The Perils of Narrowing Fiscal Spaces

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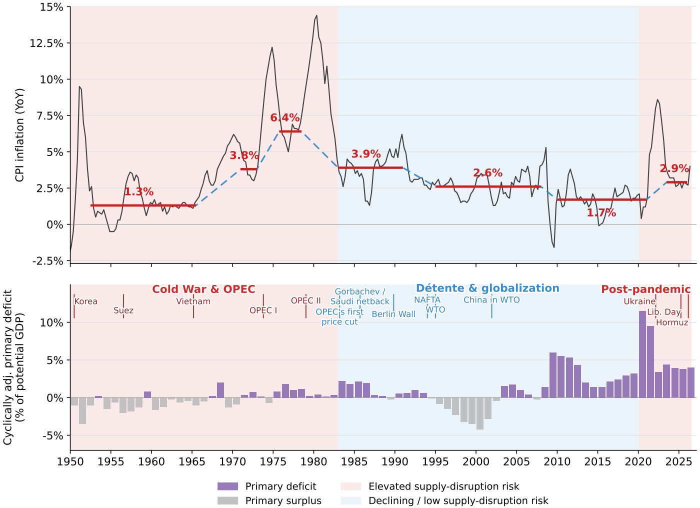
Inflation Ratcheting: Fiscal Policy and Supply-Side Risks



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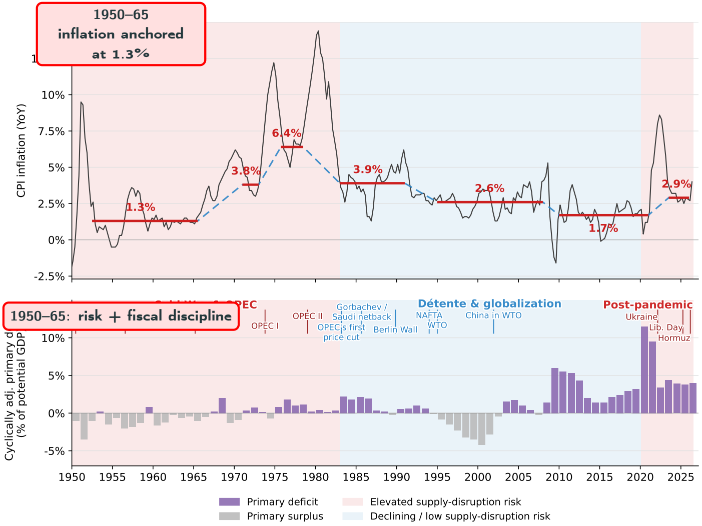

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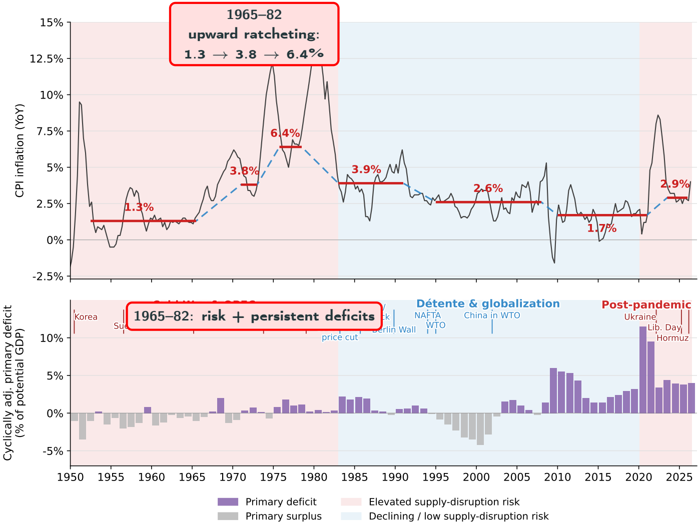

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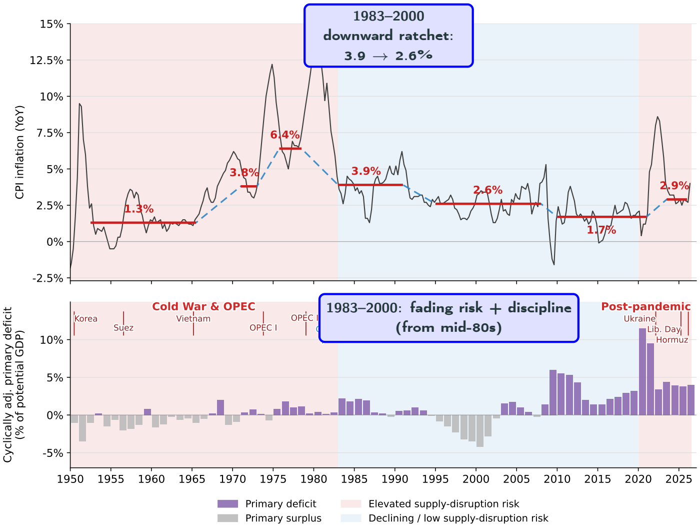

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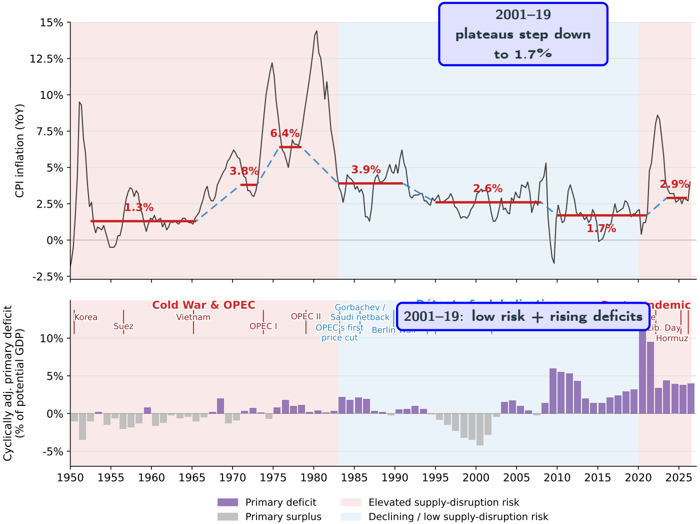

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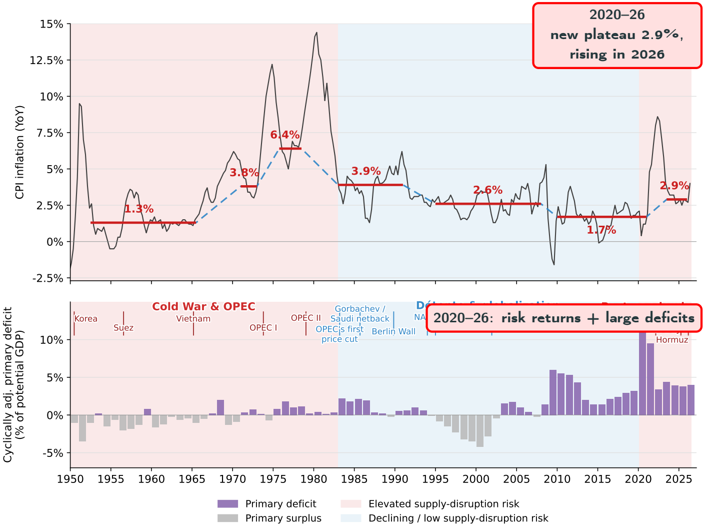

A Model of Limited Fiscal Responsibility

- Government committed to stabilizing debt in the long run, but resists deficits so large that they would eventually require costly fiscal adjustment

- Acts on this resistance by **pressing the central bank to restrain rate increases** - not by adjusting its own budget

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- Government committed to stabilizing debt in the long run, but resists deficits so large that they would eventually require costly fiscal adjustment
- Acts on this resistance by **pressing the central bank to restrain rate increases** - not by adjusting its own budget
- Modeled as a **fiscal limit** on the total deficit the government is willing to accept
    - the **fiscal space** evolves endogenously
    - monetary tightening consumes fiscal space: weaker activity, higher debt service $\Rightarrow$ **State-contingent ceiling on the nominal interest rate**

Preview of Main Results

1. The limit binds **asymmetrically**: **supply shocks consume more fiscal space**
   - Inflationary supply shocks widen the deficit precisely when tightening is needed
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2. **Fiscal limit and supply-side risks interact**
   - Low fiscal responsibility $\times$ high supply-shock volatility
     $\rightarrow$ constraint binds more often
3. **Trend inflation and inflation tail risks are endogenous outcomes**
   - The **chance of future binding** lifts expectations before the constraint ever binds
   - Trend inflation and tail risk **vary with tightness of fiscal limit and supply risk**

Preview of Main Results (cont'd)

4. Taking the model to US data (particle filter)

   - **1965–90**: trend inflation ratchets up as fiscal space narrows amid rising supply risk — and drifts back down with declining risk and subsequent fiscal adjustment [Counterfactual inflation: no ratcheting and peak inflation around 4pp lower]

   - **Post-COVID**: model explains rise in long-run inflation expectations through decline in fiscal responsibility
     $\rightarrow$ Agents expect less room for future monetary tightening.

Related Literature: Fiscal Limits and Trend Inflation

- **Monetary–fiscal interactions and inflation:** Sargent and Wallace (1981); Leeper (1991); Sims (1994); Woodford (1994, 1995, 2001); Cochrane (1998, 2001); Schmitt-Grohé and Uribe (2004); Bassetto (2002); Reis (2017).
- **Policy regimes and unfunded debt:** Bianchi and Ilut (2017); Bianchi and Melosi (2017); Leeper et al. (2017); Bassetto and Sargent (2020); Bianchi et al. (2023); Smets and Wouters (2024).
- **Fiscal pressure on monetary policy:** Bianchi and Melosi (2019); Bianchi et al. (2023); Drechsel (2026).
- **Fiscal limits and inflation risk:** Davig et al. (2010, 2011)
- **Fiscal theory in OLG model and HANK models:** Angeletos et al. (2024, 2025a,b); Kaplan et al. (2025).

Roadmap

1. **A Nonlinear New Keynesian Model with Limited Fiscal Responsability**
2. The response of the economy to shocks
3. Trend inflation and inflation risks
4. Empirical analysis

The New Keynesian Model with the Fiscal Limit

- **Representative household** subject to preference shocks ζ_t

$$C_t^{-\sigma} = \beta R_t \, \mathbb{E}_t \left[e^{\zeta_{t+1}-\zeta_t} C_{t+1}^{-\sigma} \frac{1}{\Pi_{t+1}} \right]$$

- **Phillips curve** (Rotemberg pricing) with markup shocks μ_t

$$\varphi \left(\frac{\Pi_t}{\Pi} - 1 \right) \frac{\Pi_t}{\Pi} = (1-\epsilon) + \epsilon M C_t + \varphi \mathbb{E}_t \left[\Lambda_{t,t+1} \left(\frac{\Pi_{t+1}}{\Pi} - 1 \right) \frac{\Pi_{t+1}}{\Pi} \frac{Y_{t+1}}{Y_t} \right] + \mu_t .$$

- **Monetary authority** sets nominal interest rate, responding to output and inflation

$$R_t^N = R \left(\frac{\Pi_t}{\Pi} \right)^{\phi_\Pi} \left(\frac{Y_t}{Y} \right)^{\phi_Y}$$

Without fiscal limit: $R_t = R_t^N$.

The model with fiscal limit (cont'd)

- Fiscal authority collects taxes τ_t and issues one-period bonds b_t

$$b_t = R_t \underbrace{\left(b_{t-1} \frac{Y_{t-1}}{\Pi_t Y_t} - \tau_t \right)}_{\equiv \Theta_t} = R_t \, \Theta_t$$

Θ_t: government's financing need in period t

- Fiscal rule responds to debt and output deviations

$$\tau_t = \tau + \delta(b_{t-1} - b) + \delta_Y (Y_t - Y)$$

- Parameter δ ensures **long-run debt stabilization** through fiscal adjustment.

The model with fiscal limit (cont'd)

- **Fiscal limit is a ceiling $\bar{\xi}_t$ on the total deficit-to-GDP ratio**

$$\text{def}_t = \underbrace{(R_t - 1)\,\Theta_t}_{\text{Interest bill}} - \underbrace{\tau_t}_{\text{Primary surplus}} \leq \bar{\xi}_t \qquad \text{where } \Theta_t = b_{t-1}\frac{Y_{t-1}}{\Pi_t Y_t} - \tau_t$$

- Monetary policy affects fiscal space ($\bar{\xi}_t - \text{def}_t$) directly and indirectly

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Interpretation: Limited fiscal responsibility

A government running large primary deficits without taking responsibility for the resulting increase in debt.

A way to achieve this is by forcing the central bank to keep interest rates lower, thereby containing debt accumulation.

The model with fiscal limit (cont'd)

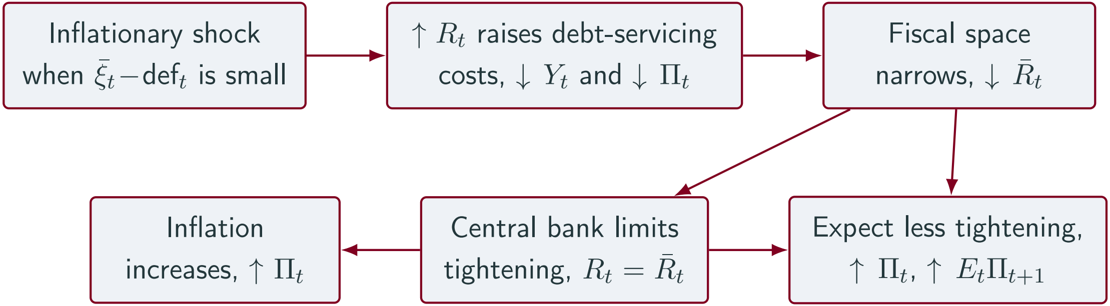
- **Fiscal limit translates into endogenous constraint on monetary policy**

$$R_t \;\leq\; \bar{R}_t \;\equiv\; 1 + \frac{\bar{\xi}_t + \tau_t}{\Theta_t}$$

- Taken together, monetary authority sets interest rate as

$$R_t = \min\left[R_t^N, \bar{R}_t\right].$$

Overview of mechanism



- **Fiscal inflation and trend inflation due to upper bound on interest rates**
  - Even before the constraint binds, risk of future binding lifts inflation

$\Rightarrow$ As **fiscal limit and supply risk** vary over time, **trend inflation** moves with them.

Model solution and calibration

- Model solved in **nonlinear** specification using **time iteration** (Richter et al., 2014)

  Future model versions: neural network approach (Kase et al., 2025)

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- Calibration based on postwar U.S. data (1960Q1-2025Q4) Detailed table
  - Shock vol. match inflation, output-growth vol. and their weak negative correlation
  - Taylor rule: ϕ_π=1.5 and ϕ_Y=0.1
  - Fiscal rule: δ=0.02 and δ_Y=0.5
  - Fiscal limit: $\bar{\xi}_t$ centered around 0.061 (90th perc. of the total deficit-to-GDP ratio)

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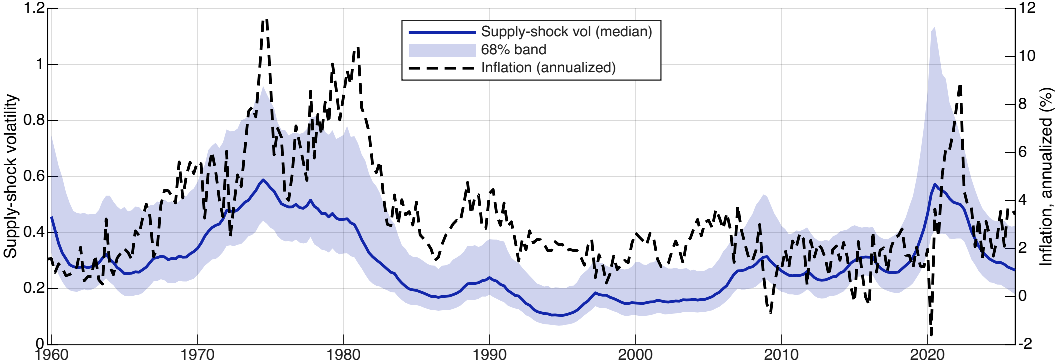
  - Fiscal limit: $\bar{\xi}_t$ centered around 0.061 (90th perc. of the total deficit-to-GDP ratio)
- Allowing for **time-variation in fiscal responsibility and supply-shock risks**
  Model solved under anticipated utility assumption (Cogley and Sargent, 2008) and implementation via pseudo-state variables (see also Kase et al., 2025)
  - We allow the fiscal limit ($\bar{\xi}$) to be time-varying
  - We estimate time-varying supply shock volatility based on structural TVP-BVAR

Time-varying structural supply shock volatility



Notes: Estimated structural supply shock volatility from bivariate TVP-BVAR with inflation and output gap. Sample period from 1960Q1-2025Q4. Identification using sign restrictions on IRFs and structural coefficients following methodology by Arias et al. (2026).

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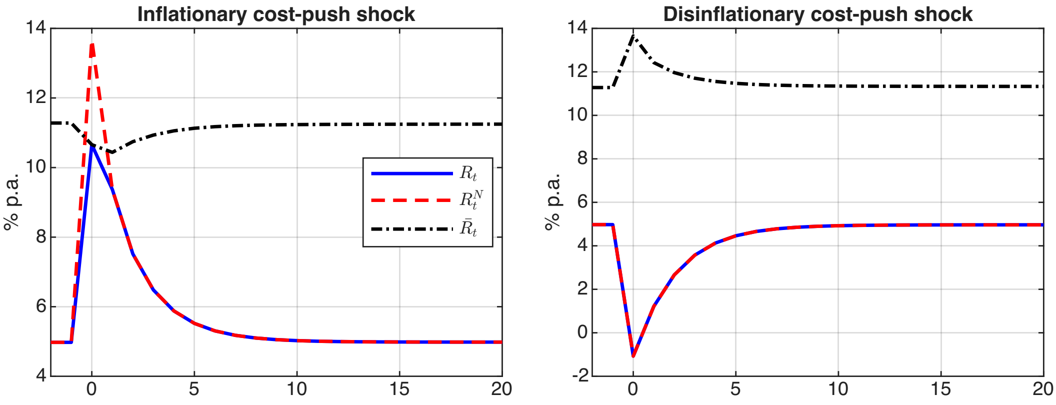
Model dynamics under fiscal limit

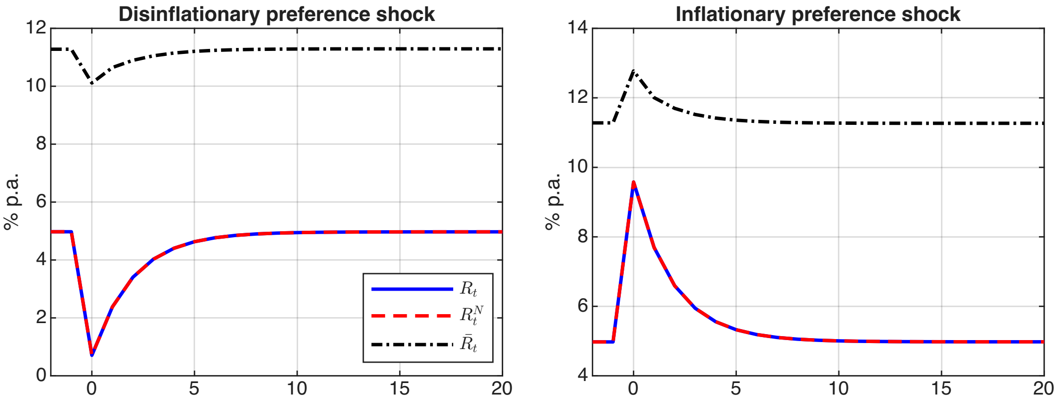
- Illustration: Interest rate dynamics in response to large demand/supply shocks
  $\rightarrow$ Fiscal limit may bind after **inflationary supply shock**
  $\Rightarrow$ Higher inflation, stronger real activity and lower debt accumulation
- Model simulations: what makes constraint most relevant for monetary policy?
  - Role of economic environment: tightness of fiscal limit and supply-side volatility
  - Role of shock (history): demand vs supply

Cost-push shock and the fiscal limit



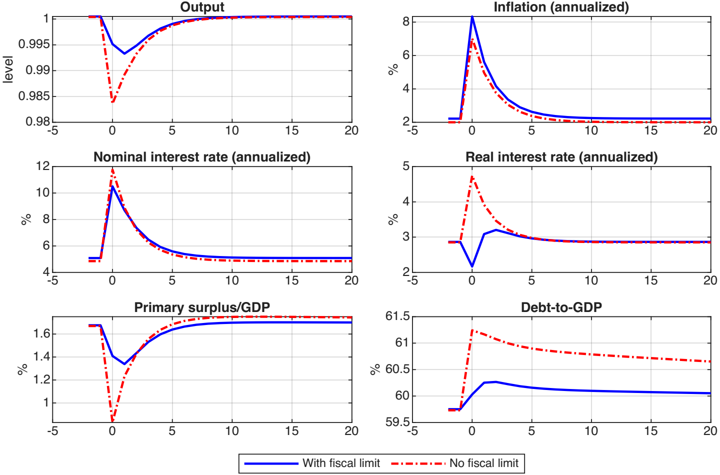
Notes: Dynamics of nominal, notional and upper bound interest rate in response to a three-standard-deviation inflationary (left panel) and disinflationary (right panel) cost-push shock. Shock happens in period 0.

Demand shock and the fiscal limit



Notes: Dynamics of nominal, notional and upper bound interest rate in response to a three-standard-deviation disinflationary (left panel) and inflationary (right panel) preference shock. Shock happens in period 0.

Economic impact of an inflationary markup shock

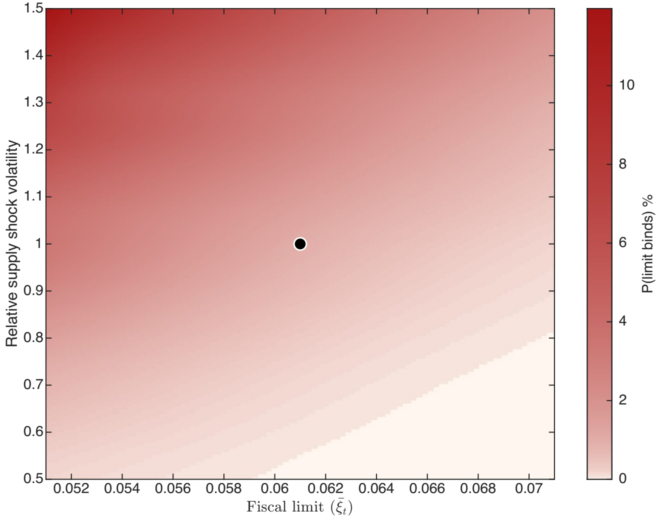


- Inflation rises, output contracts
- Fiscal pressure caps the response: central bank tightens, but less than the notional rule
- Real rate decreases

⇒ higher inflation, stronger activity and lower debt accumulation

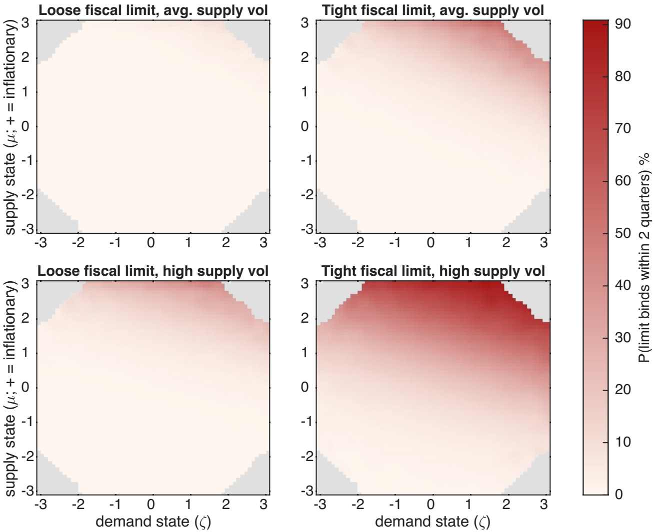
Notes: Dynamics in response to three-standard-deviation inflationary markup shock. Initialization at ergodic mean. Shock happens in period 0. IRFs

Risk and fiscal margins matter jointly



- **Interaction** between tightness of **fiscal limit** and **supply-shock volatility** determines how often monetary policy is constrained
- Moving from centered fiscal limit and average supply shock volatility to environment with tight fiscal limit and 1.5 times supply shock volatility
  $\rightarrow$ probability of binding limit increases by more than $10pp$

Path dependence



- Given environment, **supply shocks** are the main source of binding episodes
- Expansionary demand state, combined with a large or sequence of supply shocks makes constraint most binding

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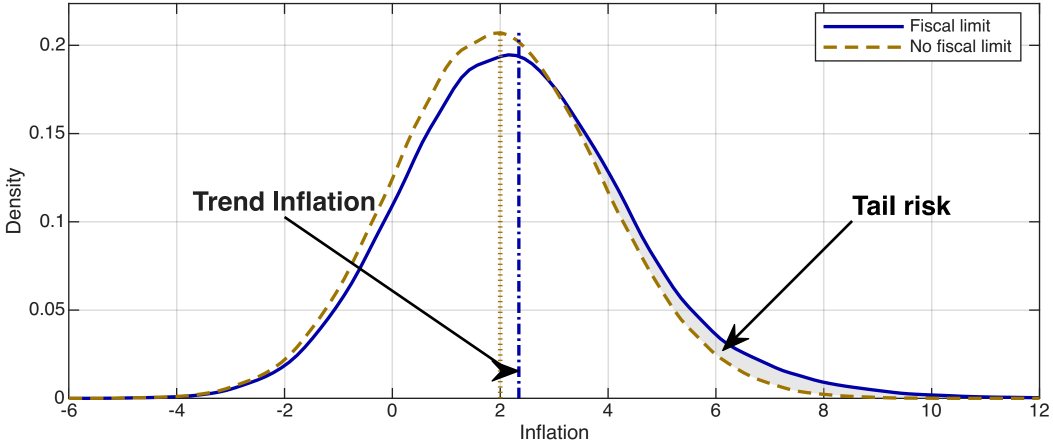
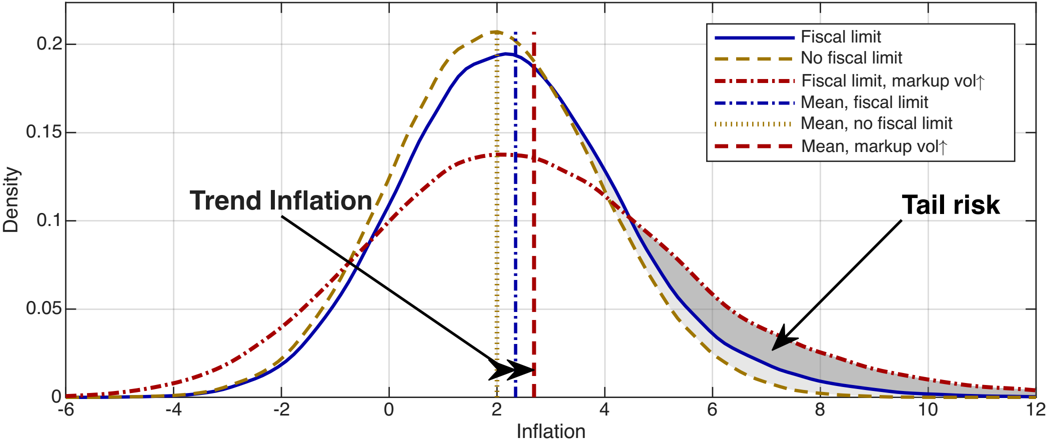
Trend inflation and inflation risks



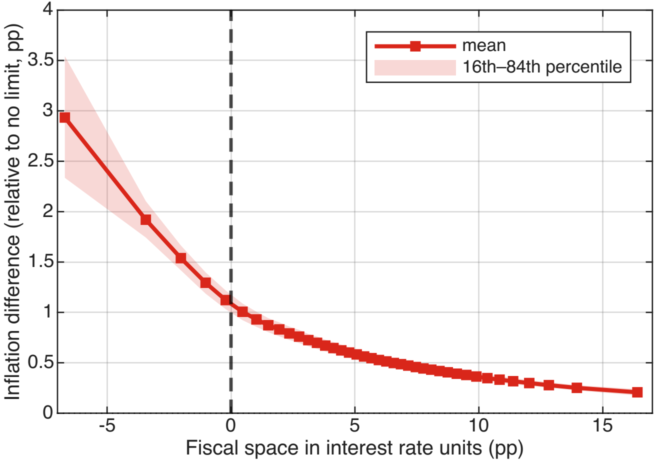
Notes: Simulated distribution of inflation outcomes under model with fiscal limit (blue) and without (yellow).

Trend inflation and inflation risks



Notes: Simulated distribution of inflation outcomes under model with fiscal limit (blue: low supply shock volatility, red: high supply shock volatility) and without (yellow).

Nonlinear effects of the fiscal limit



Higher supply side volatility:

- Inflation sits above target even with ample fiscal space: risk of future binding lifts exp. today
- Strongly nonlinear inflation difference
- Narrow fiscal space raises inflation risk, not just level relative to no-limit model but also dispersion

Notes: Inflation difference relative to the model without a fiscal limit as fiscal space varies.

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Quantitative Analysis of the Inflation Dynamics

- Nonlinear state-space representation as starting point

$$\begin{aligned} X_t &= f(X_{t-1}, \Omega_t, \nu_t,) && \text{Transition equations} \\ Y_t &= g(X_t) + \mu_t && \text{Observation equations} \end{aligned}$$

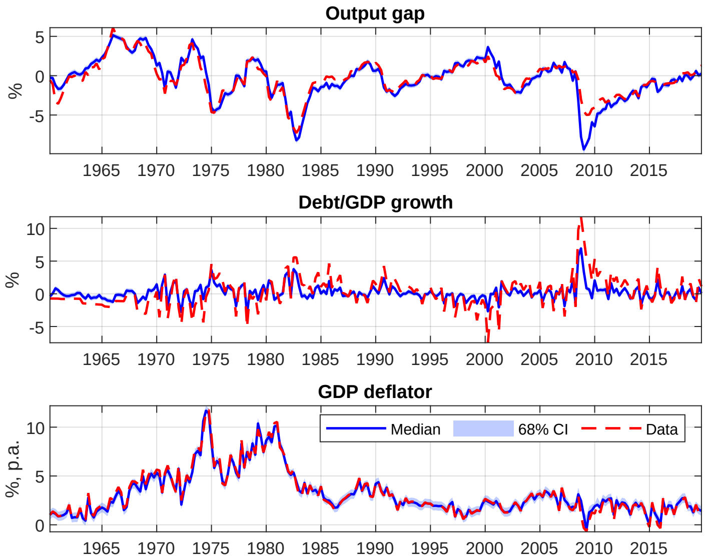
- First set of equations contains the transition equations
  - Depends on state variables X_t, pseudo state variables Ω_t, and structural shocks ν_t
  - Nonlinear functions f are obtained from the global solution method
- Observation equations connect the state variables with the observables
  - Inflation, output gap and debt to GDP growth between 1960:Q1 and 2019:Q4
  - Supply shock volatility calibrated based on TVP-BVAR
- **Particle filter** extracts a sequence of conditional distributions for the shocks
  - Allows counterfactual analysis of inflation dynamics
  - Assessment of the role of the fiscal limit and supply shock volatility

Two key episodes: 1970/80s and Post-Covid

1. Inflation dynamics in the 1970/80s
    - Assume time-invariant fiscal limit set at baseline value

    $\rightarrow$ How much of inflation does interaction of fiscal limit and high supply vol. explain?

Estimated Paths of Observables



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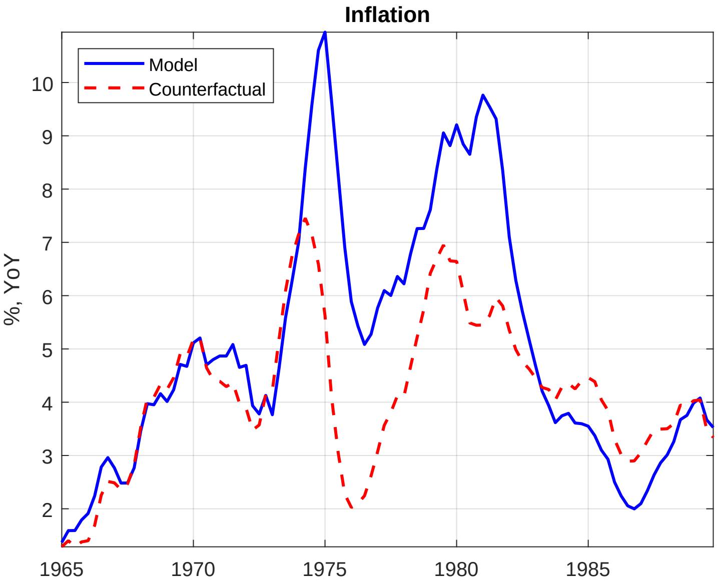

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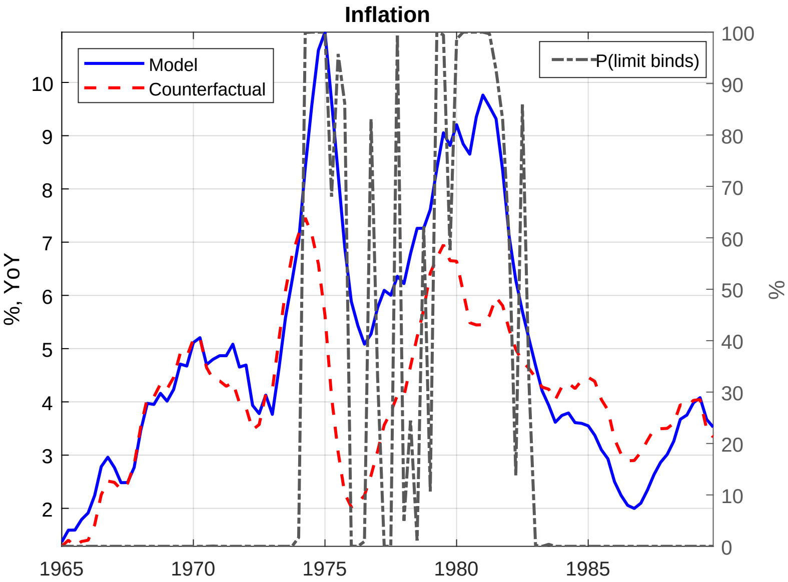

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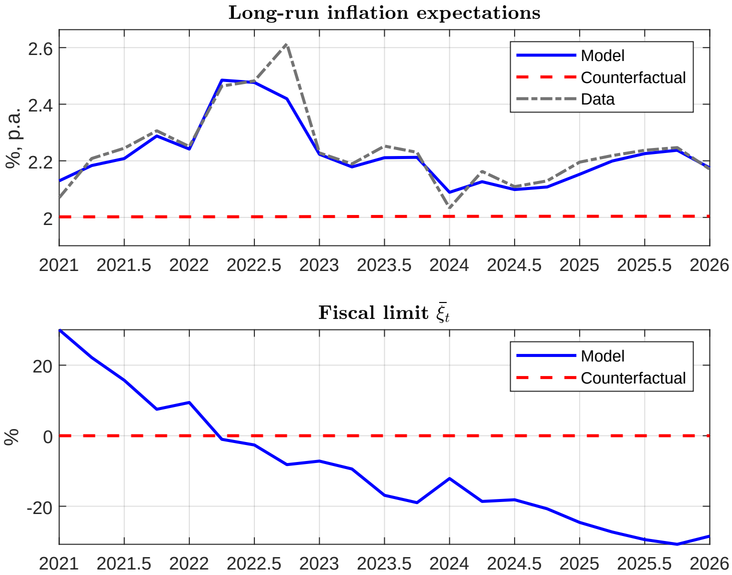
2. Post-Covid inflation dynamics
   - Additional observable to match: Average PCE long-run inflation expectations (SPF)

   $\rightarrow$ How much does fiscal responsibility need to vary to match inflation expectations?

2. Long-Run Inflation Expectations and Time-Varying Fiscal Limit



Conclusions

We presented a **nonlinear model with limited fiscal responsibility** that **occasionally constrains** the central bank's ability to **tighten monetary policy**.

- **Trend inflation is endogenous** to the interaction between fiscal space and supply risk.
- **Narrow fiscal space** amplifies the effects of shocks and causes **inflation expectations to ratchet with changes in supply-side risk**.
- The mechanism helps explain both the **ratcheting of inflation between 1965 and 1990** and the **post-pandemic rise in long-run inflation expectations**.

Appendix

Inflationary bias and spiral of the fiscal limit

- A **simplified version to gain intuition about the link between risk of hitting the fiscal limit and trend inflation**
- Only markup shocks: two values: $\mu_t \in \left\{\mu_t^L, \mu_t^H\right\}$
- Simplified fiscal policy setting regime-specific debt-to-output ratios

$$\tau_t = \begin{cases} b_{t-1}\frac{1}{\Pi_t}\frac{Y_{t-1}}{Y_t} - \frac{b_t^L}{R_t} & \text{if } \mu_t^L \\ b_{t-1}\frac{1}{\Pi_t}\frac{Y_{t-1}}{Y_t} - \frac{b_t^H}{R_t} & \text{if } \mu_t^H \end{cases}$$

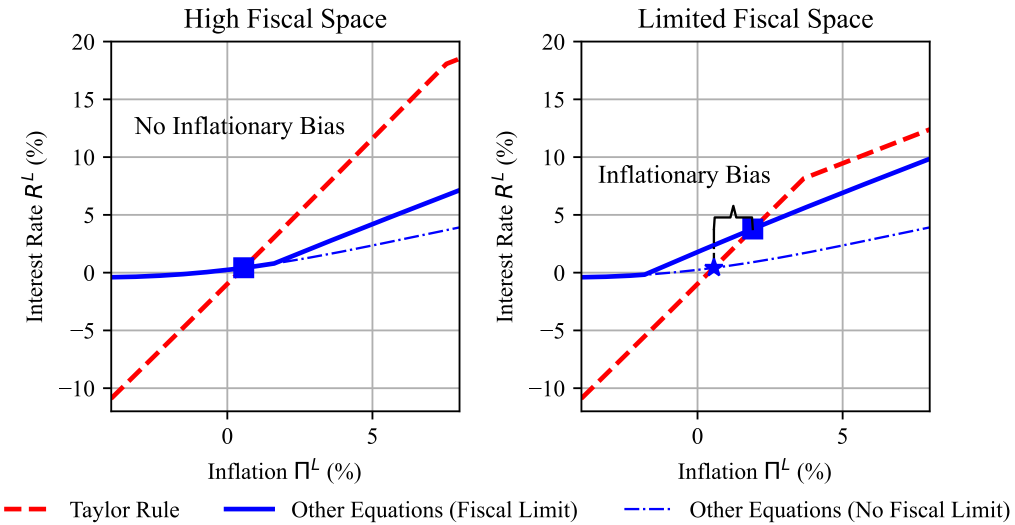
- Fiscal limit abstracting from period-by-period growth:

$$\bar{R}_t = \frac{\bar{b} E_t \Pi_{t+1}}{b_t}$$

Equilibrium characterization

- Equilibria can be characterized by solving a set of nonlinear equations
  - Partition of equilibrium conditions in blocks for low and high markup regime
  - Blocks are connected as agents are rational and forward looking
  - Even before constraint binds, risk of future binding can lift inflation

Inflationary bias: A graphical characterization

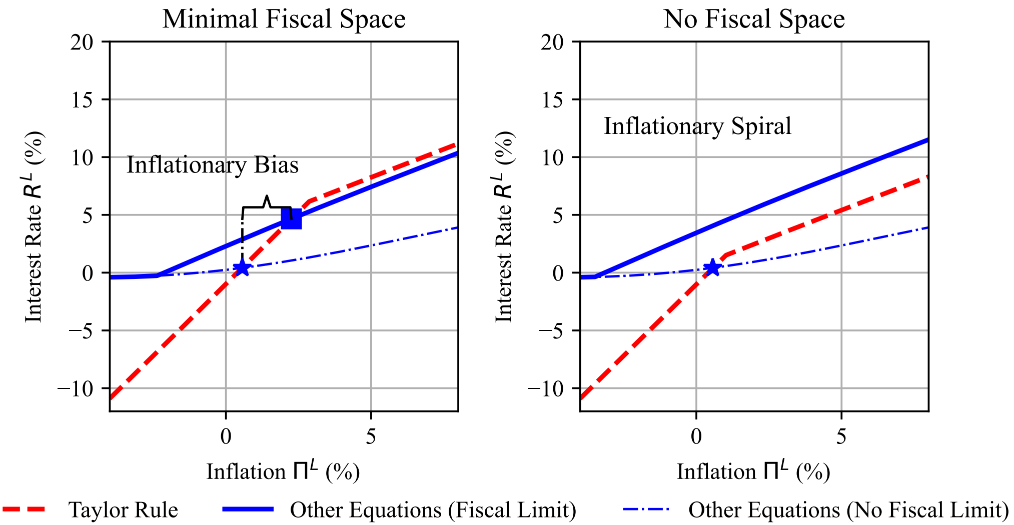


Inflationary bias and expectations

- Fiscal limit does not bind in the low markup state, but in the high markup state
- Agents understand that it may bind in the future, affecting their current behavior
- Fiscal limit increases inflation in high markup state, affecting inflation expectations
- Inflation is higher in low markup state, despite fiscal limit not being binding

$\Rightarrow$ Inflationary bias due to fiscal constraint

Inflationary spiral: A graphical characterization



Inflationary Spirals

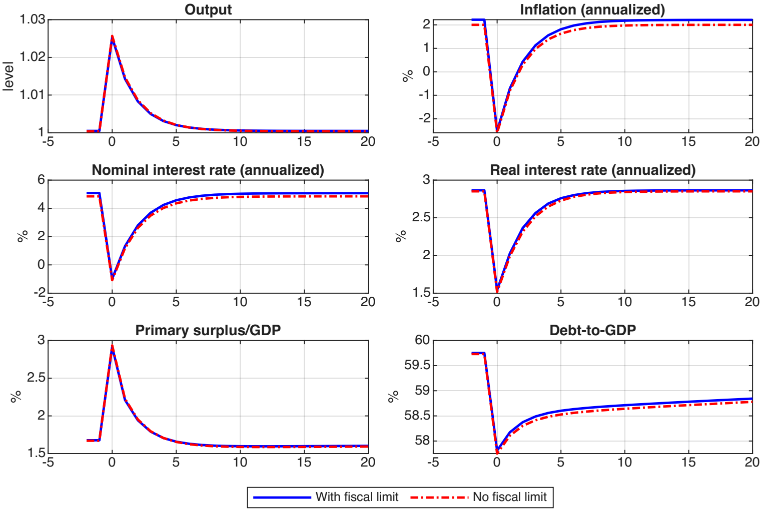
- Under a sufficiently tight fiscal constraint, monetary accommodation can become substantial.
- The accommodation required to preserve fiscal sustainability raises inflation expectations and current inflation.
- Stabilizing inflation would require higher real interest rates, but this would violate the fiscal limit.

$\Rightarrow$ A very tight fiscal constraint or heightened risk of supply disruptions can generate inflationary spirals and equilibrium instability.

Calibration

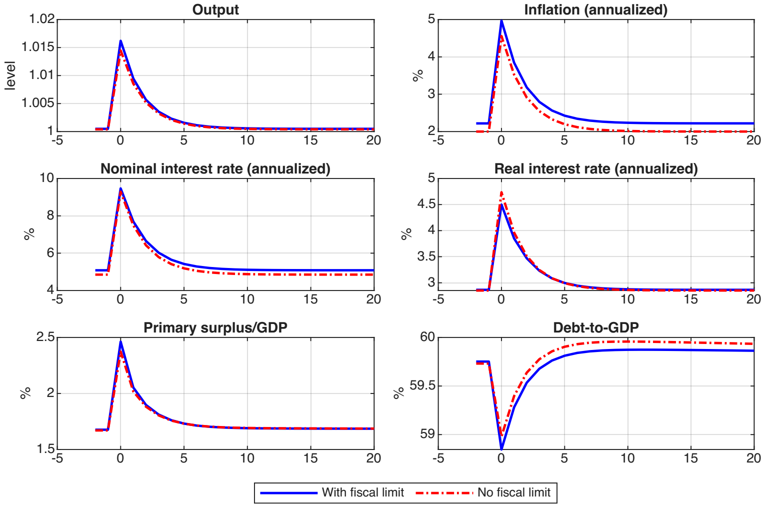
Parameters	Sign	Value	Parameters	Sign	Value
Discount factor	β	0.993	Relative risk aversion	σ	1
Inverse Frisch elasticity	η	1.33	Disutility of labor	ψ	0.87
Price elasticity of demand	ϵ	7.67	Rotemberg pricing	φ	78.36
Fiscal response to debt	δ	0.02	Fiscal response to output	δ_Y	0.5
Monetary response to inflation	ϕ_Π	1.5	Monetary response to output	ϕ_Y	0.1
Persistence Pref. Shock	ρ_ζ	0.6	Std. Dev. Pref. Shock	σ^ζ	0.01
Persistence Markup Shock	ρ_μ	0.6	Std. Dev. Markup Shock	σ^μ	0.19
Inflation target	$(\Pi$-1)*4	2%	Steady-state debt-to-output	b	2.4

Economic effects of disinflationary markup shock



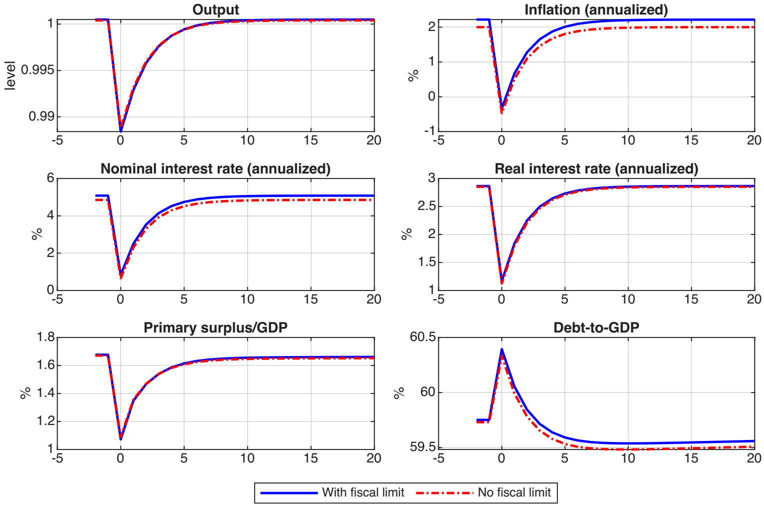
Notes: Dynamics in response to three-standard-deviation disinflationary markup shock. Shock happens in period 0. Initialization at ergodic mean. back

Economic effects of positive demand shock



Notes: Dynamics in response to three-standard-deviation inflationary preference shock. Initialization at ergodic mean. Shock happens in period 0. ◂ back

Economic effects of negative demand shock



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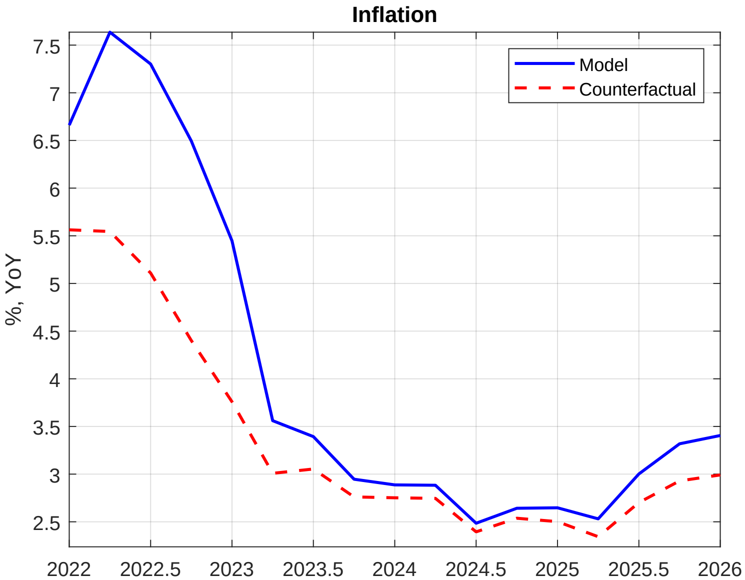
2. Post-Pandemic Inflation Surge



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