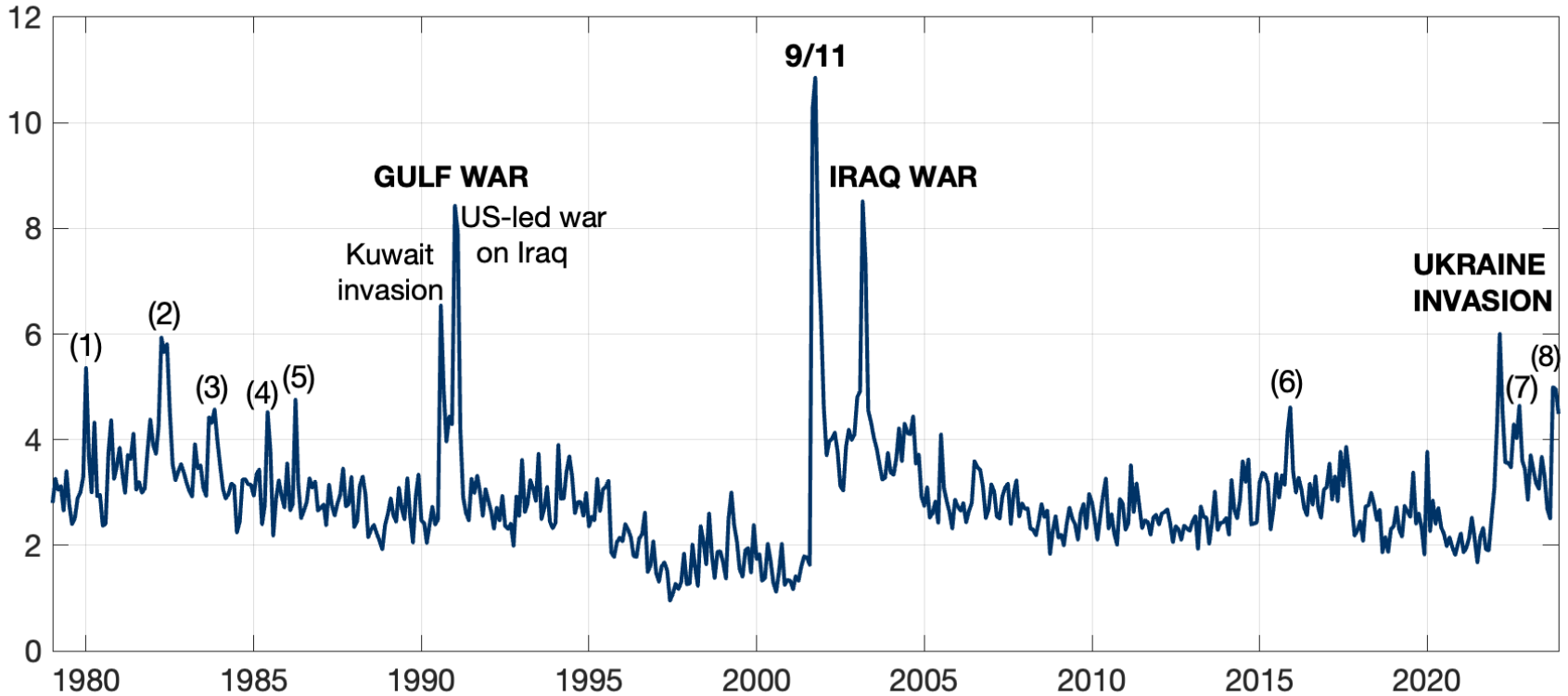
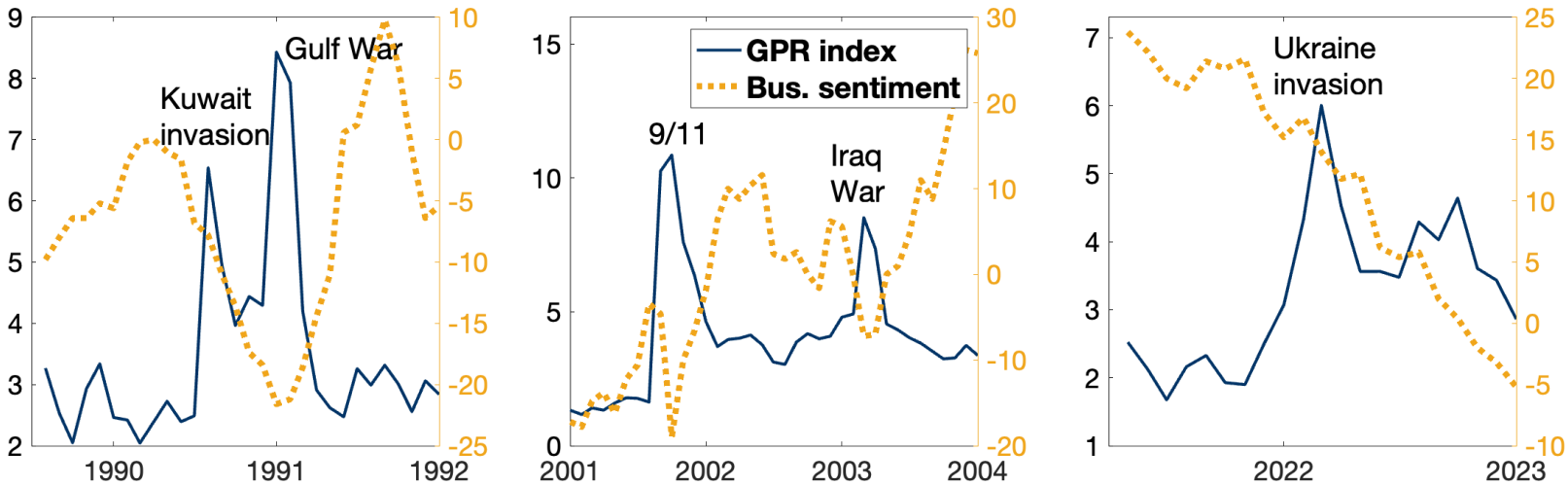


Figure: The solid blue line is the U.S. geopolitical risk index. (1) January 1980: US-Soviet tensions as the Soviet Union invaded Afghanistan in December 1979; (2) April 1982: Falkland war; (3) September 1983: Nuclear war scare; (4) June 1985: Hijacking of TWA Flight 847; (5) April 1986: US bombing of Libya; (6) November 2015: Paris terrorist attack; (7) October 2022: Crimea bridge attack and Russia strikes on Ukraine's energy infrastructure; (8) October 2023: Hamas Terrorist attack and Israeli invasion of Gaza.

GPR and business sentiment



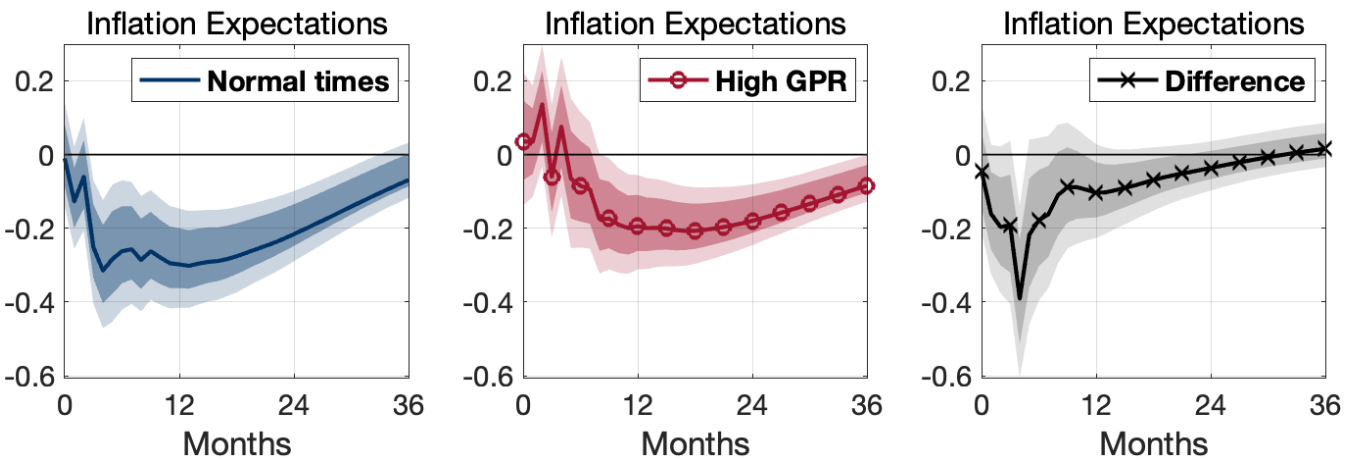
(a) Gulf War (b) 9/11 and Iraq War (c) Russia invades Ukraine

Figure: Geopolitical risk and business sentiment

go back

Monetary Policy and Geopolitical Risk

Figure: Inflation Expectations



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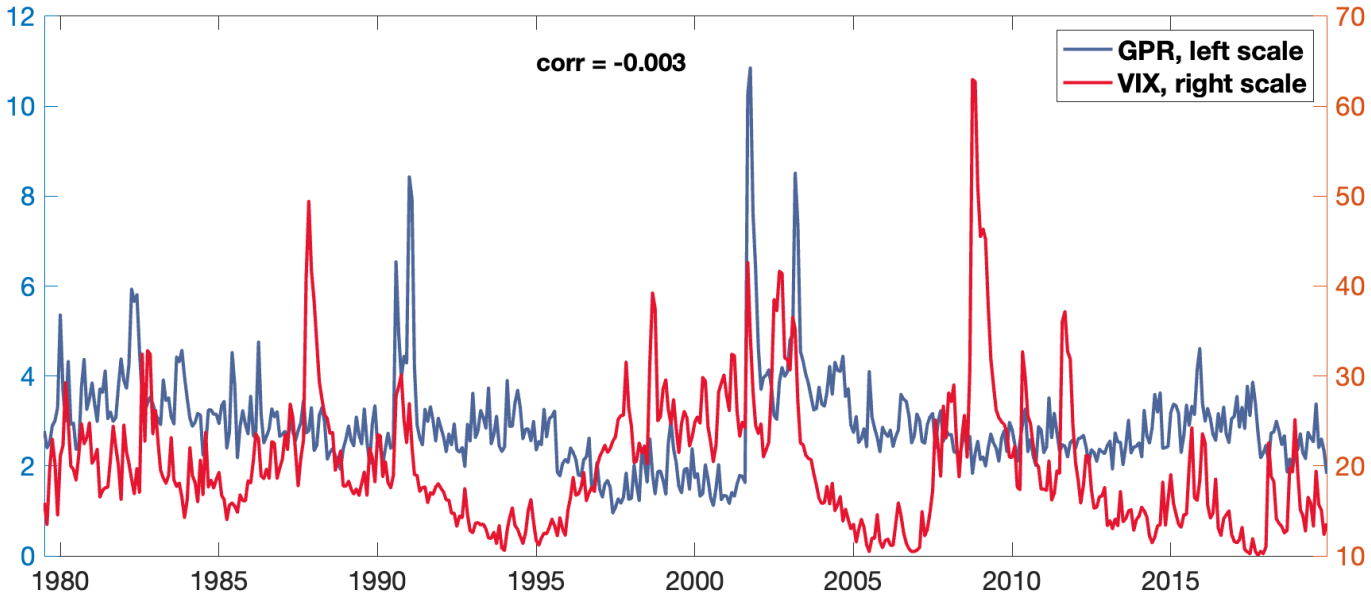
GPR: comparison with common uncertainty indicators

- GPR and the VIX (stock market volatility indicator) ▸ graph
- GPR and Financial Uncertainty ▸ graph
- GPR and Macro Uncertainty ▸ graph
- GPR and Real Uncertainty ▸ graph
- GPR and Economic Policy Uncertainty ▸ graph

Financial Uncertainty (VIX)



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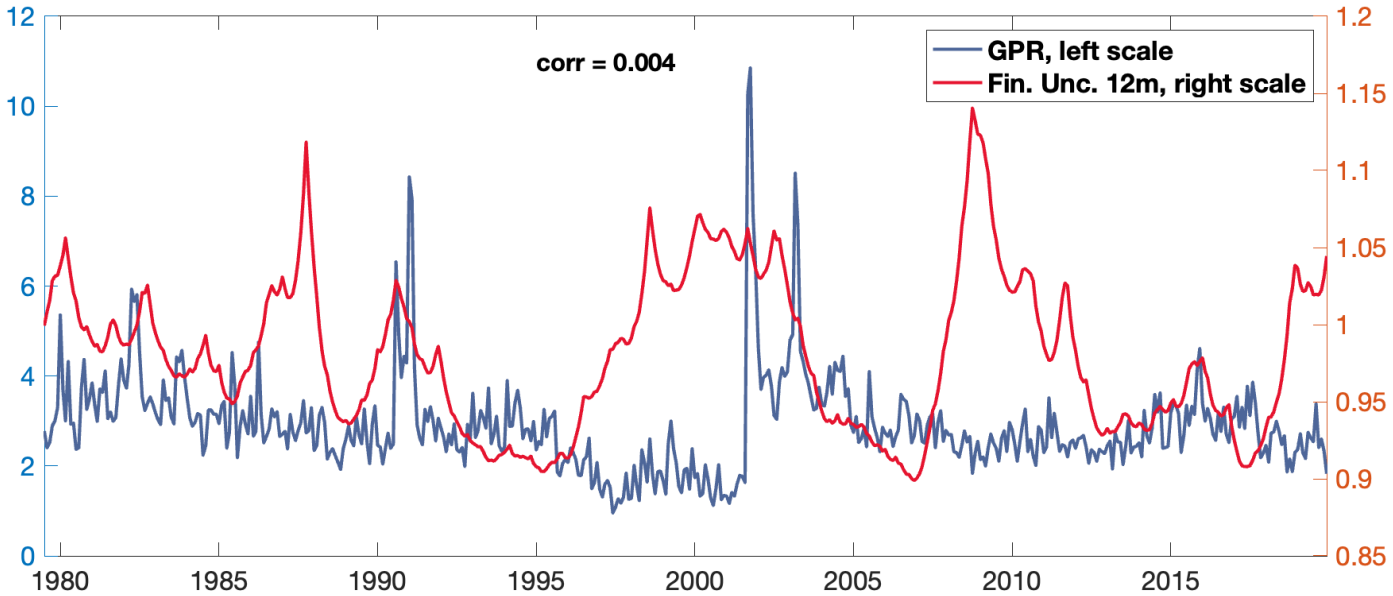
Financial Uncertainty (Jurado et al., 2015)



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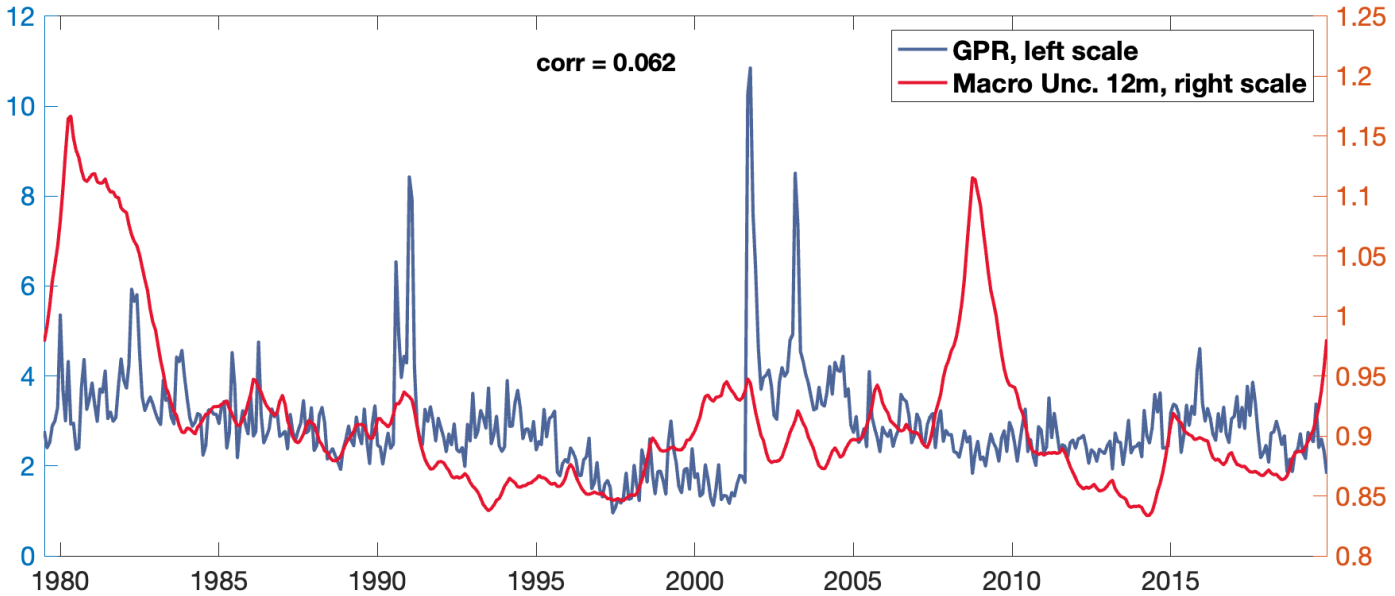
Macroeconomic Uncertainty (Jurado et al., 2015)



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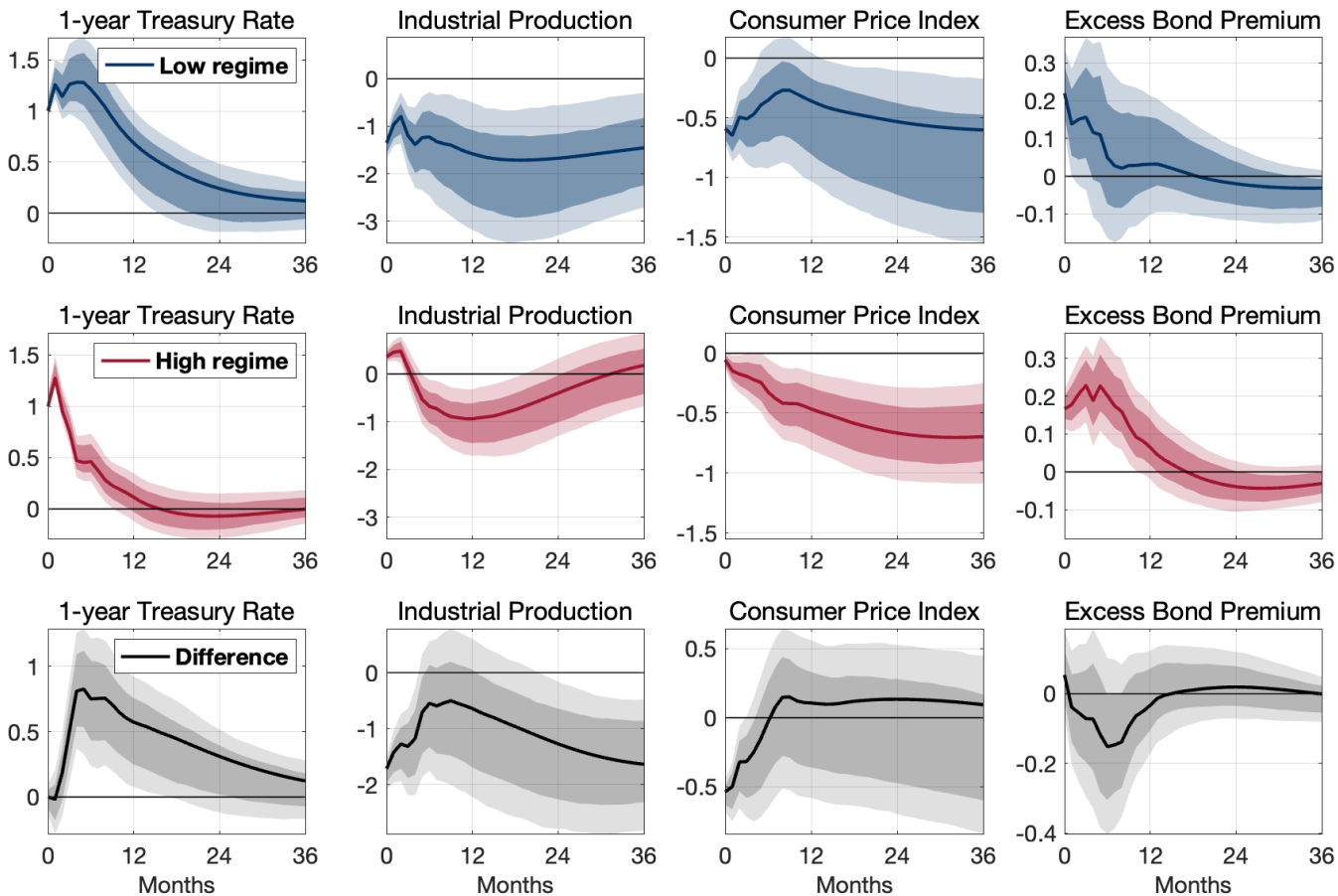
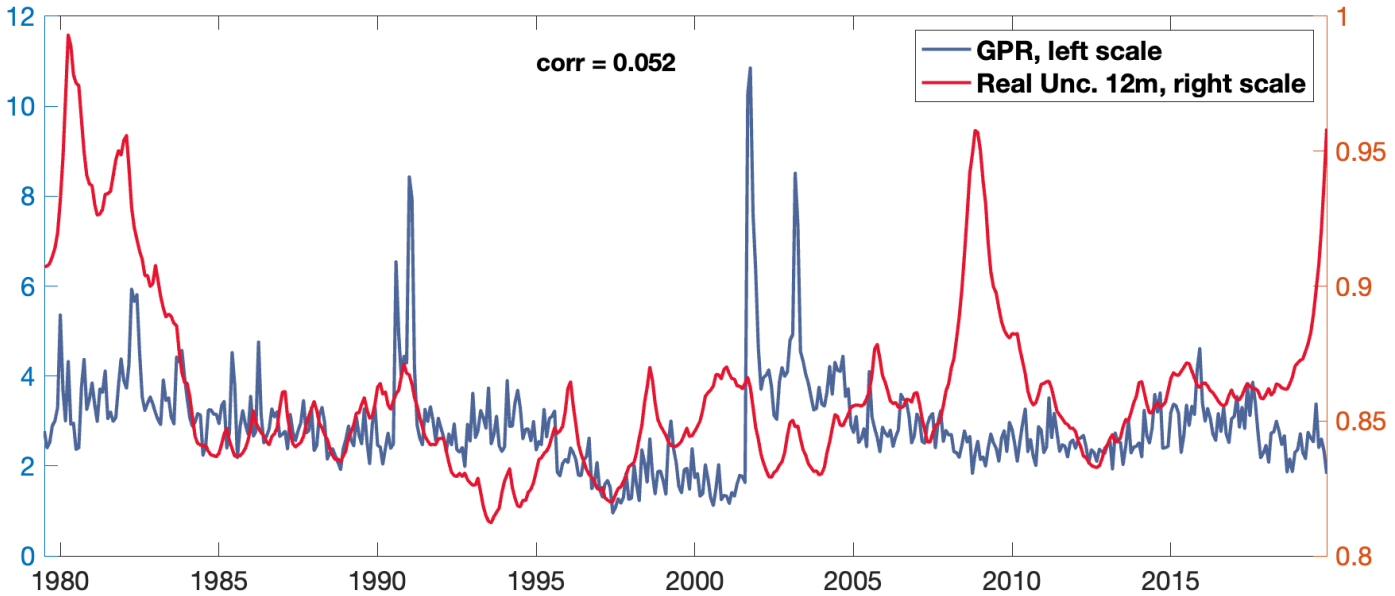
Monetary Policy and Macroeconomic Uncertainty



Real Uncertainty (Jurado et al., 2015)



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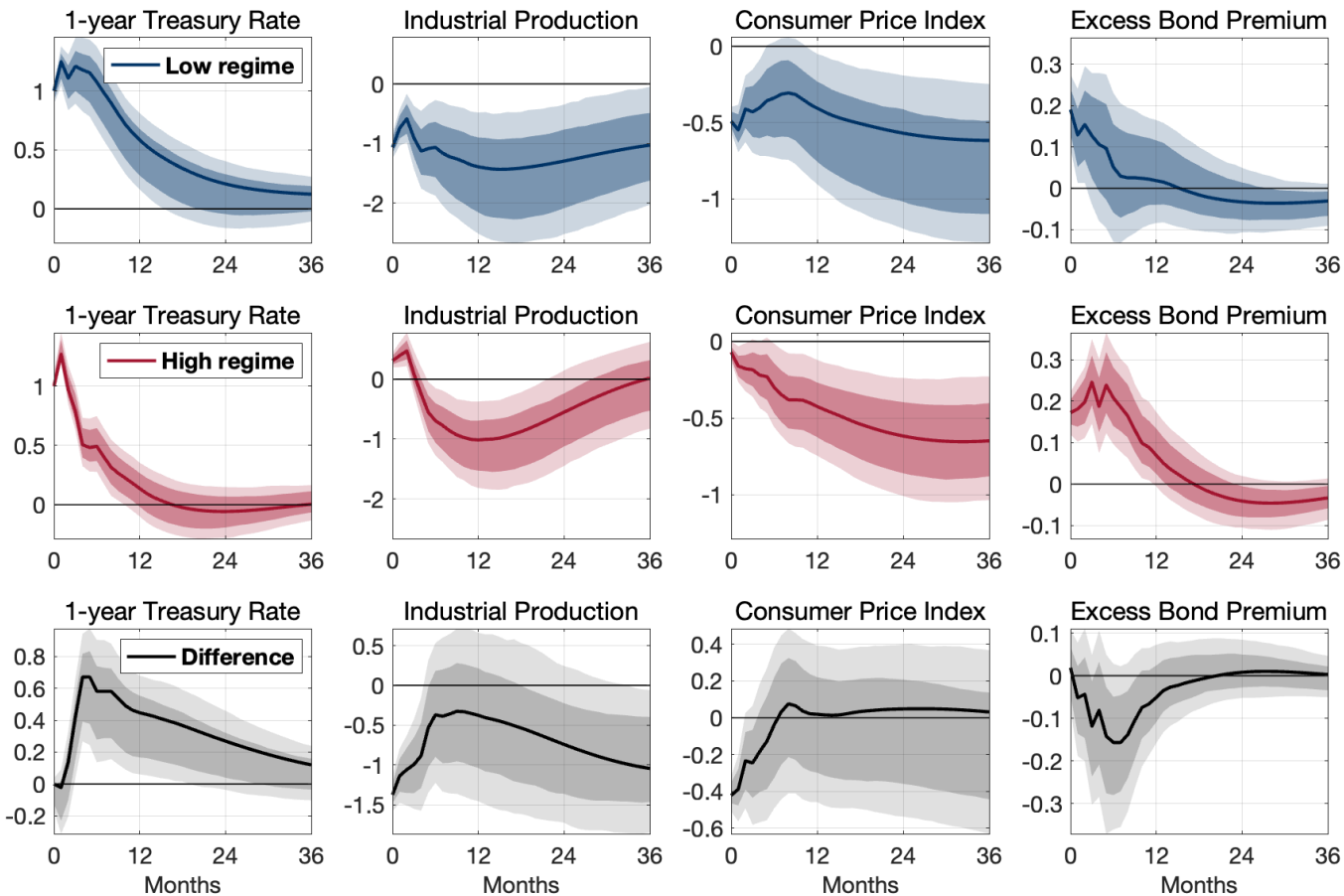
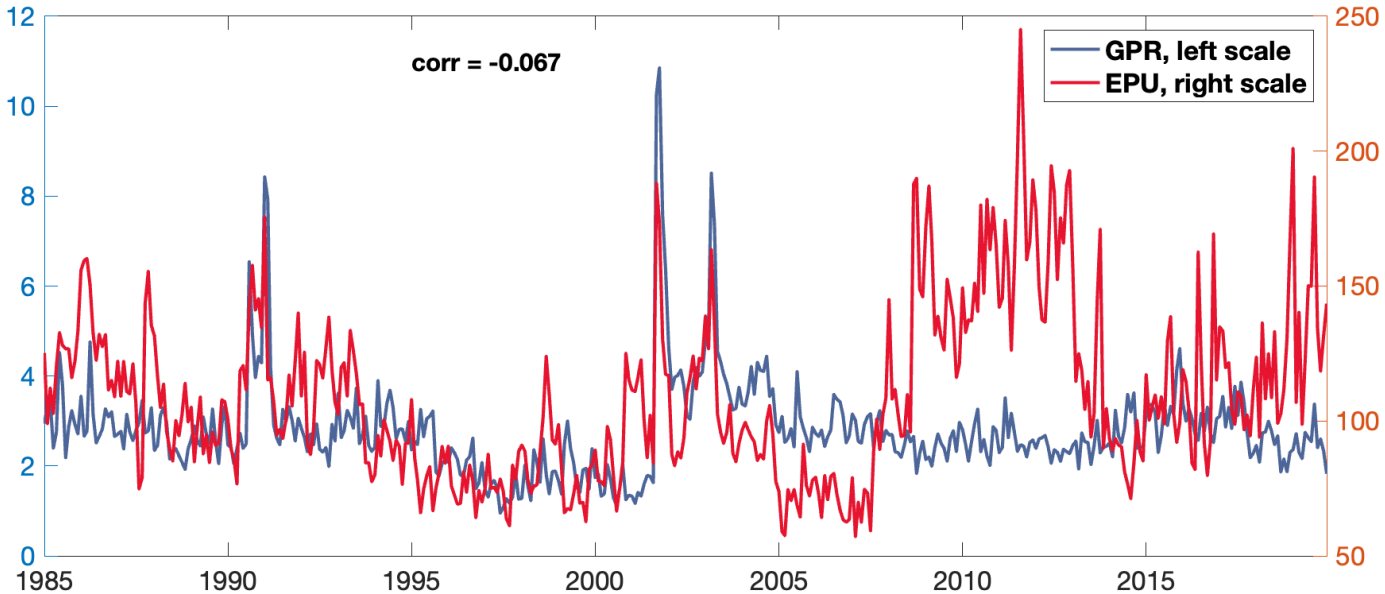
Monetary Policy and Real Uncertainty



Economic Policy Uncertainty (Baker et al., 2016)



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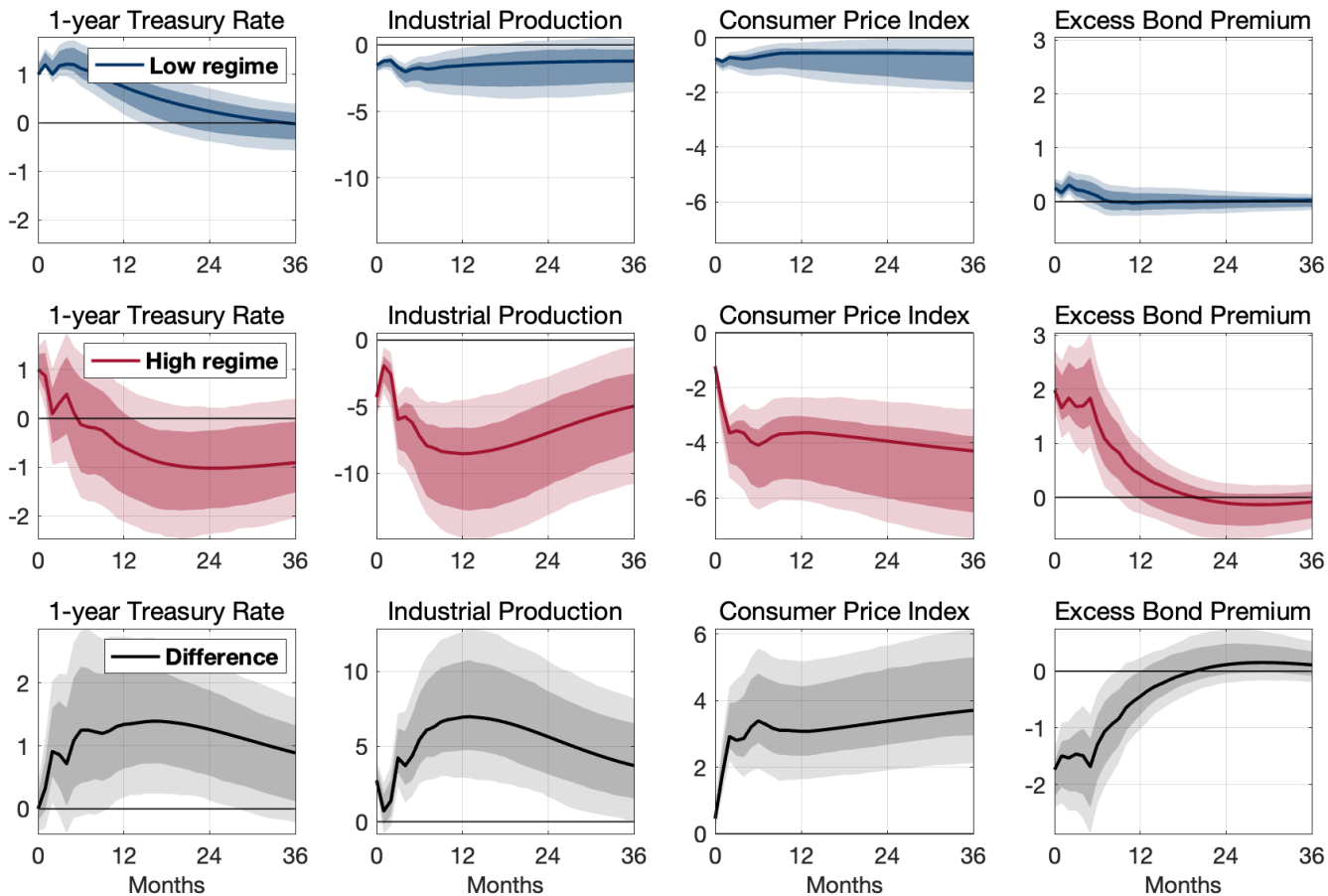
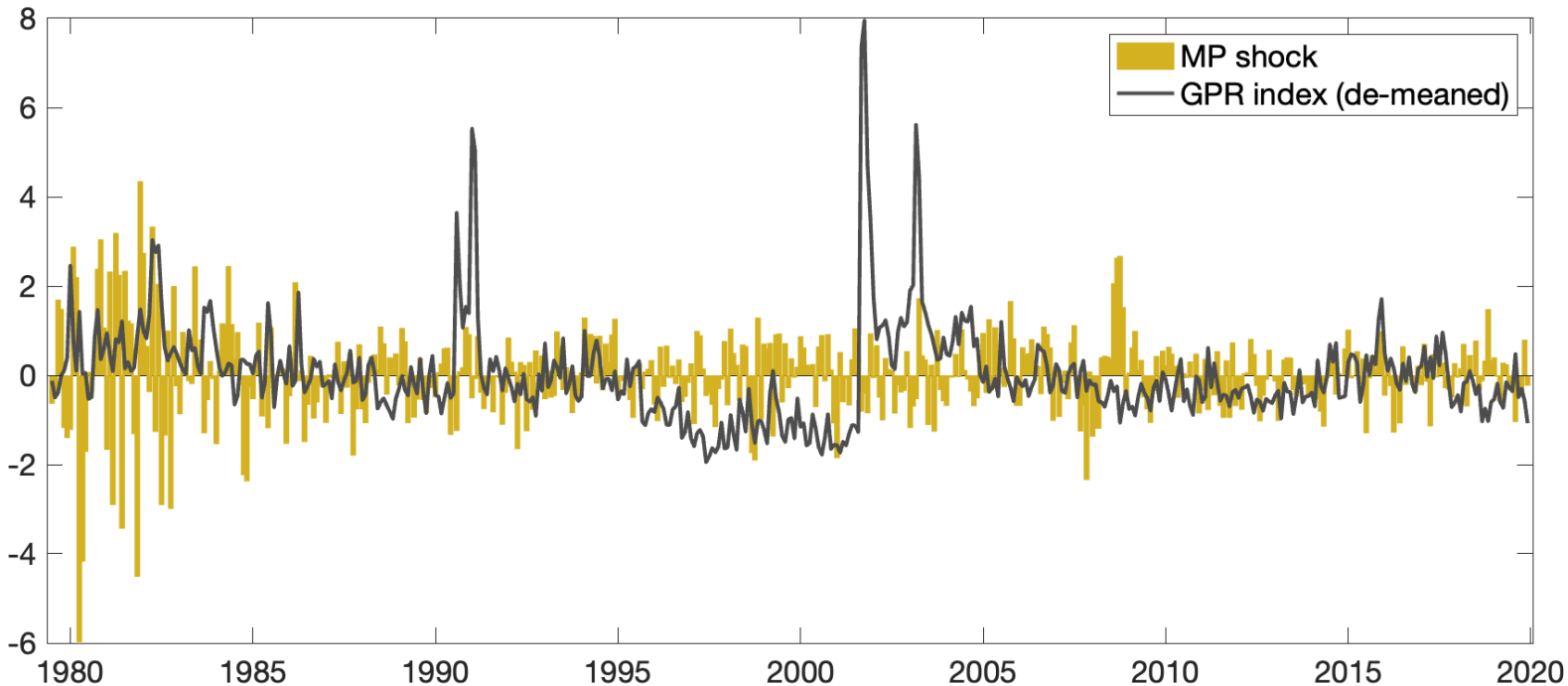
Monetary Policy and Economic Policy Uncertainty



Monetary Policy shocks and the GPR index



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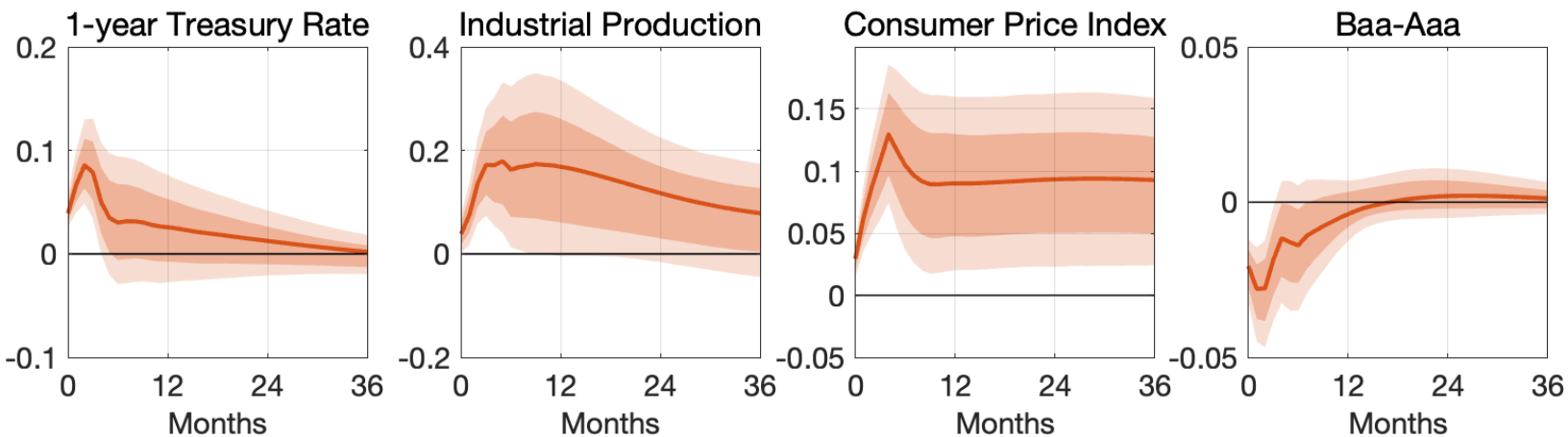
Test of nonlinearity: Baa-Aaa



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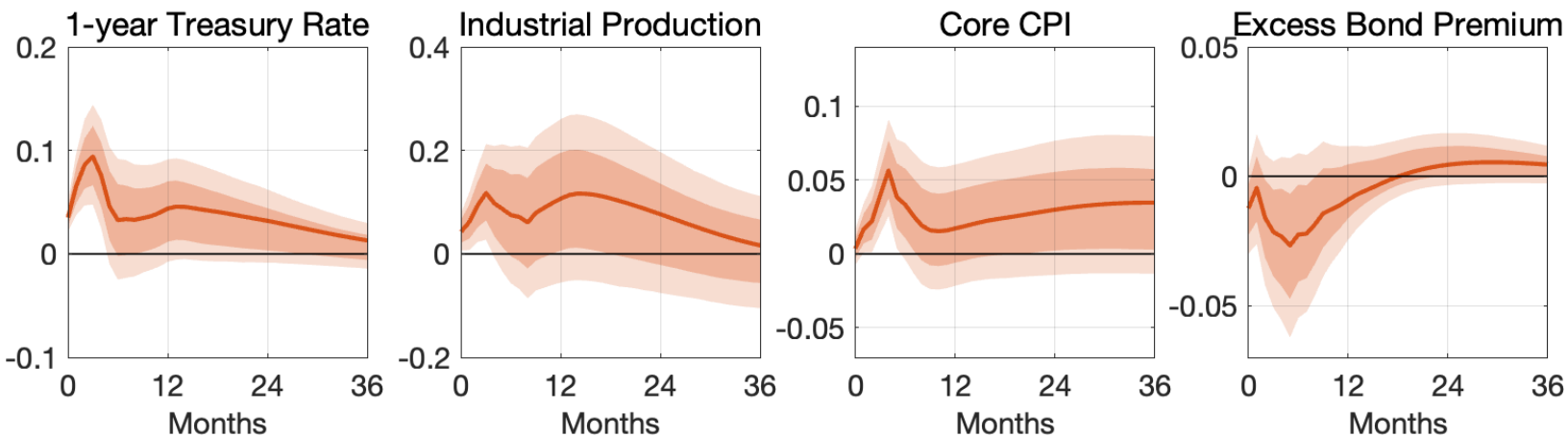
Test of nonlinearity: core CPI



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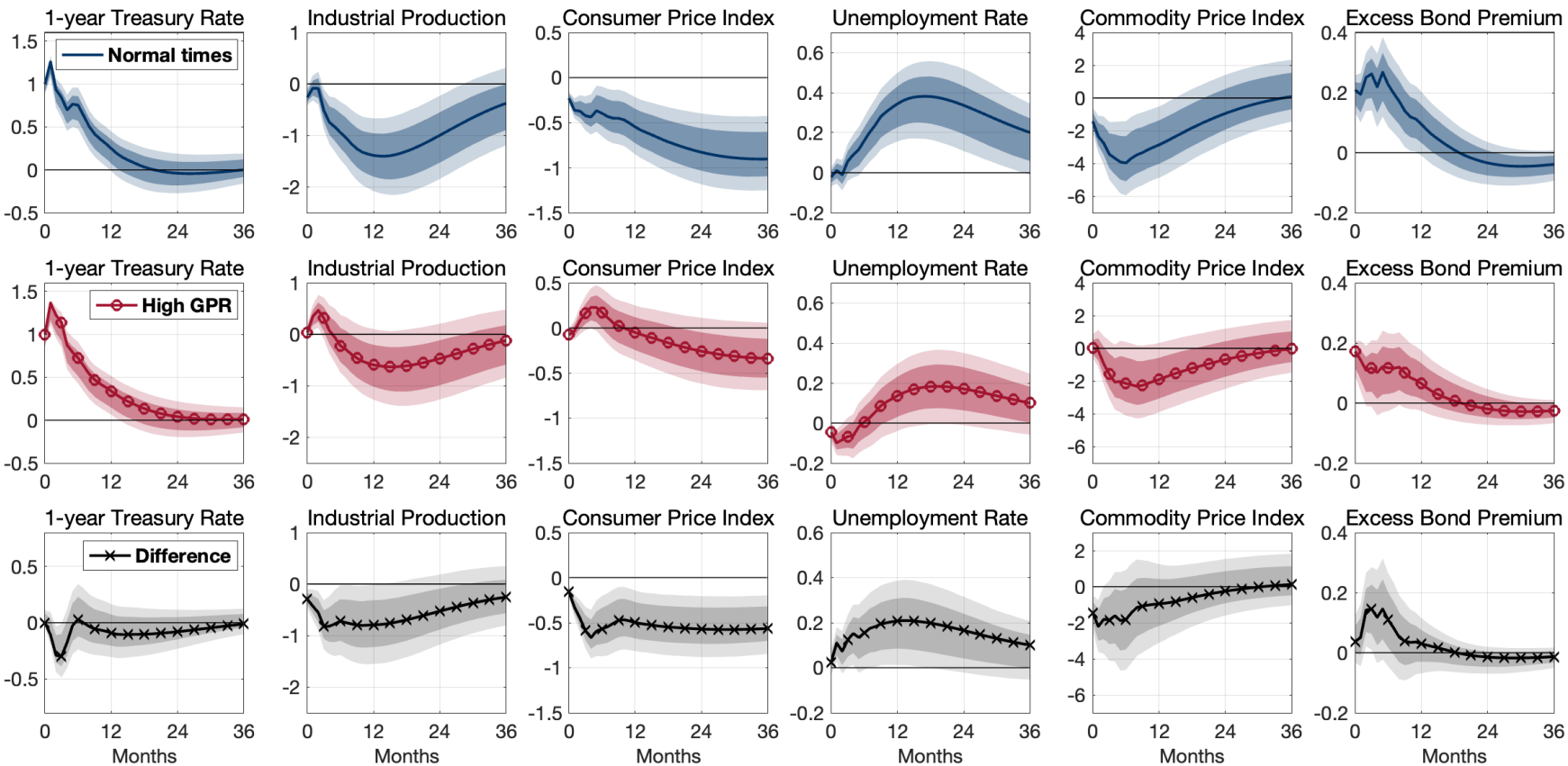
Monetary Policy and Geopolitical Risk: full responses



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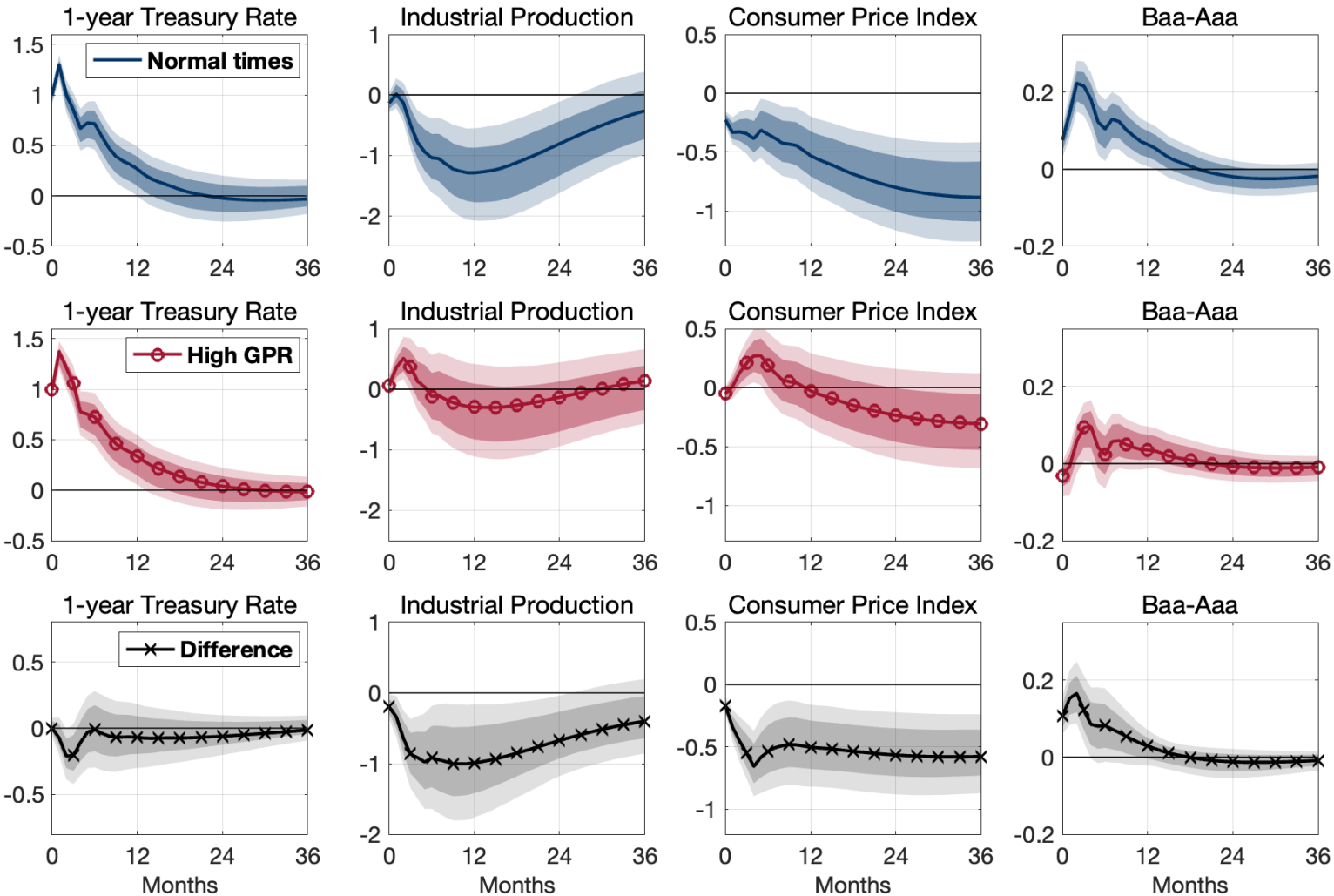
Monetary Policy and Geopolitical Risk: Baa-Aaa



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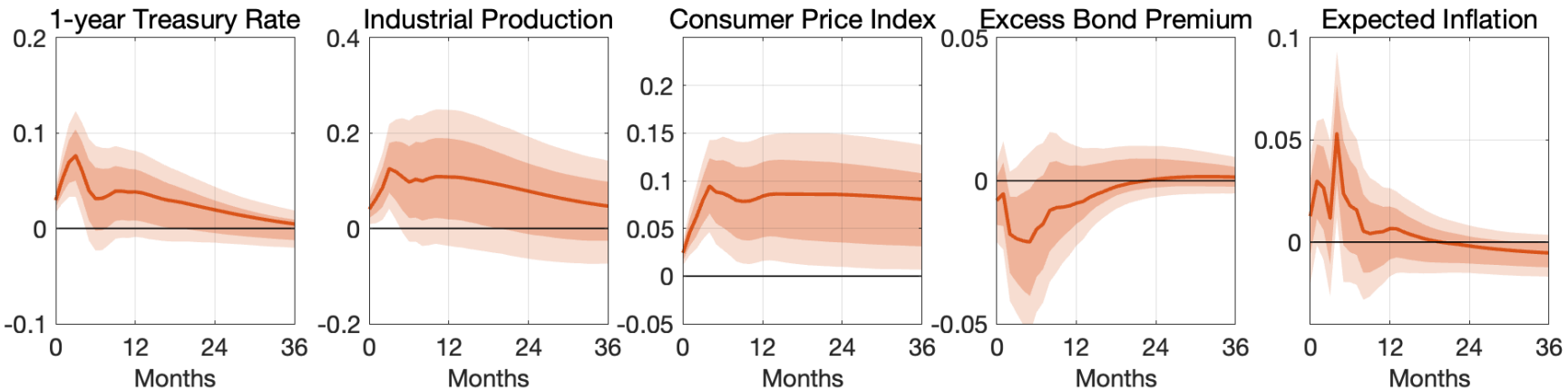
Test of nonlinearity: inflation expectations



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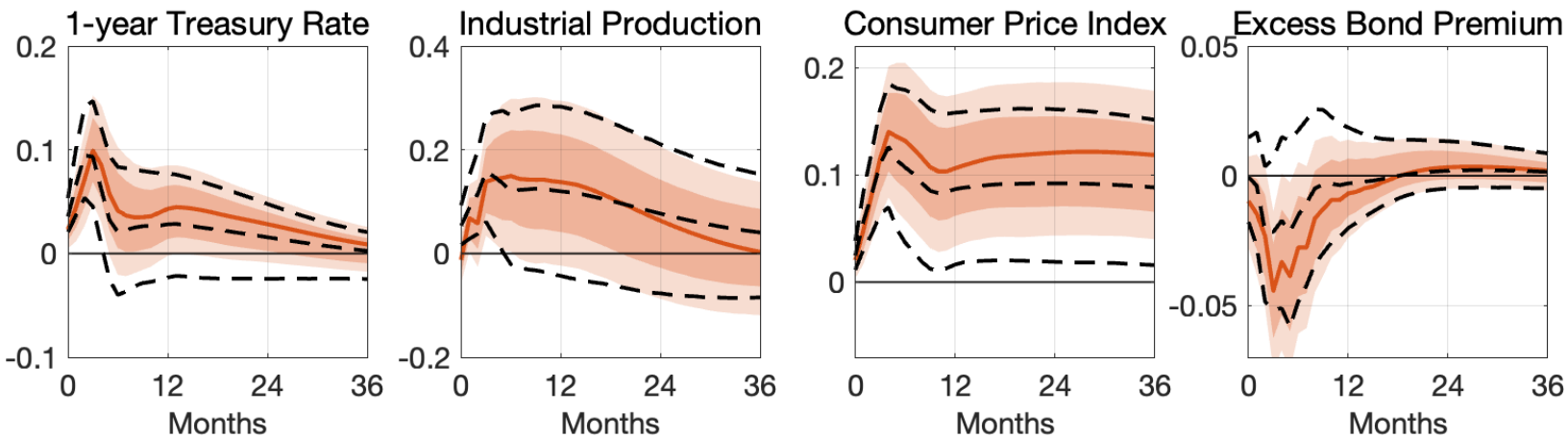
Test of nonlinearity: model with NBER recessions

$$IRF(u_t = \bar{u}) = \alpha(L)\bar{u} + \beta(L)d_t\bar{u}$$



Dashed black lines are the point estimates and the 90% confidence bands of the baseline test.

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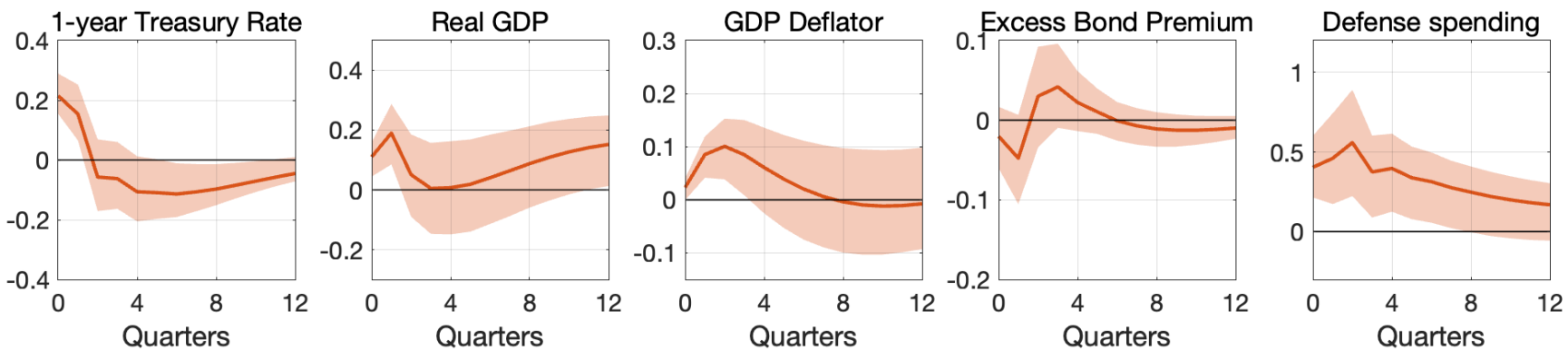
Test of nonlinearity



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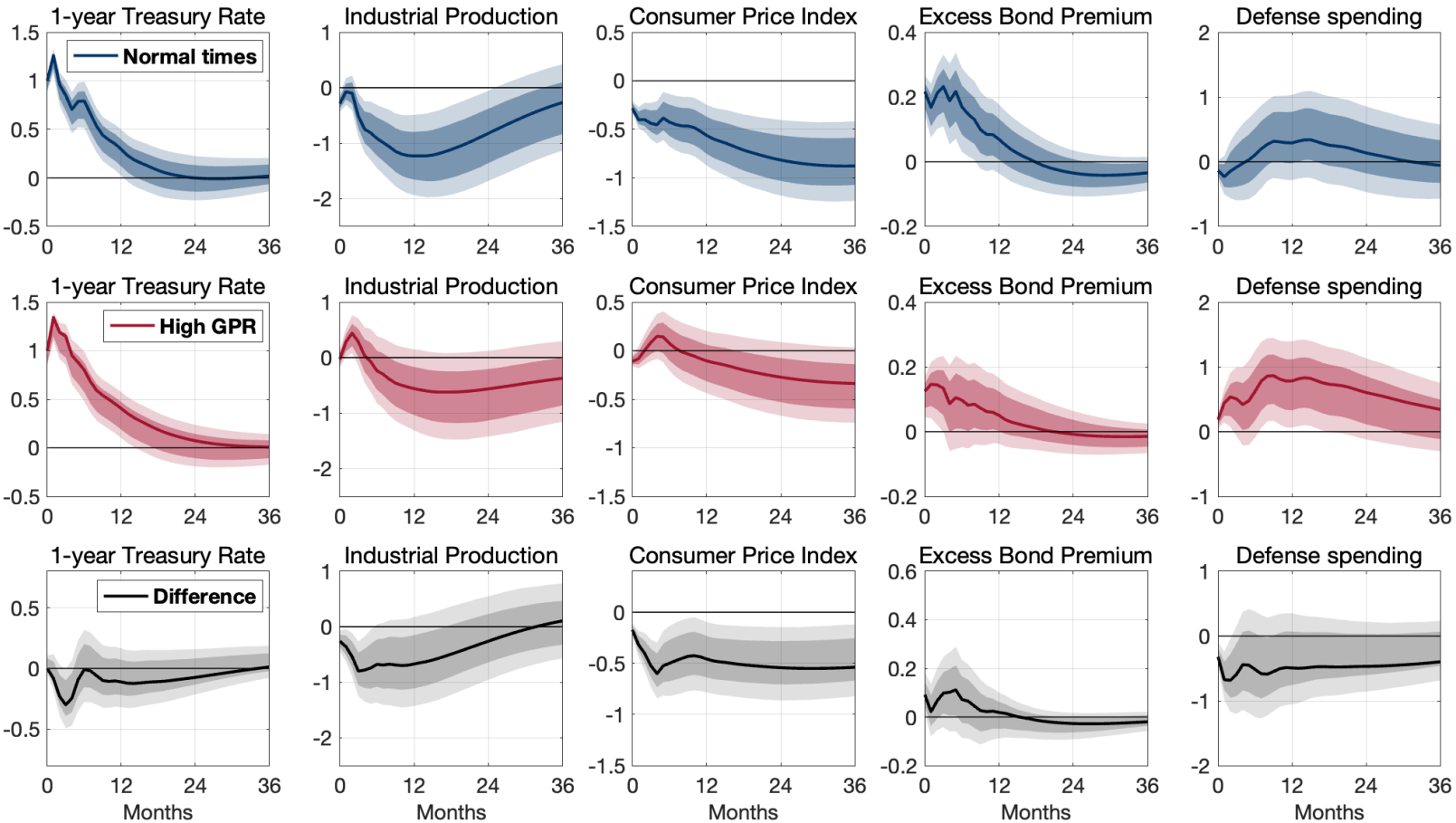
Monetary Policy and Geopolitical Risk



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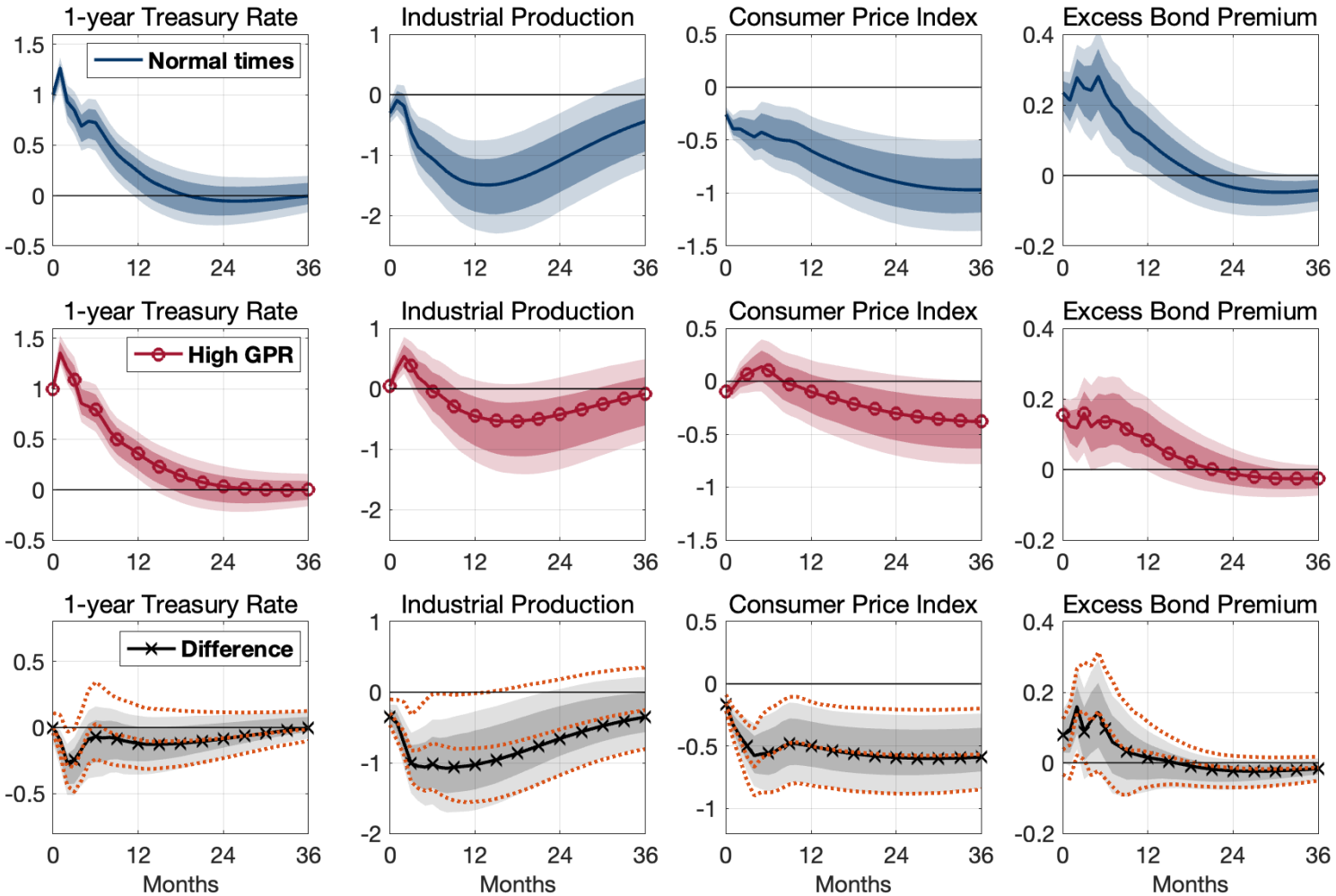
GPR *Threats and Wars*



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Monetary Policy and Geopolitical Risk

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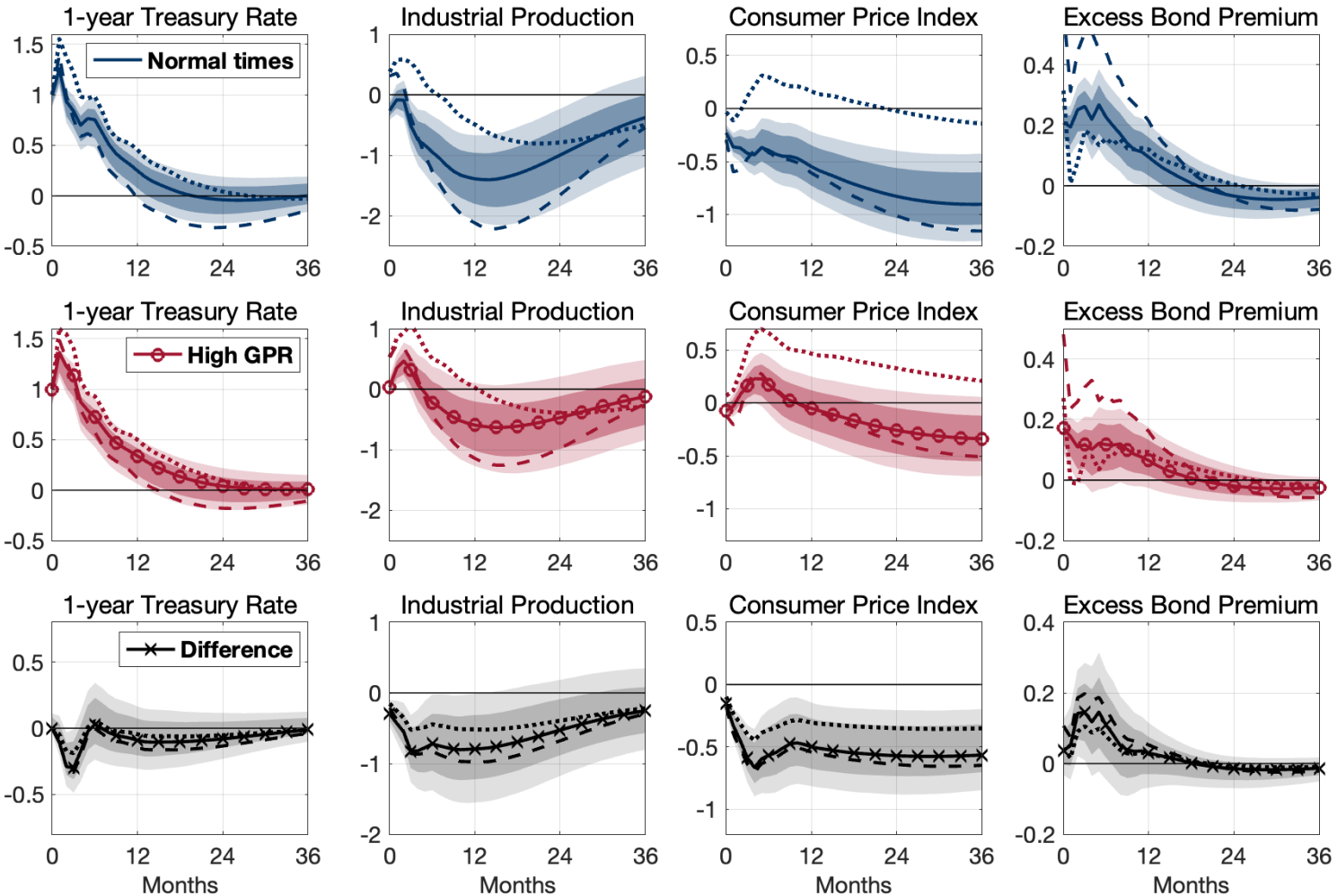
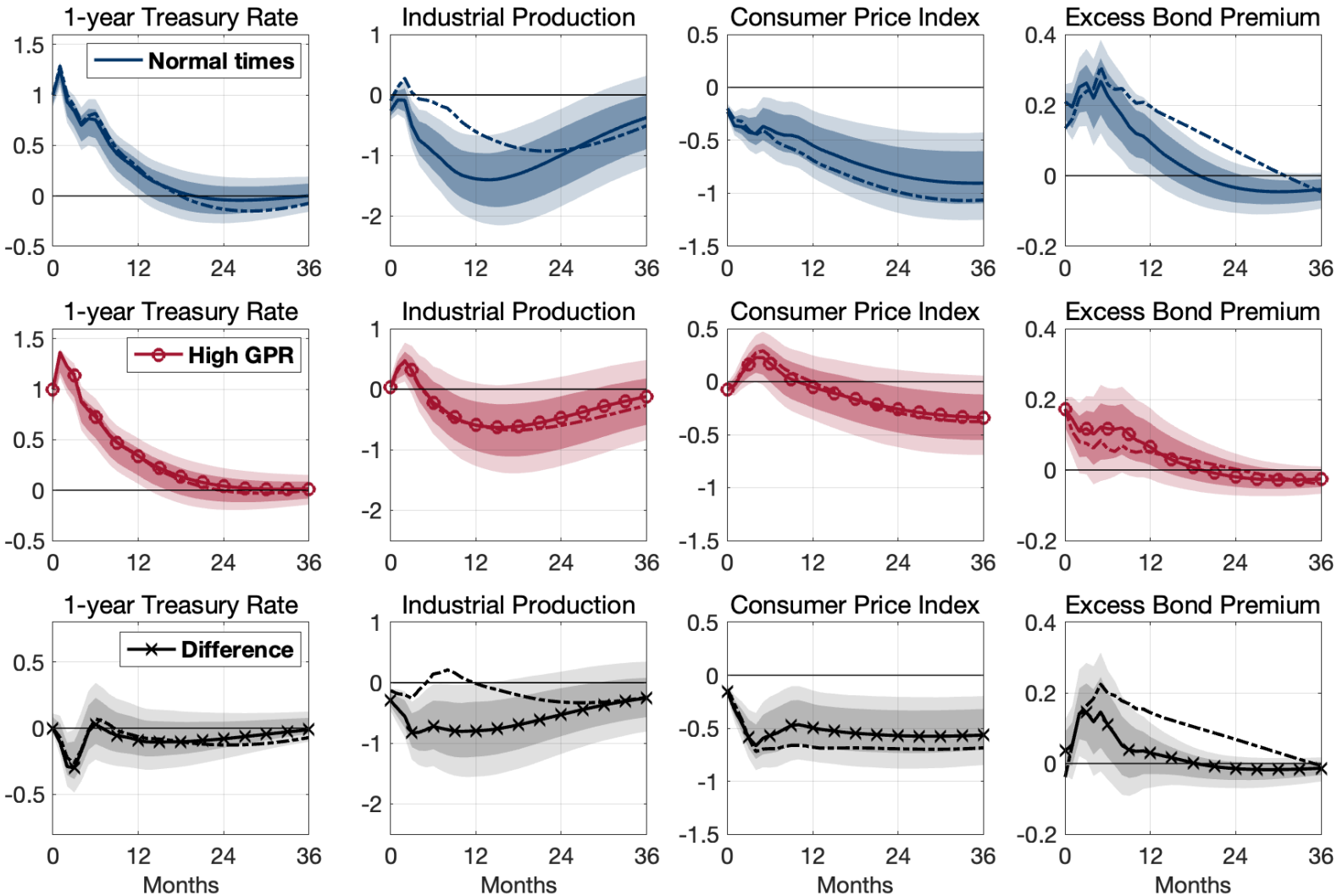


Figure: Dotted lines (Jarociński and Karadi, 2020) and dashed lines (Bauer and Swanson, 2023). The solid lines and shaded area are point estimates and 90% confidence bands for the baseline model, respectively.

Monetary Policy and Geopolitical Risk: ZLB



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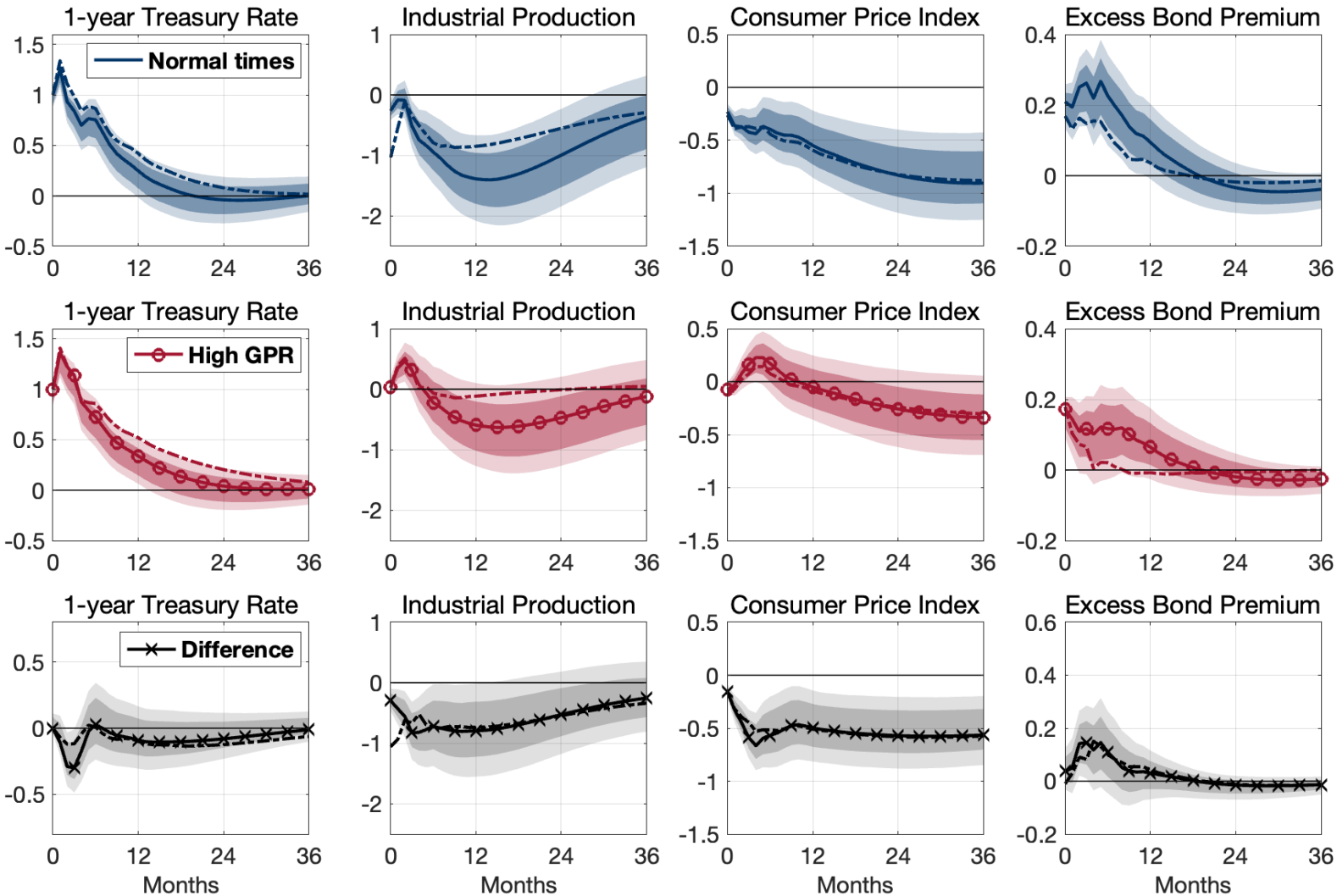
Monetary Policy and Geopolitical Risk: 2023M12



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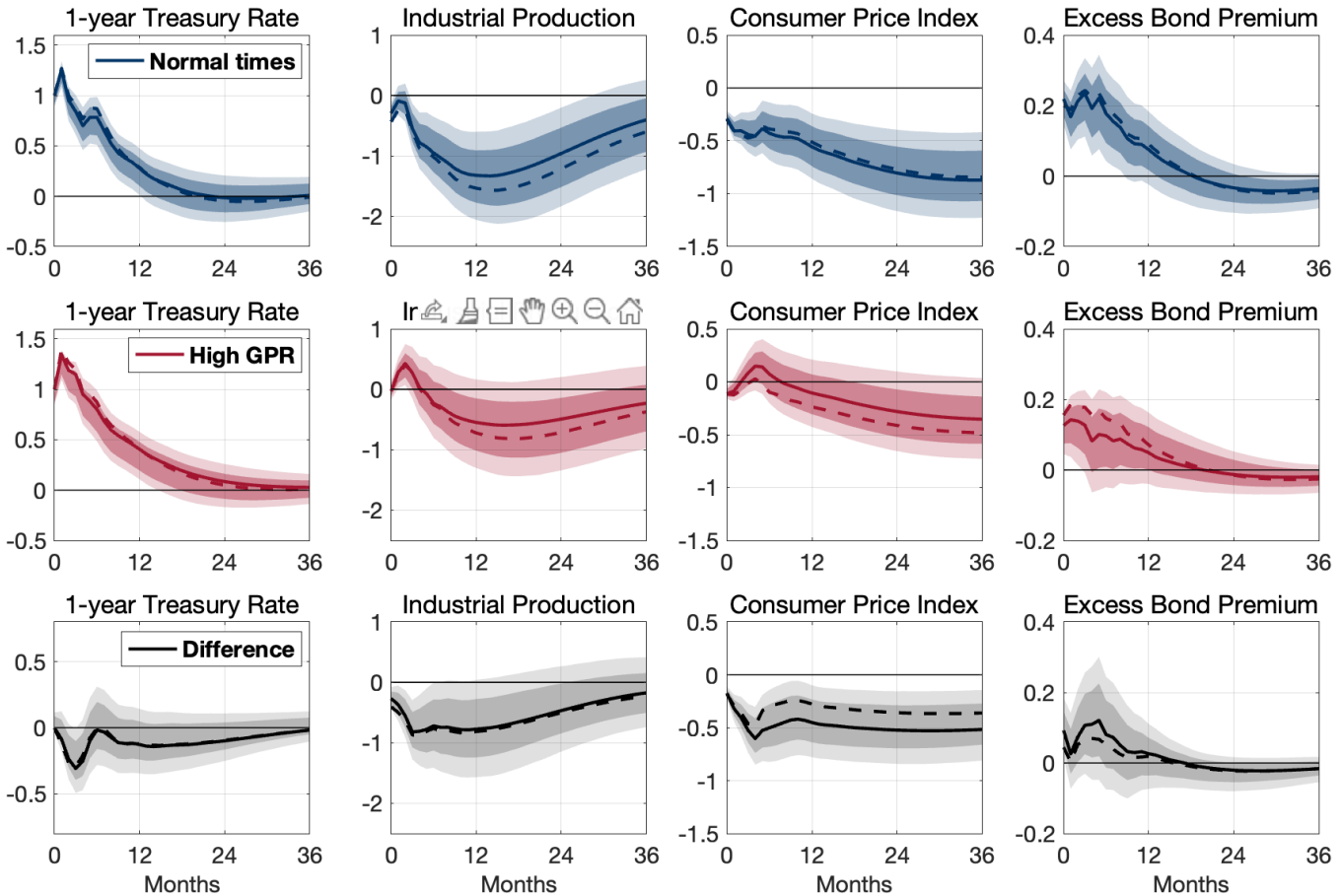
Information sufficiency: add principal component



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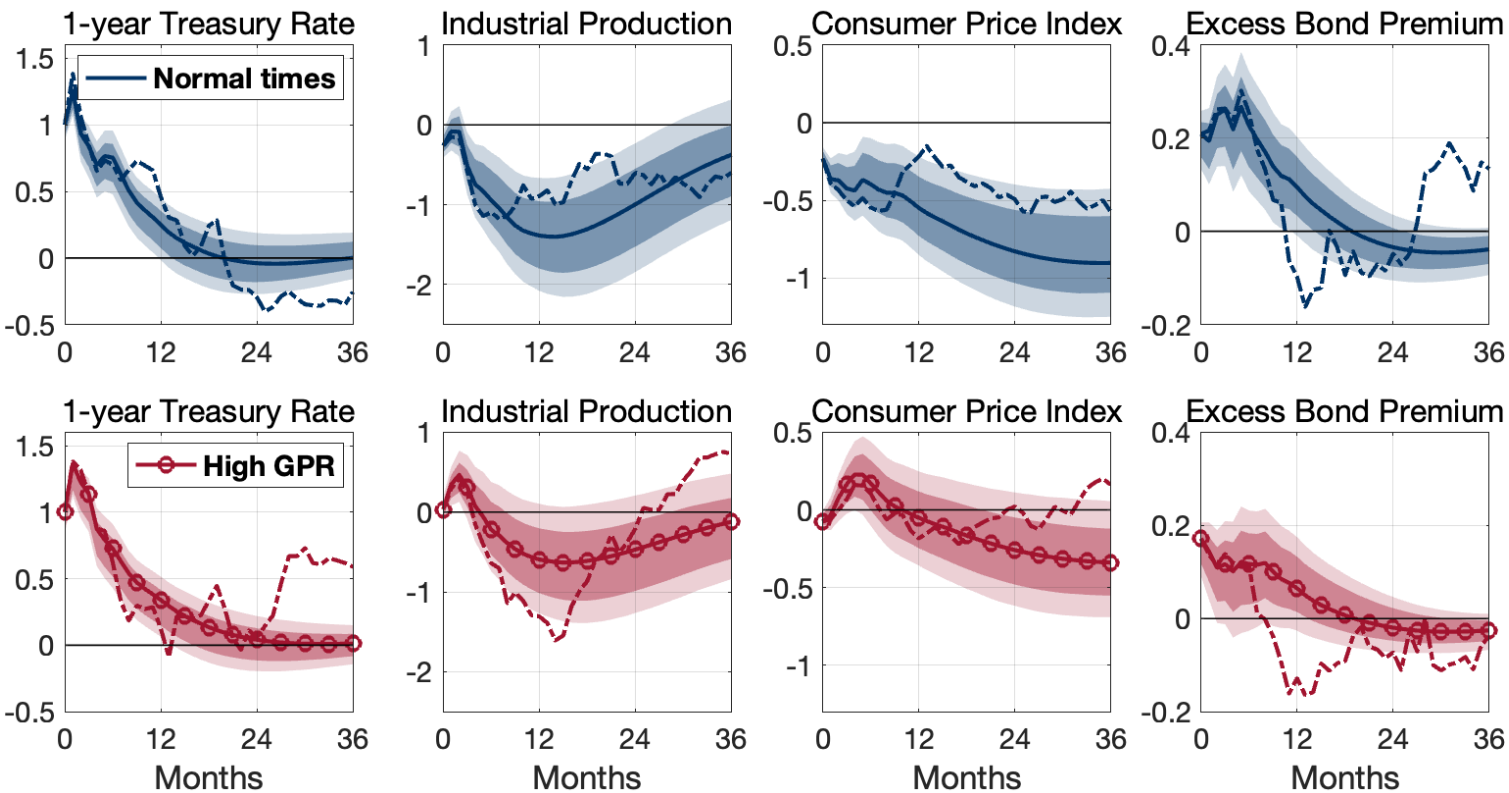
Local Projections



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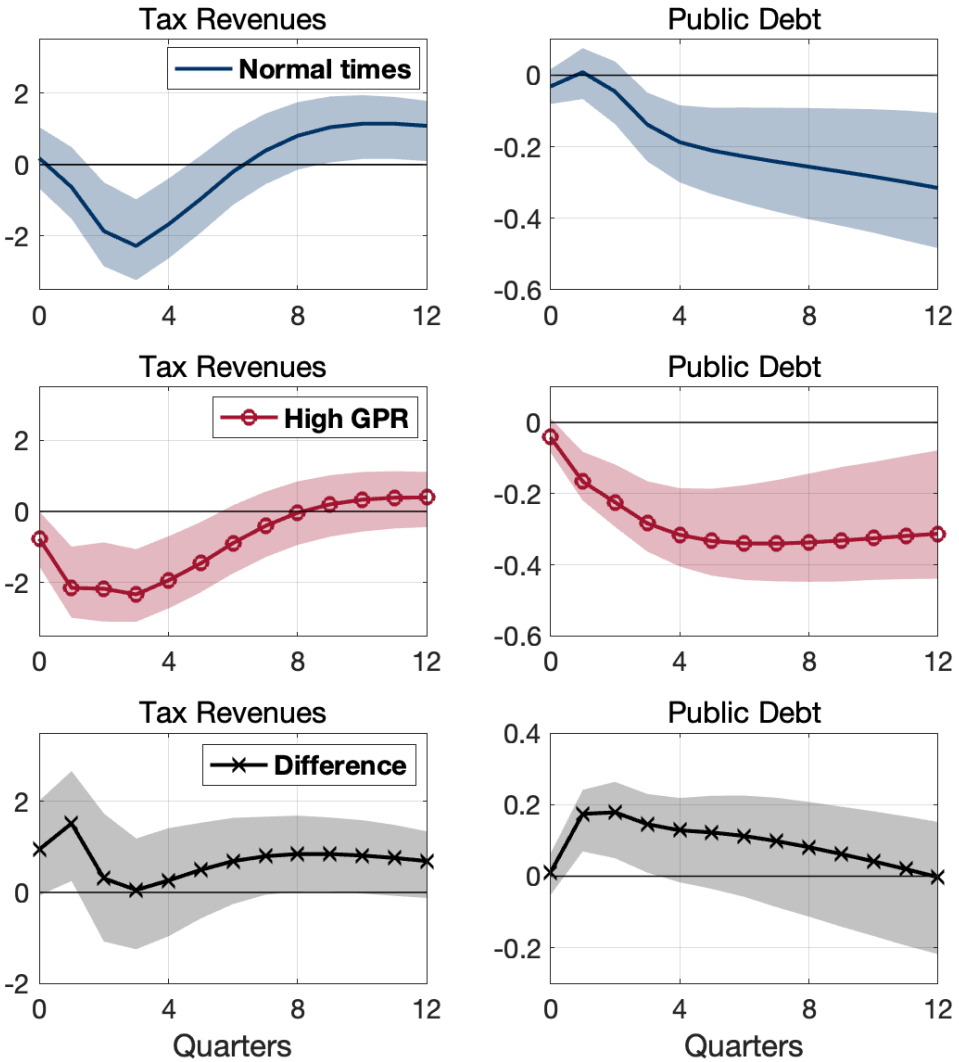
The Role of Fiscal Policy



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Disentangling the GPR index: Terror Acts

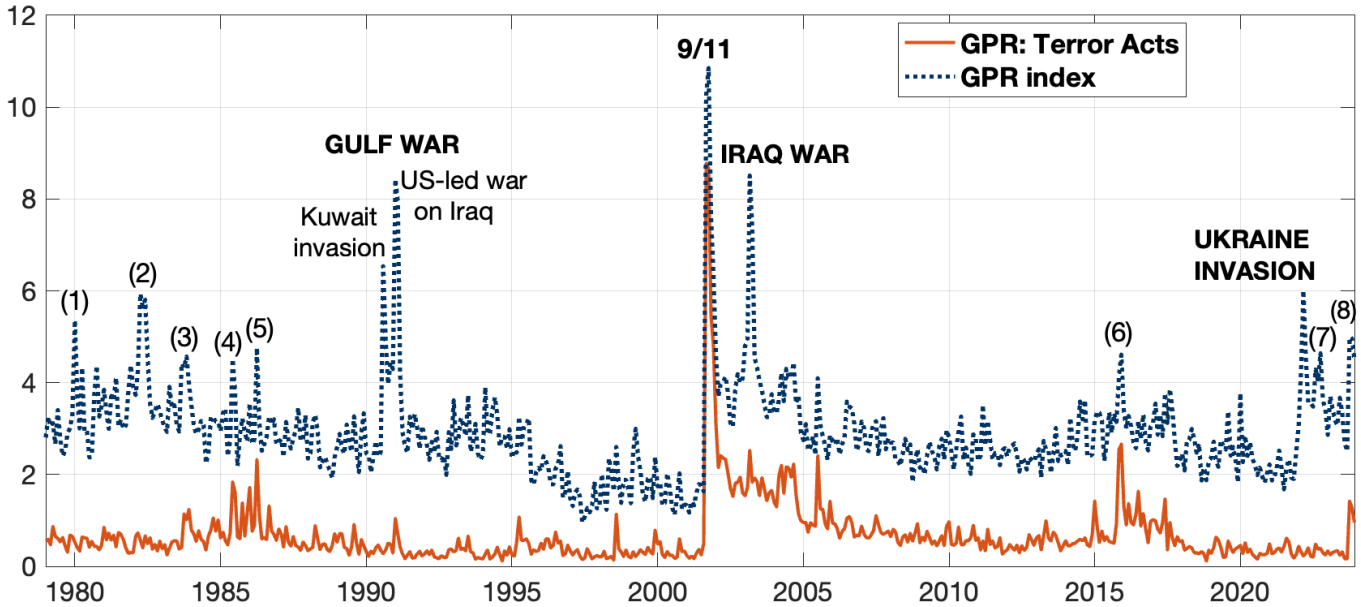

Figure: The dotted blue line is the monthly U.S. historical geopolitical risk index and the solid orange line is the *Terror Acts* index. (1) January 1980: US-Soviet tensions as the Soviet Union invaded Afghanistan in December 1979; (2) April 1982: Falkland war; (3) September 1983: Nuclear war scare; (4) June 1985: Hijacking of TWA Flight 847; (5) April 1986: US bombing of Libya; (6) November 2015: Paris terrorist attack; (7) October 2022: Crimea bridge attack and Russia strikes on Ukraine's energy infrastructure; (8) October 2023: Hamas Terrorist attack and Israeli invasion of Gaza.

GPR and oil futures spread

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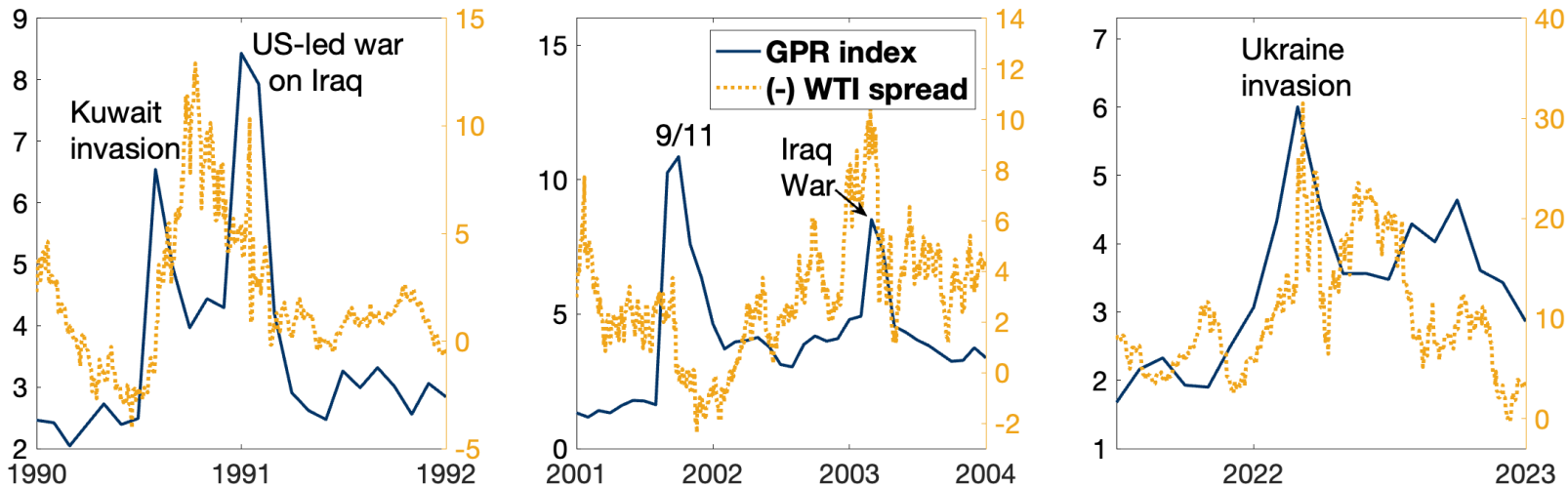
Alquist and Kilian (2010) and Kilian and Murphy (2014): the spread of oil futures prices ($f_t^{12} - f_t^1$) can be viewed as an indicator of fluctuations in the price of oil driven by a precautionary demand component of the real oil price.

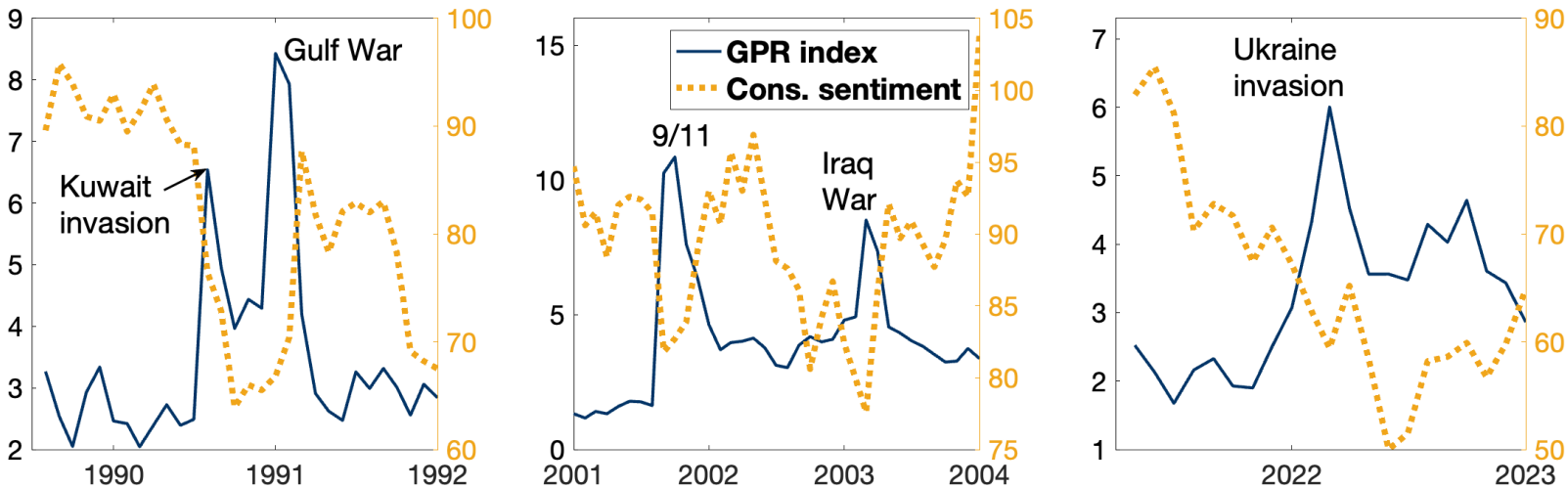
- **Rationale:** If agents anticipate ↑uncertainty about future oil supply: → buy oil futures as insurance against future higher oil prices (or increase oil stocks).



(a) Gulf War (b) 9/11 and Iraq War (c) Russia invades Ukraine

Figure: The blue line is the GPR index and the yellow line is the (negative) daily oil futures spread (12-month to 1-month).

GPR and consumer sentiment



(a) Gulf War (b) 9/11 and Iraq War (c) Russia invades Ukraine

Figure: Geopolitical risk and consumer sentiment

- Regardless of the GPR event, all episodes are associated with a decline in consumer sentiment.
- This is also true for business sentiment See