The Perils of Narrowing Fiscal Spaces*

Hanno Kase† Leonardo Melosi‡ Sebastian Rast§ Matthias Rottner¶

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Abstract

When public debt is elevated, the fiscal cost of fighting inflation rises sharply, as interest rate hikes increase government interest expenditures. We formalize this mechanism in a nonlinear New Keynesian model with a state-dependent fiscal constraint on monetary policy. High debt may dampen the monetary response to inflation, generating an inflationary bias even though government debt remains fully fiscally backed. The interaction between high debt and inflationary cost-push shocks makes the fiscal limit more likely to bind, amplifying inflation. In demand-driven downturns, the fiscal constraint may become more restrictive than the zero lower bound, forcing the central bank to either print money to purchase excess debt or accept fiscal dominance.

Keywords: Fiscal limits, Public debt, Monetary policy, Inflation, Zero lower bound, Fiscal space, Nonlinear New Keynesian models.

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*Emails: hanno.kase@ecb.europa.eu, leonardo.melosi@eui.eu, s.g.rast@dnb.nl, and matthias.rottner@bis.org. Any views expressed in this paper are those of the authors and do not necessarily reflect the views of the Bank for International Settlements (BIS), Deutsche Bundesbank, De Nederlandsche Bank, the European Central Bank or the European System of Central Banks. This research was partly conducted while Melosi was a Research Fellow of the BIS. The hospitality and support of the BIS are gratefully acknowledged.

†European Central Bank

‡European University Institute & CEPR

§De Nederlandsche Bank

¶Bank for International Settlements and Deutsche Bundesbank

1 Introduction

Globally, elevated public debt is increasingly reshaping how monetary and fiscal authorities interact, blurring the traditional boundaries between them. Until recently, the dominant paradigm rested on a sharp separation between monetary and fiscal policy, with monetary policy largely insulated from fiscal considerations. The accumulation of large public debt stocks challenges this separation, rendering interest rate decisions increasingly consequential for government interest expenditures. As a consequence, pressures on monetary policy to limit interest rate hikes have intensified, both in public discourse and likely through private channels, reflecting the growing fiscal costs associated with monetary tightening.

In fiscal year 2024–2025, net interest outlays on U.S. federal debt approached one trillion dollars, absorbing close to one-fifth of total federal revenues and exceeding spending on national defense. At these debt levels, monetary policy has a considerably large footprint on fiscal space, making interest rate decisions a relevant concern for the fiscal authority. This development occurs at a time when inflationary pressures are more likely and more persistent, driven by geopolitical and economic fragmentation, climate change, and demographic forces. Against this backdrop, fiscal constraints on monetary policy tightening may prove particularly pernicious, limiting the effectiveness of inflation stabilization precisely when it is most needed.

These developments have coincided with renewed political pressure on central banks to ease monetary policy. During his presidency, US President Donald Trump repeatedly and publicly urged Federal Reserve Chair Jerome Powell to lower interest rates, often framing monetary easing as a means to reduce government borrowing costs. These episodes are not without precedent. Similar pressures have been documented during the early 1970s, when U.S. President Richard Nixon exerted direct influence on Federal Reserve Chairman Arthur Burns in the run-up to the 1972 election (see, among others, Abrams, 2006, Meltzer, 2009, Ferrell, 2010). Bianchi et al. (2023b) use a high-frequency approach to analyze the effects of President Trump's tweets that criticize the Federal Reserve and document that they impacted actual monetary policy, the stock market, bond premia, and the macroeconomy. Drechsel (2025) documents that political pressure on the Federal Reserve has historically led to lower interest rates and persistent increases in the price level, without durable gains in real economic activity. Using narrative identification, Drechsel shows that even temporary political interference can have long-lasting inflationary consequences by shaping expectations. The Trump–Powell episode underscores that when public debt is large, incentives to influence monetary policy intensify, raising concerns that fiscal considerations may constrain central bank actions even in the absence of formal institutional changes.

In this paper, we formalize this fiscal constraint on monetary policy within a nonlinear

New Keynesian model in which the constraint is state-dependent and reflects the magnitude of the prevailing fiscal imbalance. The key innovation is an endogenous fiscal constraint that operates as an upper bound on the policy interest rate. This constraint stems from a ceiling on the debt-to-output ratio and captures the point at which further interest rate increases would entail severe costs, including political backlash from the fiscal authority due to the resulting compression of fiscal policy space. Anticipating these outcomes, the central bank internalizes the fiscal limit in its policy decisions and moderates monetary tightening to avoid confronting such external pressures.

Through the government budget constraint, this debt limit maps directly into an endogenous and state-dependent upper bound on the nominal interest rate that the central bank can set. When debt is low and fiscal space is ample, this constraint is typically slack and monetary policy operates as in a textbook symmetric Taylor-rule environment. When debt is high, however, raising interest rates sharply increases debt servicing costs and lowers economic growth, possibly pushing the debt-to-GDP ratio toward its fiscal limit. To avoid violating this limit, the central bank has to, at times, moderate or forgo some of the planned monetary tightening. Monetary policy remains active in the sense that it satisfies the Taylor principle when the constraint is not binding and, if feasible, when it is binding.

The mechanism underlying inflation dynamics differs fundamentally from that implied by the Fiscal Theory of the Price Level (FTPL). In our framework, inflation does not arise because fiscal policy fails to stabilize public debt, requiring inflation to adjust so that the real value of outstanding debt equals the expected discounted stream of future primary surpluses. In our model, fiscal policy remains Ricardian at all times, adjusting as needed to ensure that debt is ultimately backed by future primary surpluses. Instead, inflation emerges because forward-looking agents understand that monetary policy cannot raise interest rates beyond the fiscal constraint. Anticipating this constraint, agents expect a weaker resolve by the central bank in fighting inflation due to fiscal pressures, and these expectations feed back into current inflation outcomes. As a result, the economy exhibits an inflationary bias even though fiscal policy remains disciplined and government debt is fully backed fiscally.

A key feature of the fiscal constraint on monetary policy is its endogeneity and state-dependence. Unlike an exogenous interest-rate ceiling, the fiscal constraint varies with macroeconomic conditions, affecting the fiscal imbalance. Higher inflation reduces the real value of outstanding nominal debt and relaxes the fiscal constraint. Strong output growth lowers the debt-to-GDP ratio, also expanding the fiscal constraint. Conversely, low inflation, weak growth, or high initial debt tighten the fiscal constraint on monetary policy. Monetary policy, therefore, affects fiscal space both directly, through the interest rate, and indirectly, through its effects on inflation and output. This feedback generates a state-dependent interaction between monetary policy, fiscal constraints, and macroeconomic dynamics. The nonlinear structure of the model is key to making the fiscal constraint on monetary policy dependent on the size of government debt.

The response of the fiscal constraint differs systematically across shocks. Aggregate demand shocks move output and inflation in the same direction and therefore have unambiguous effects on fiscal constraint. Positive demand shocks raise output and inflation, relax the fiscal constraint, and expand the room for monetary tightening. Negative demand shocks do the opposite, tightening the fiscal constraint. Cost-push shocks, by contrast, move inflation output in the opposite direction, making their net effect on the fiscal constraint ambiguous a-priori.

Disinflationary cost-push shocks are relatively benign in our framework. As inflation declines, the central bank lowers interest rates, and the fiscal constraint relaxes as economic activity remains buoyant, supported by the nature of the shock and the accompanying monetary accommodation. By contrast, inflationary cost-push shocks create a particularly challenging environment for monetary policy. In this case, the fiscal constraint severely limits the central bank's ability to tighten in response to rising inflation. While the fiscal constraint does relax somewhat, the relaxation is insufficient to accommodate the degree of tightening implied by the monetary policy rule. Consequently, even though monetary policy remains active, tightening is weaker than prescribed by the rule, leading to higher inflation.

Countercyclical fiscal policy amplifies these mechanisms. Automatic stabilizers and discretionary fiscal expansions during downturns increase deficits and debt when output falls, accelerating the approach to the fiscal limit. As a result, countercyclical fiscal policy, while stabilizing demand in the short run, can inadvertently constrain monetary policy in a large-debt environment. The interaction between countercyclical fiscal policy and an endogenous fiscal constraint on monetary policy creates a feedback loop in which recessions tighten fiscal space, which in turn limit the central bank's ability to respond to inflationary pressures arising from adverse shocks.

The fiscal constraint operates in a manner analogous to the zero lower bound (ZLB), but in reverse. Whereas the ZLB limits how far interest rates can be reduced in a low-inflation environment, the fiscal constraint restricts how far interest rates can be raised in a high-debt environment. Both constraints are state-dependent and nonlinear, and both generate persistent macroeconomic biases. The ZLB induces a deflationary bias by preventing sufficiently aggressive easing, while the fiscal constraint induces an inflationary bias by preventing sufficiently aggressive tightening. One important difference, however, is that the implied upper bound from the fiscal limit varies endogenously over time, while the location of the ZLB is static.

Interestingly, these two constraints may interact. A large negative demand shock can simultaneously push the economy toward the ZLB constraint and tighten the fiscal constraint by depressing output and worsening debt dynamics. In the event of an extreme downturn, the fiscal constraint on the policy interest rate may become more restrictive than the constraint implied by the ZLB constraint. In such circumstances, if the central bank seeks to avoid severe political backlash or, in the extreme, an outright loss of fiscal solvency, it faces stark trade-offs. It may either engage in large-scale asset purchases to absorb excess government debt, or allow fiscal policy to become active and accommodate the resulting inflationary pressures. In the latter case, the interaction between the ZLB and the fiscal constraint can give rise to fiscal dominance in the sense of the FTPL. Our theory of the fiscal limit is therefore connected to the quantity theory of money (as, for instance, in Galí, 2020) and the FTPL (as, for instance, in Leeper, 1991, Bianchi et al., 2023a) in the event of extreme demand-driven downturns pushing the fiscal constraint for the interest rate below the ZLB.

The analysis sheds light on the macroeconomic risks associated with a narrowing of monetary policy space driven by high public debt in advanced economies. When public debt is large, monetary policy may become constrained not by institutional design, but by the need to preserve sufficient fiscal space for the government or to avoid imposing excessive balance-sheet losses on financial intermediaries with substantial holdings of government bonds. Even a fully independent central bank, committed to price stability and following an active Taylor rule, may be forced to accommodate inflation to preserve fiscal sustainability and financial stability, particularly when banks hold large quantities of government bonds. Understanding this constraint is essential for evaluating the limits of monetary policy in the current high-debt environment.

Finally, we note that the nonlinear structure of the New Keynesian model is essential for capturing aggregate risk and, more importantly, the endogeneity of the occasionally binding fiscal constraint and its associated highly state-dependent effects. For this reason, we solve the model in its nonlinear specification using global solution methods. Note that in a linearized framework, this state dependence would be lost, making it impossible to represent how the proximity to the fiscal limit endogenously constrains monetary policy.

Related Literature Our paper contributes to a large literature on monetary-fiscal interactions and their implications for inflation dynamics (among many others, Sargent and Wallace (1981); Leeper (1991); Sims (1994); Woodford (1994, 1995, 2001); Cochrane (1998, 2001); Schmitt-Grohé and Uribe (2004); Benhabib et al. (2002); Bassetto (2002); Bianchi and Ilut (2017); Bianchi and Melosi (2017); Leeper et al. (2017); Reis (2017); Bassetto and Sargent (2020)). In much of this literature equilibrium determination is characterized through the interaction of active and passive policy regimes. In a monetary-dominant regime, an active Taylor-type rule determines inflation and the price level, while fiscal policy is passive, adjusting expected primary surpluses to satisfy the intertemporal government budget constraint. In a fiscal-dominant regime, by contrast, fiscal policy is active and the price level adjusts to ensure government solvency. In recent work this has been often modelled through regime switching. Bianchi et al. (2023a) move in a new direction where monetary-led and fiscally-led rules coexist and policy coordination is shock-specific. They show that partially unfunded fiscal shocks can generate persistent inflation even under an otherwise active monetary regime, as the central bank accommodates these shocks to preserve debt stability. As explained, in our model fiscal inflation arises not because of exogenous switches or unfunded fiscal shocks. Rather fiscal inflation arises endogenously and in a state-dependent manner, governed by the size of fiscal imbalance, which depends on past and current macroeconomic conditions, relative to the fiscal limit.

Angeletos et al. (2024) and Angeletos et al. (2025) study models with nominal rigidities and violations of Ricardian equivalence, such as HANK frameworks, and show that in these settings fiscal deficits can drive inflation in a manner closely related to the Fiscal Theory of the Price Level, with the important distinction that monetary policy remains active. We share a similar objective by demonstrating that fiscal inflation may also arise in a nonlinear stylized New Keynesian model in which there is a limit to how much public debt can be accumulated. Ricardian equivalence holds in our nonlinear framework, consistent with conventional New Keynesian models, and monetary policy remains active and satisfies the Taylor principle. Fiscal policy is passive at all times, adjusting to ensure debt sustainability. Nevertheless, the presence of an endogenous fiscal limit introduces a constraint on the central bank's ability to pursue aggressive anti-inflationary actions. The nonlinear structure of the model captures the fact that higher fiscal imbalances increase the likelihood that the economy hits the fiscal limit, thereby restricting monetary tightening. As a result, when public debt is high, the fiscal limit can generate inflationary pressures not through the traditional FTPL mechanism–based on unbacked debt, regime switching–but through an endogenous constraint on monetary policy itself.

A complementary strand models fiscal limits explicitly. Davig et al. (2010, 2011) introduce stochastic fiscal limits tied to regimes for transfers and the tax rate reaching its maximum: as transfers switch to a non-stationary regime and debt increases there is a limit to the amount of debt that can be financed through tax increases. As the tax rate approaches the limit the probability rises that fiscal promises are reneged or that monetary policy must temporarily accommodate inflation to stabilize debt. Bi (2012) embeds endogenous fiscal limits - that arise from dynamic Laffer curves - in a nonlinear model with (partial) default where sovereign risk premia rise nonlinearly with debt. In follow-up work Bi et al. (2018) incorporate this type of fiscal limit into a conventional New Keynesian model. Based on their setting, they show that whether the Taylor rule targets the risky or risk-free rate is pivotal: near the fiscal limit, a contraction in the risky rate can paradoxically raise inflation even when monetary policy is active and fiscal policy passively adjusts taxes to stabilize debt. Differently, in our setup there is no default or a switch to a different transfer regime. We present a tractable nonlinear framework where the fiscal limit constitutes an upper bound on the debt-to-GDP ratio and through the government budget constraint leads to an endogenous upper bound on the interest rate set by the monetary authority.

Other related papers that also focus on the estimation of fiscal space and limits include Ghosh et al. (2013), Collard et al. (2015) and Renne and Pallara (2024).

Organization of the paper. The paper is organized as follows. In Section 2, we introduce the New Keynesian model with a fiscal limit on government debt and discuss how this limit induces an endogenous and state-dependent upper bound on the policy interest rate; we also describe the solution method and calibration. In Section 3, we illustrate the mechanisms through a stylized version of the model, highlighting the inflationary bias and the possibility of inflationary spirals when fiscal space becomes sufficiently tight. Section 4 returns to the full model and quantifies how the fiscal constraint and its endogeneity shape the economy's responses to supply (cost-push) and demand (preference) shocks, including the role of the expectation channel. Section 5 discusses monetary policy at the edge by analyzing the interaction between the fiscal upper bound and the zero lower bound. Section 6 concludes.

2 The Model with Fiscal Limit

In this section, we introduce a New Keynesian model featuring a fiscal limit on debt issued by the government. The fiscal limit leads to a constraint on the nominal interest rate set by the monetary authority. The model is solved with global methods in its nonlinear specification to capture the state-dependence of the fiscal constraint on monetary policy.

2.1 Model Description

The economy consists of a representative household, firms, a monetary authority, and a fiscal authority.

Representative household. The representative household consumes (C_t), supplies labor (N_t), and invests in one-period government bonds (B_t). The household maximizes

$$\max_{\{C_t,N_t,B_t\}} \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \zeta_t \left[\frac{C_t^{1-\sigma}}{1-\sigma} - \psi \frac{N_t^{1+\eta}}{1+\eta}\right], \tag{1}$$

subject to the flow budget constraint

$$P_t C_t + Q_t B_t = W_t N_t + B_{t-1} - P_t T_t + P_t D_t, \tag{2}$$

where β is the households' discount factor, P_t denotes the price of consumption, W_t the nominal wage, T_t real lump-sum net taxes, D_t real dividends paid by firms, and $Q_t = \frac{1}{R_t}$ is the price of the one-period bond which is equal to the inverse of the gross nominal interest rate. ζ_t is a preference shock which follows an AR(1) process in logs as follows

$$\ln(\zeta_t) = \rho_\zeta \ln(\zeta_{t-1}) + \sigma^\zeta \epsilon_t^\zeta, \quad \text{where } \epsilon_t^\zeta \sim N(0,1). \tag{3}$$

Final good firm. On the production side, competitive final good firms buy intermediate goods and aggregate them into a homogeneous final good (Y_t) using the following technology:

$$Y_t = \left(\int_0^1 Y_t(j)^{\frac{\varepsilon-1}{\varepsilon}} dj\right)^{\frac{\varepsilon}{\varepsilon-1}}, \tag{4}$$

where $Y_t(j)$ is the consumption of the good of the variety produced by intermediate good firm j.

The price index for the aggregated good is given as:

$$P_t = \left[\int_0^1 P_t(j)^{1-\varepsilon} dj\right]^{\frac{1}{1-\varepsilon}}. \tag{5}$$

Intermediate good firms. Intermediate goods are imperfect substitutes, and the firms behave as monopolistically competitive setting the price of their good subject to price adjustment costs a la Rotemberg. Labor is the only factor of production. The first order conditions yield the following standard New-Keynesian Phillips Curve:

$$\varphi\left(\frac{\Pi_t}{\Pi} - 1\right)\frac{\Pi_t}{\Pi} = (1-\epsilon) + \epsilon MC_t + \varphi \mathbb{E}_t\left[\Lambda_{t,t+1}\left(\frac{\Pi_{t+1}}{\Pi} - 1\right)\frac{\Pi_{t+1}}{\Pi}\frac{Y_{t+1}}{Y_t}\right] + \ln(\mu_t). \tag{6}$$

where $\Pi_t \equiv \frac{P_t}{P_{t-1}}$ denotes inflation, MC_t real marginal costs, $\Lambda_{t,t+1}$ the household's stochastic discount factor and Π steady-state inflation. φ measures the cost of price adjustment in units of the final good, and ϵ is the elasticity of substitution between varieties (price elasticity of demand). Firms face a cost-push (markup) shock, μ_t, that evolves as an AR(1) process in logs:

$$\ln(\mu_t) = \rho_\mu \ln(\mu_{t-1}) + \sigma^\mu \epsilon_t^\mu, \quad \text{where } \epsilon_t^\mu \sim N(0,1). \tag{7}$$

Fiscal authority. The fiscal authority collects taxes T_t and issues one-period bonds satisfying the following budget constraint

$$Q_t B_t = B_{t-1} - P_t T_t. \tag{8}$$

In this setting, net taxes coincide with the real primary surplus and we assume the fiscal authority follows a fiscal rule where the surplus-to-output ratio is responding to debt and output deviations:

$$\tau_t = \tau + \delta(b_{t-1} - b) + \delta_Y(Y_t - Y) \tag{9}$$

where $\tau_t \equiv \frac{T_t}{Y_t}$, $b_t \equiv \frac{B_t}{P_t Y_t}$ is the debt-to-GDP ratio and τ, b and Y denote steady-state values.

Resource constraint. The resource constraint is

$$C_t = Y_t \left(1 - 0.5\varphi \left(\Pi_t/\Pi - 1\right)^2\right). \tag{10}$$

Monetary authority. The monetary authority sets the nominal interest rate, responding to inflation and output from their corresponding targets

$$R_t^N = R \left(\frac{\Pi_t}{\Pi}\right)^{\phi_\Pi} \left(\frac{Y_t}{Y}\right)^{\phi_Y} \tag{11}$$

where R is the steady-state interest rate, Π the inflation target and R_t^N is the notional interest rate that the monetary authority would set without any constraints. Without the fiscal limit $R_t = R_t^N$.

Fiscal limit. We can rewrite the government budget constraint by dividing by P_tY_t as

$$b_t = R_t \left(b_{t-1} \frac{Y_{t-1}}{\Pi_t Y_t} - \tau_t \right). \tag{12}$$

We assume that the fiscal limit is a constraint on the debt-to-GDP ratio above which the government cannot issue additional debt, that is, $b_t \leq \bar{b}$. The fiscal space, that is, the gap between b_t and $\bar{b}$, is endogenous and state dependent. Specifically, it depends on the previous period's debt-to-output ratio as well as current inflation, output growth, and the nominal interest rate. Higher inflation and stronger output growth reduce the real value of the outstanding debt that must be serviced in the current period, thereby alleviating fiscal pressure. Conversely, a higher nominal interest rate increases debt servicing costs, raising the fiscal imbalance and reducing fiscal space.

When the initial debt-to-output ratio b_{t-1} is high, the effects of inflation, growth, and the interest rate on the fiscal imbalance become more pronounced. Monetary policy affects fiscal sustainability both directly, through the interest rate it sets, and indirectly, by influencing output and inflation in response to shocks. In particular, monetary tightening lowers inflation and output growth, increasing the effective burden of outstanding debt. These effects are especially strong when public debt is already elevated, generating a leverage-type amplification of monetary policy on government finances.

Fiscal policy further amplifies these mechanisms. By conducting countercyclical policy ($\delta_Y > 0$), the fiscal authority increases the sensitivity of the fiscal space to macroeconomic conditions. During recessions, fiscal policy becomes expansionary, pushing the debt-to-output ratio b_t closer to its ceiling $\bar{b}$.

The key assumption of the model is that if the debt-to-output ratio exceeds the fiscal limit $\bar{b}$, the central bank intervenes by correcting the policy interest rate downward to avert government's pressures on monetary policy. As a result, the fiscal limit translates directly into a constraint on monetary policy. Formally, the fiscal constraint faced by the monetary authority is given by:

$$R_t \leq \bar{R}_t \equiv \bar{b} \cdot \underbrace{\left[b_{t-1} \frac{Y_{t-1}}{\Pi_t Y_t} - \tau_t \right]}_{\Theta_t}^{-1}. \tag{13}$$

Taken together this implies the monetary authority sets the interest rate as

$$R_t = \min \left[R_t^N, \bar{R}_t \right]. \tag{14}$$

To sum up, the fiscal limit introduces a potential upper bound on the policy space of the monetary authority. Crucially, this upper bound is endogenous, as it depends on the component Θ_t, which in turn reflects prevailing macroeconomic conditions. The full set of model equations is presented in Appendix A.1.

2.2 The Endogeneity of the Fiscal Constraint on Monetary Policy

Similarly to the ZLB, the fiscal limit constrains the range over which the central bank can adjust interest rates. Unlike the ZLB, however, the fiscal limit imposes an upper bound on the policy rate and is not a hard, exogenously fixed constraint. Instead, it is endogenous: current output and inflation determine how costly it is to service the fiscal imbalance inherited from the previous period, and thus how tightly the constraint binds.

The variable Θ_t captures the endogeneity of the fiscal constraint on the interest rate set by the central bank. When Θ_t increases, the fiscal constraint becomes more lax, expanding the room for monetary tightening. This occurs when inflation and economic growth rise, as both contribute to lowering the debt-to-output ratio today. Conversely, when Θ_t declines, the fiscal constraint tightens, reducing the scope for interest rate increases. This typically happens when inflation falls and economic activity contracts, causing the debt-to-output ratio to rise.

Inflation and output growth are endogenous variables, and their joint dynamics depend on the full set of shocks and model equations. In general, preference (demand) shocks move output and inflation in the same direction and therefore have an unambiguous effect on Θ_t. In particular, a positive demand shock relaxes the fiscal constraint on the interest rate, whereas a negative demand shock tightens it.

By contrast, the effects of markup shocks on Θ_t, and thus on the fiscal constraint, are more ambiguous, since these shocks move output and inflation in opposite directions. The net effect depends crucially on the slope of aggregate demand, which is influenced by the conduct of monetary policy among other factors (i.e., preference parameters). For instance, a central bank that places greater weight on inflation stabilization will induce larger movements in output relative to inflation.

The degree of countercyclicality in fiscal policy, captured by the parameter δ_Y, also plays an important role by increasing the sensitivity of the fiscal constraint to output fluctuations. For example, following a negative markup shock, economic activity contracts and countercyclical fiscal policy leads the government to cut taxes, thereby increasing the current fiscal imbalance. All else equal, this reduces the room available to the central bank to raise interest rates to counteract the inflationary consequences of the shock.

2.3 Solution and Calibration

The model is solved using time iteration with linear interpolation of policy functions following the approach by Richter et al. (2014), and as used in Bianchi et al. (2021). Expectations are calculated using numerical integration based on Gauss-Hermite quadrature. We provide more details of the algorithm in Appendix A.2.

The model is calibrated as shown in Table 1. The discount factor β is set to 0.993, which corresponds to an annualized nominal interest rate of almost 5%, which is in line with the average US Federal Funds rate since 1960, and implies a steady-state annualized real interest rate of almost 3%. The coefficients of the monetary policy rule are set to $\phi_\Pi = 1.5$ and $\phi_Y = 0.1$. The coefficients of the fiscal rule are set to $\delta = 0.1$ and $\delta_Y = 0.5$, implying a stronger response to output than debt in line with empirical literature and the important role of automatic stabilizers (see Bohn (1998), Galí and Perotti (2003), Leeper et al. (2010), among others). The persistence parameters of the shock processes are set to 0.6 for simplicity. The shock volatilities are calibrated based on US postwar data (since 1960Q1) for annual inflation and quarterly real GDP growth. In particular, we aim to broadly match the standard deviation of annual inflation, the standard deviation of quarterly real GDP growth, and the correlation of inflation and GDP growth. Over this sample, annual inflation has been more than 2.5 times as volatile as quarterly real GDP growth, and the correlation between inflation and GDP growth has been close to zero. The steady-state level of debt-to-output is calibrated in line with a debt-to-GDP ratio of 60% as observed on average for the US over the sample since 1960. The fiscal limit parameter $\bar{b}$ is set to 2.45.

How realistic is a fiscal limit of this magnitude? It may appear small. However, our model features neither trend growth nor strong persistence: as the impulse responses of inflation and output indicate, both variables return close to their pre-shock levels after roughly eight quarters. To gauge the empirical plausibility of the implied variation, we take the observed debt-to-GDP series and apply business-cycle filters (Baxter–King and Christiano–Fitzgerald) that retain fluctuations at horizons up to eight quarters. The resulting filtered series has a standard deviation of about 2 percentage points, implying that swings of 5 percentage points—consistent with our fiscal-limit calibration—would be relatively extreme. Of course, this exercise isolates only high-frequency movements and therefore abstracts from lower-frequency shifts in debt dynamics.

3 Inflationary Bias and Spiral of the Fiscal Limit

To understand the potential inflationary pressures of the fiscal constraint for monetary policy, we use a simplified version of the full model. First, we assume that only the markup shock

Table 1: Model 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	0.1	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	0.012
Persistence Markup Shock	ρ_μ	0.6	Std. Dev. Markup Shock	σ_μ	0.18
Inflation target	(Π-1)*4	2%	Steady-state debt-to-output	b	2.4
Fiscal limit	$\bar{b}$	2.45			

operates, that is, the standard deviation of the remaining shocks is zero. The markup shock is assumed to follow a Markov process with two realizations $\mu_t \in \left\{\mu_t^L, \mu_t^H\right\}$ so that the economy is either hit by a negative or a positive markup shock. Second, we assume that the tax rules are conditional on the state and ensure a debt level of b^L and b^H in the different markup shock states. We specify the rule as

$$\tau_t = \begin{cases} b_{t-1}\frac{1}{\Pi_t}\frac{Y_{t-1}}{Y_t} - \frac{b_t^L}{R_t} & \text{if } \mu_t^L \\ b_{t-1}\frac{1}{\Pi_t}\frac{Y_{t-1}}{Y_t} - \frac{b_t^H}{R_t} & \text{if } \mu_t^H \end{cases} \tag{15}$$

This rule is a passive fiscal policy, as taxes are adjusted to ensure that debt is not explosive, as a passive rule. In fact, the rule is superpassive, as it not only rules out explosive dynamics of debt but also sets the debt level depending on the markup regime: low-markup debt, b^L, and high-markup debt, b^H. The advantage of this rule is to break the path dependence of debt, as only two levels of debt are actually possible in equilibrium, with $b^H > b^L$. This will allow us to break the model equations into two separate blocks, where each block affects the other only through the expectation of switching to a different markup regime (low or high). This feature greatly simplifies the analysis that follows, allowing us to illustrate the key implications of having a fiscal limit in a New Keynesian model. Therefore, the markup shock realized today is the only remaining state variable, which will simplify the analysis considerably.

Abstracting from period-by-period economic growth, we specify the fiscal limit as follows:

$$\bar{R}_t = \frac{\bar{b} E_t \Pi_{t+1}}{b_t} \tag{16}$$

which relates the debt level adjusted for expected inflation to the fiscal space. It should be noted that an increase in inflation expected for tomorrow leads to a relaxation of the fiscal limit, as in the benchmark model presented earlier.

Finally, for simplicity, we also assume that the Rotemberg pricing is rebated as a lump sum and that the monetary authority only responds to inflation following an active monetary rule, except when it has to deviate from it due to the fiscal limit, which effectively works as an upper bound for the interest rates.

The equilibrium outcomes can be conditioned on the binary realizations of the markup shock and can be determined by solving this set of nonlinear equations, as shown in the Appendix B. This simplified version of the model is helpful to discuss and analyze the impact of the fiscal limit on inflation and its potential consequences. After discussing these points with the simplified model, we will return to the benchmark model.

We can exploit the structure of the simplified model to partition the model equilibrium conditions into two blocks of equations, one for the high markup and one for the low markup shock. We will focus on the equilibrium in the low markup shock, as this is where the inflationary bias arises.

The red dashed line in Figure 1 displays the monetary policy reaction function conditional on markup shocks being low. Moving along this line, the central bank increases the interest rate R_t^L faster than inflation –shown on the x-axis, because monetary policy is active. Nevertheless, for a high level of interest rate and inflation, the central bank can no longer keep raising the real interest rate (i.e., keep raising the nominal interest rate faster than the increase in inflation) because doing so would violate the fiscal limit. This change in the policy behavior is captured by the kink of the red dashed line that can be observed in the upper right chart and in the bottom charts.

The blue line in the same figure displays the relation between the interest rate and inflation in the low markup state by all the other equations (i.e., the IS equation and the New Keynesian Phillips curve). This line takes into account the probability of switching to the high-markup regime in the future. The expectations of such a switch, which can potentially make the debt-to-output ratio exceed the fiscal limit $b^H > \bar{b}$, creates a kink also on the blue line, as agents expect monetary policy to be constrained and let inflation increase more in the other regime (high-markup regime).

The intersections between the red dashed line and the blue solid line give us the rational expectations equilibrium, and the equilibrium interest rate and inflation rate in the low-markup state can be read on the axes of the charts.

Moving from the upper-left panel to the right and then down, we consider a sequence of cases in which fiscal space is progressively reduced ($\bar{b} \downarrow$). When fiscal space is sufficiently

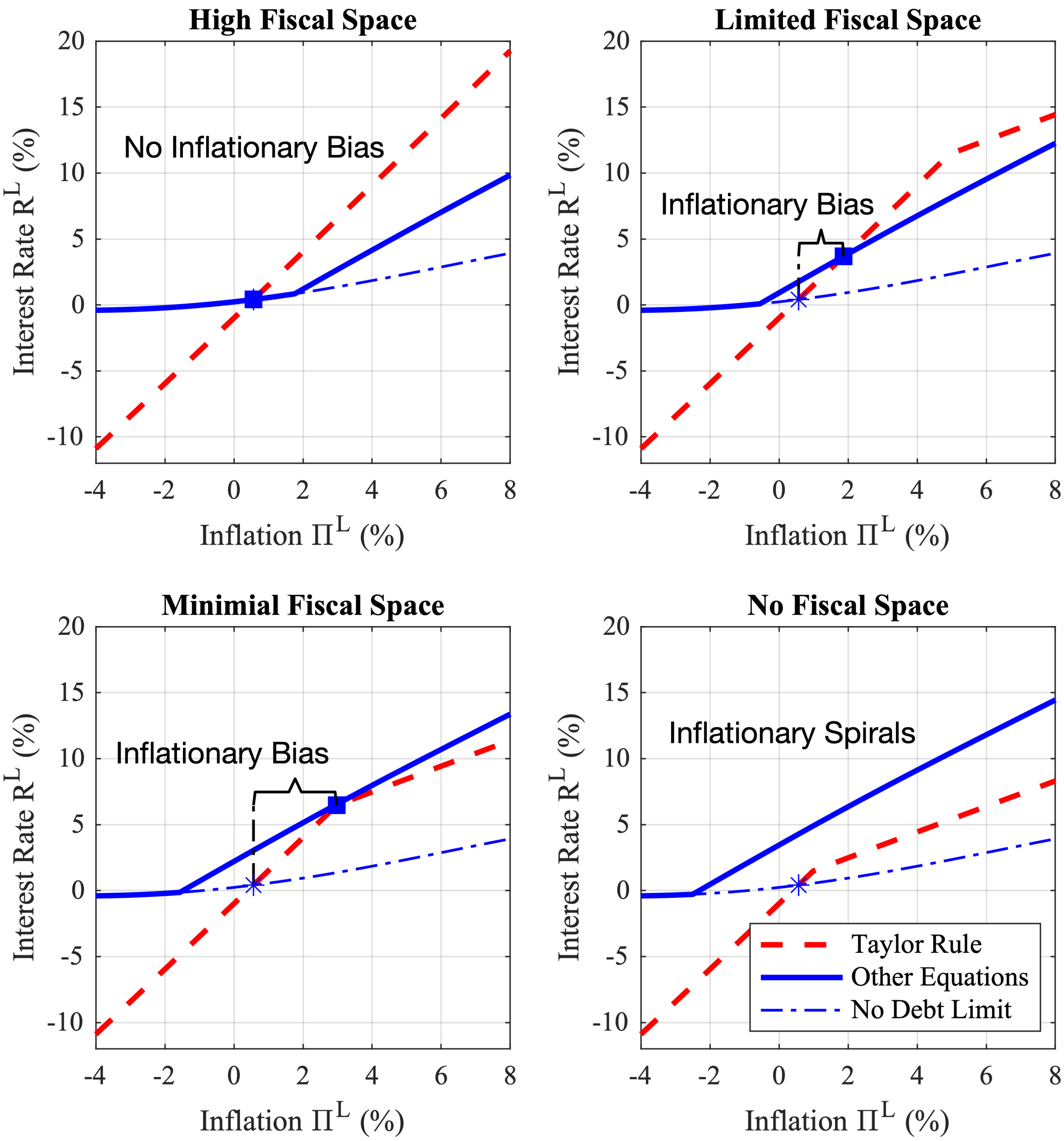

Figure 1: Inflationary outcomes and fiscal space in the stylized model. Equilibrium interest rate and inflation when there is a low (deflationary) markup shock for different fiscal limits: High fiscal space $\bar{b} = 1.03$, limited fiscal space $\bar{b} = 1.015$, minimal fiscal space $\bar{b} = 1.0075$, no fiscal space fiscal space $\bar{b} = 1.0$. The red dashed line in this figure represents the Taylor rule in the low markup state, subject to the fiscal limit. The blue line in the same figure represents the restrictions imposed on the inflation rate and the nominal interest rate in the low markup state by all remaining conditions (including the ones for the high markup state). The intersections of the red dashed line and the blue solid line are the (stable) Rational Expectations equilibria in the low markup state. The blue dashed-dotted line captures the counterfactual case in which the fiscal limit is not imposed on the nominal interest rate in the high markup state.

large, the fiscal limit does not bind even in the high-markup regime, and therefore the two policy schedules intersect before any kink arises.

The upper-right panel examines a situation in which the fiscal limit is low enough to bind if the high-markup regime materializes. Anticipation of hitting the fiscal limit, together with the associated dampened central banks' response to inflation in the other regime, leads to higher expected inflation in the current low-markup regime. Because agents are forward-looking, this increase in expected inflation spills over into the low-markup regime, raising equilibrium inflation there as well. This inflation bias in the low-markup regime is illustrated in the upper-right panel. The steeper blue line captures the effects of higher inflation expectations on the equilibrium inflation and equilibrium interest rate in the low-markup regime.[1]

As the fiscal limit is reduced further, a violation of the limit in the high-markup regime becomes more severe. Consequently, the degree of monetary accommodation required to prevent government default increases. As a result, the inflation bias becomes larger, as can be seen by comparing the upper-right and lower-left panels. Moreover, in the low-markup regime, government debt is exactly at the fiscal limit, since the equilibrium lies at the kink of the monetary policy rule, represented by the red-dashed line.

Finally, when the fiscal limit is lowered even further, the lower-right panel depicts a case in which no equilibrium exists. The substantial monetary accommodation required to rescue the government in the event of a positive markup shock generates such high inflation expectations – and inflation today – that the central bank must raise the real interest rate sufficiently to induce government default. In this case, fiscal space is so limited that the economy cannot avoid the fiscal limit in either regime.

It is important to note that non-existence of equilibrium is not inevitable, as it depends on the slope of the monetary policy rule (the dashed red line) beyond the kink and on the procyclicality of fiscal policy, which affects the slope of the blue line. Adjusting these slopes can restore a unique equilibrium, though one characterized by a larger inflationary bias as fiscal space compresses.

4 The Response of the Fiscal Limit to Supply and Demand Shocks

Earlier in the paper, we show that the fiscal limit can be interpreted as an endogenous upper bound on the interest rate set by the central bank. This constraint on monetary policy is endogenous, as it depends on output growth and inflation, which attenuate the impact of the previous period's fiscal burden on today's fiscal imbalance and thereby create additional

[1] The red and the blue line will intersect each other at a higher level of inflation and the interest rate. This is because in this model the fiscal limit imposes the central bank to conduct passive monetary policy –i.e., the red dashed line is flatter than the 45-degree line when the fiscal limit is binding. This feature does not arise in our benchmark model, where the fiscal constraint does not force the central bank to adopt a passive monetary policy.

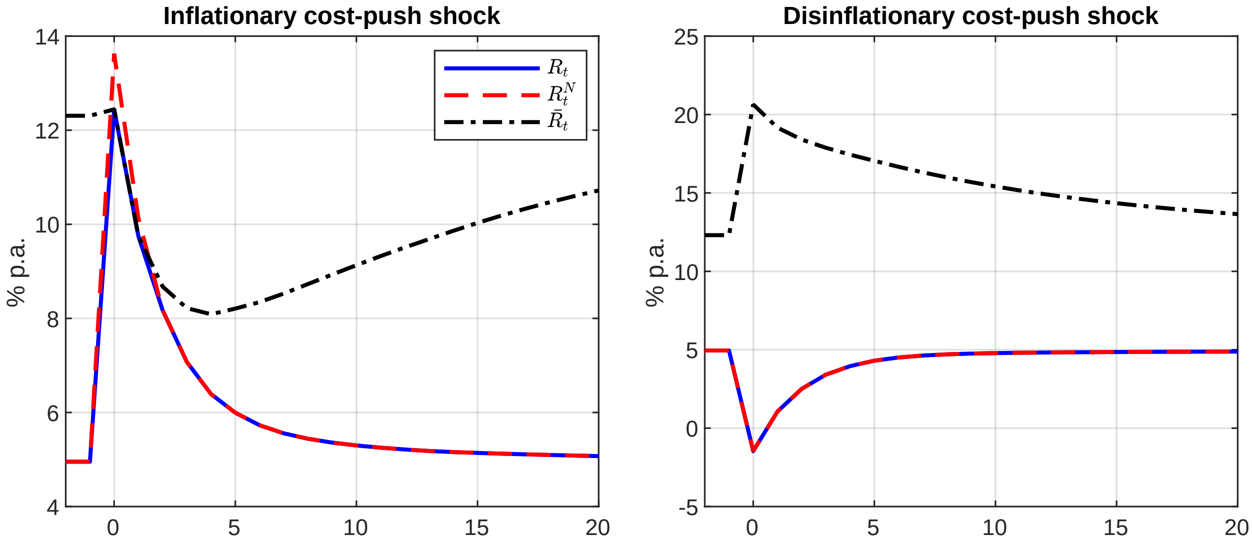

Figure 2: Interest rate dynamics in response to cost-push shock. Dynamics of nominal, notional and upper bound interest rate in response to a four-standard-deviation inflationary (left panel) and disinflationary (right panel) cost-push shock. Interest rates transformed to net interest rates in % per annum. Shock happens in period 0.

room for monetary policy tightening in the current period.

Unexpected inflation relaxes the fiscal constraint on monetary tightening faced by the central bank. Consequently, the requirement to avoid government default—operationalized through the constraint on nominal interest rates—does not necessarily compel the central bank to adopt a passive monetary policy. Indeed, as we show below, the central bank is always able to satisfy the Taylor principle. By contrast, the fiscal authority always adjusts taxes to keep public debt on a sustainable path; in Leeper's terminology, fiscal policy is passive at all times.[2] As a result, the nature of inflation generated by the fiscal limit differs fundamentally from that implied by the Fiscal Theory of the Price Level, in which inflation rises to ensure debt sustainability precisely because fiscal policy is irresponsible and fails to guarantee it.

The existence of the fiscal limit generates inflationary pressures even though monetary policy is always active and fiscal policy is always passive insofar as the fiscal limit is satisfied.

We now illustrate how the model with a fiscal limit responds to demand and supply shocks. We initialize the model at its deterministic (non-risky) steady-state values, based on the calibration reported in Table 1. We then simulate the model for 1,000 periods in the absence of shocks, ensuring convergence to the stochastic (or risky) steady-state equilibrium.

We show the effects of markup and preference shocks on the fiscal constraint on monetary

[2]By respecting the fiscal limit, the central bank enables the fiscal authority to remain credibly committed to stabilizing public debt.

policy first. The size of the shock is set to 4 standard deviations. In Appendix C we also show the dynamics in the case of a sequence of three non-zero shocks of smaller size.

First, consider a negative (favorable) markup shock, which lowers inflation and boosts output. Such a shock does not pose significant fiscal sustainability concerns, as the combination of lower inflation and higher economic growth—ceteris paribus—reduces the current fiscal imbalance and thereby increases the fiscal constraint, allowing for greater scope for potential monetary tightening. Nevertheless, following a favorable markup shock, the central bank lowers the policy rate in response to the decline in inflation. Thus, a favorable markup shock is a benign disturbance that never triggers fiscal sustainability concerns that would constrain monetary policy and, in fact, creates additional fiscal space for future monetary tightening.

This is illustrated in the right panel of Figure 2. Notice that the upper bound on the interest rate, $\bar{R}_t$ (the dash–dotted black line), increases following the favorable markup shock, while the central bank lowers the policy rate, R_t (the solid blue line), in response to deflationary pressures.

However, a positive markup shock creates a challenging environment for the central bank: inflation rises while output growth slows, rendering the net effect on the fiscal constraint ambiguous. Higher inflation erodes the real value of outstanding debt and expands the scope for monetary tightening, whereas weaker growth raises the debt-to-GDP ratio and tightens the fiscal constraint. In addition, the slowdown in economic activity induces the fiscal authority to adopt a more expansionary fiscal stance, which further contributes to tightening the fiscal constraint. In our model, the fiscal constraint increases only marginally—insufficient to accommodate the tightening implied by the monetary policy rule. Consequently, although the central bank raises the policy rate and the real interest rate increases, consistent with active monetary policy, the adjustment is weaker than prescribed by the rule. The notional policy rate (dashed red line) is constrained by the fiscal constraint (dash–dotted black line), keeping the implemented rate below its notional level. To avoid debt instability, the central bank tightens less aggressively, allowing higher inflation and supporting output growth, which in turn contributes to an expansion of the fiscal constraint, $\bar{R}_t$.

We now turn to demand shocks. The results are reported in Figure 3. Consider first a positive demand shock, which raises both output and inflation. These effects naturally relax the fiscal constraint, thereby providing additional room for the central bank to counteract the inflationary consequences of the shock. Expansionary demand shocks improve the interest–growth differential, reduce the fiscal imbalance, and expand the scope for monetary tightening, even when the fiscal constraint is initially tight. As shown in the right panel of Figure 3, the upper bound on the interest rate, $\bar{R}_t$, increases by more than the policy rate, R_t, because the economic expansion induces the fiscal authority to raise taxes, τ_t. In addition, the

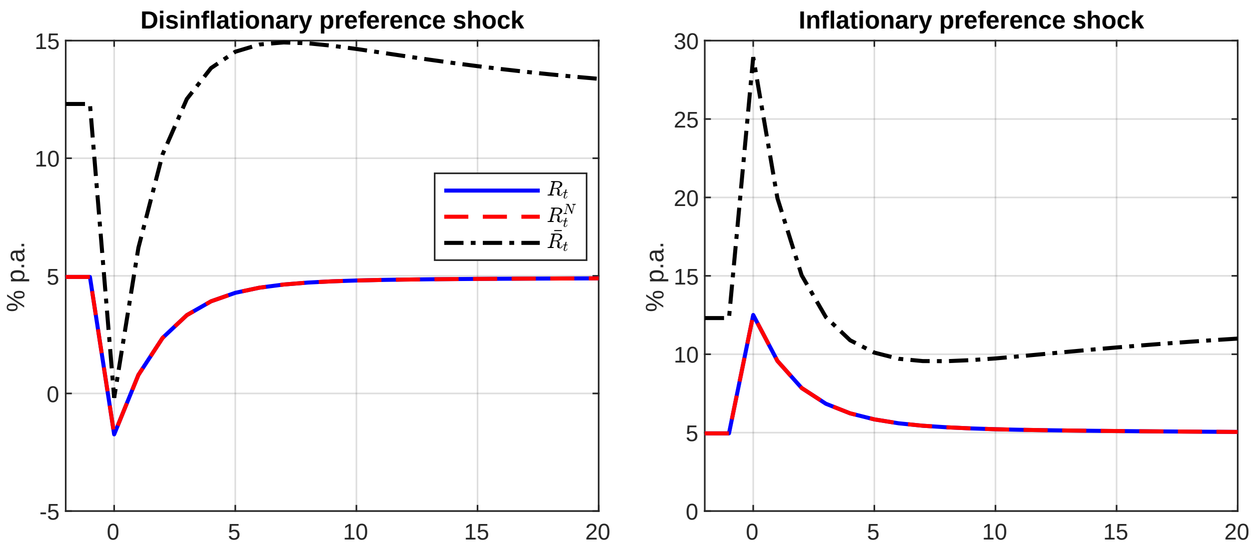

Figure 3: Interest rate dynamics in response to preference shock. Dynamics of nominal, notional, and upper bound interest rate in response to a four-standard-deviation disinflationary (left panel) and inflationary (right panel) preference shock. Interest rates are transformed to net interest rates in % per annum. Shock happens in period 0.

monetary authority raises the policy rate by one-tenth of a percentage point in response to a one-percentage-point increase in output, while the pass-through to the fiscal constraint is one-for-one. Overall, an expansionary demand shock does not generate fiscal sustainability concerns.

We finally consider a negative demand shock that depresses both economic activity and inflation, triggering a severe recession with falling prices. Fiscal policy is countercyclical and therefore becomes expansionary in an effort to stabilize the economy. However, this fiscal stabilization comes at the cost of narrowing the space for monetary policy accommodation, as it decreases the primary surplus, τ_t, and hence the upper bound on the interest rate, $\bar{R}_t$; see equation (13). Moreover, the impact of the output contraction on the fiscal constraint, $\bar{R}_t$, is larger than its effect on the policy rate, R_t, which is reduced by only one-tenth of a percentage point for each one-percentage-point decline in output. As a result, the fiscal constraint declines considerably more than the policy rate, as shown in the left panel of Figure 3, where the dash–dotted black line, $\bar{R}_t$, approaches the dashed red line representing the notional interest rate, R_t^N, from above.

In this simulation, the fiscal limit does not bind, even though the recession substantially increases the fiscal imbalance and restricts monetary policy space. Nevertheless, large negative demand shocks drive the nominal interest rate into negative territory, violating the ZLB constraint, which is not modeled here. When the zero lower bound binds, the real interest rate rises, lowering output and inflation. As a result, the fiscal constraint (the black dashed line) shifts downward further, pushing the feasible nominal interest rate below the zero lower bound. We will discuss the interaction between the fiscal upper bound and the zero lower bound on the policy rate in the next section.

Inflationary bias due to the fiscal limit. Agents' decisions at the stochastic steady state reflect the risks associated with future shock realizations. In particular, agents internalize the possibility that sufficiently large shocks may cause the fiscal limit to bind, thereby weakening the monetary policy response to inflation. Under our calibration, the inflation rate at the risky steady state is approximately 2.1%, which is 10 basis points higher than in the non-risky steady state, implying that the risk of the fiscal limit generates an inflationary bias of about 10 basis points.

With the baseline calibration and both shocks active, the fiscal limit binds around 8% of the time. Decomposing this into the contribution of supply and demand shocks, we find that only the supply shocks already lead to the fiscal limit binding in around 7% of the time, while only 1% of the time in the case of demand shocks.

5 The Effects of the Shocks

We now study the propagation of shocks in the model and compare it with a counterfactual scenario in which the fiscal limit is not enforced. Figure 4 displays the impulse response functions to an inflationary markup shock, which, as shown earlier, causes the fiscal limit to bind for a few periods at the beginning of the simulation. The comparison between the blue solid line and the red dashed line–the latter representing the counterfactual case–captures both the impact of the fiscal constraint on monetary policy and the effects of changes in agents' beliefs about the likelihood that the fiscal limit will bind again. As will become clear below, the latter effects are quantitatively small, for reasons we discuss later.

When the fiscal limit binds, it constrains the central bank to adopt a more accommodative stance, resulting in stronger responses of both output and inflation. Importantly, this inflation is fiscal in nature, as it originates from the need to satisfy the fiscal limit. Nevertheless, it is not related to the fiscal theory of the price level: as long as the fiscal limit is respected, fiscal policy remains passive and is thereby always committed to stabilizing government debt in the long run. Inflation instead arises from the more accommodative monetary policy response to the inflationary pressures generated by the markup shock. Therefore, the nature of the equilibrium does not change. It remains an equilibrium of monetary dominance in which monetary policy is active and fiscal policy is passive, since the fiscal limit is always satisfied.

The accommodative stance of monetary policy is evident in the response of the real

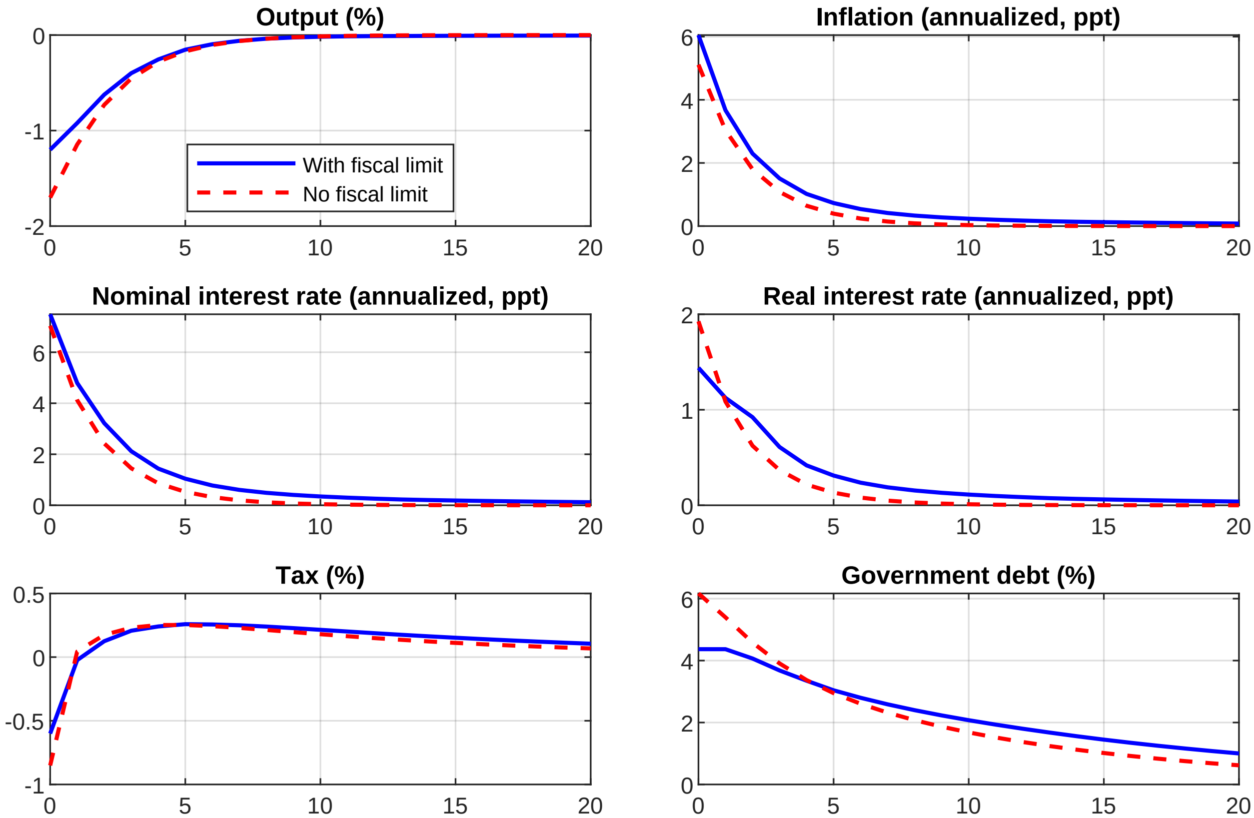

Figure 4: Responses to inflationary cost-push shock. Impulse response functions to a four-standard-deviation inflationary cost-push shock. Responses from the model with a fiscal limit shown in blue and without a fiscal limit in dashed red. Shock happens in period 0. Figures show dynamics in deviation from pre-shock level.

interest rate, which is lower when the fiscal limit binds (blue solid line) in the initial phase of the simulation. This outcome is directly driven by the fiscal constraint. Once the fiscal limit ceases to bind later on, the real interest rate rises above its level in the counterfactual scenario (red dashed line). Overall, the figure illustrates how the fiscal limit keeps the real interest rate temporarily lower, even though inflation and output are higher than in the absence of the fiscal constraint.

The effects of this accommodative monetary stance on inflation are both sizable and persistent, while output growth remains elevated for roughly the first three quarters. These dynamics arise even though monetary policy eventually becomes more responsive to inflation and raises the real interest rate more aggressively in the medium run. As accommodative monetary policy supports economic activity and inflation, the debt-to-GDP ratio declines, and the fiscal limit gradually stops binding.

Initially, the fiscal limit dampens the increase in the debt-to-GDP ratio relative to the counterfactual. However, toward the end of the simulation, this pattern reverses, and the debt-to-GDP ratio becomes higher under the model with fiscal limit. This reversal is driven

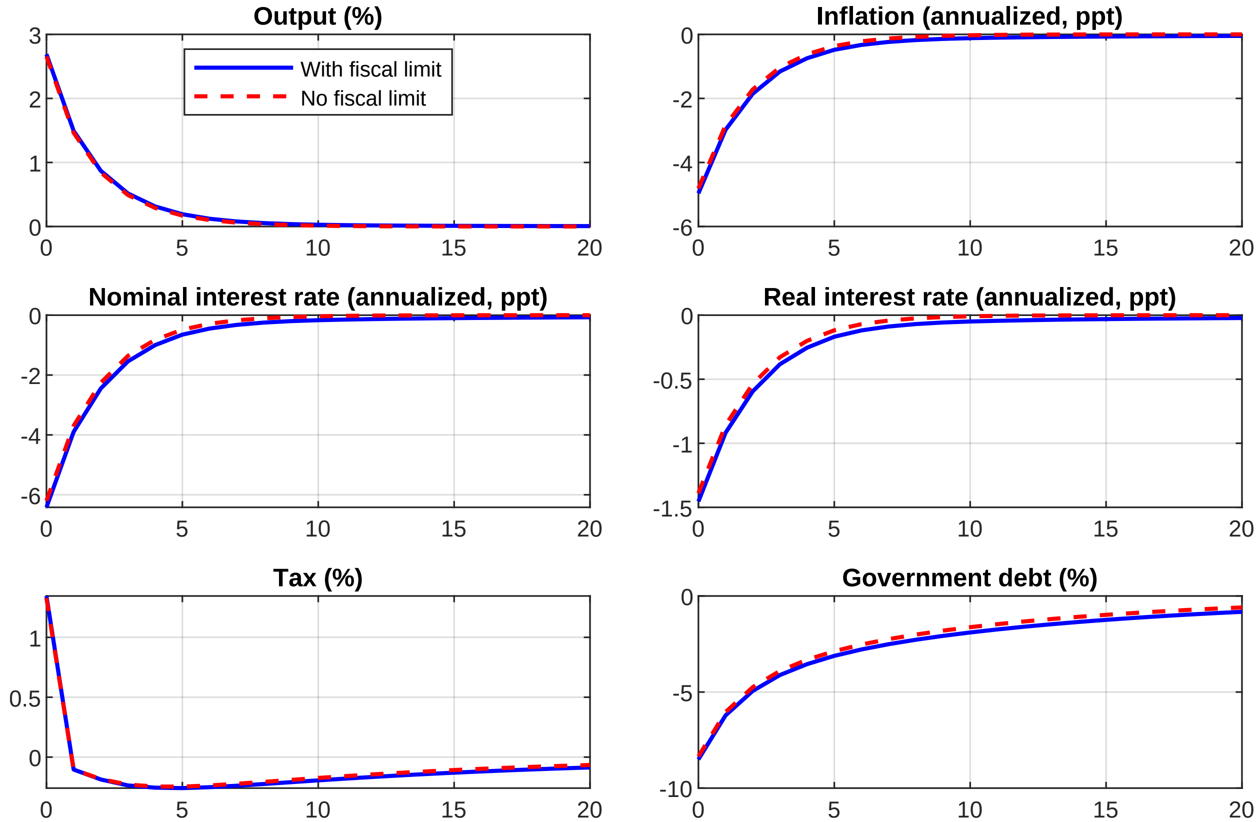

Figure 5: Responses to disinflationary cost-push shock. Impulse response functions to a four-standard-deviation disinflationary cost-push shock. Responses from the model with a fiscal limit shown in blue and without a fiscal limit in dashed red. Shock happens in period 0. Figures show dynamics in deviation from pre-shock level.

by the subsequent monetary tightening once the interest rate is no longer constrained by the fiscal limit.

The expectation channel. Figures 5-7 report the impulse response functions for the shocks that do not cause the fiscal limit to become binding: the disinflationary markup shocks and the two demand shocks. For all variables, the actual and counterfactual responses largely overlap, indicating that the expectation channel is quantitatively weak. Since the fiscal limit never binds in these simulations, any difference between the two responses can only arise from agents' beliefs about the probability of hitting the fiscal limit in the future. These effects are captured by the blue solid line, whereas the red dashed line assumes that the fiscal limit never binds.

The only exception to this limited role of expectations arises in the impulse responses to inflationary preference shocks (see Figure 7). Although this shock initially relaxes the fiscal constraint, the subsequent monetary tightening leads to higher debt accumulation. In the medium term of the simulation, debt approaches the fiscal limit, increasing agents'

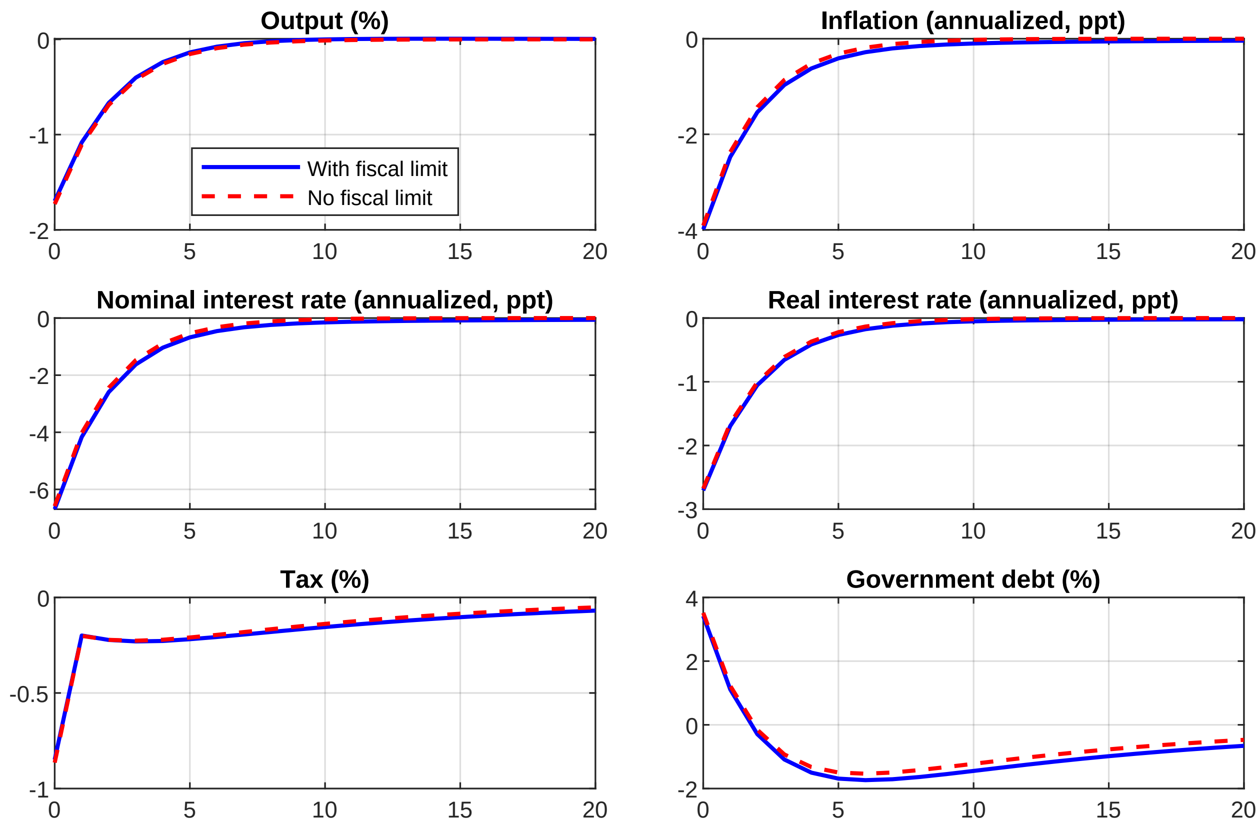

Figure 6: Responses to disinflationary preference shock. Impulse response functions to a four-standard-deviation disinflationary preference shock. Responses from model with fiscal limit shown in blue and without fiscal limit in dashed red. Shock happens in period 0. Figures show dynamics in deviation from pre-shock level.

perceived likelihood of inflationary outcomes associated with a binding fiscal constraint. While these expectation-driven effects on inflation are non-negligible, they remain quantitatively contained.

The limited role played by expectations is closely related to the weak endogenous propagation mechanism embedded in the model. More inertial behavior by policymakers, particularly in the fiscal reaction function, would generate more persistent movements in the debt-to-GDP ratio following shocks and, consequently, a higher perceived likelihood of violating the fiscal limit.

While a more inertial specification would be computationally more demanding, we believe it remains feasible in light of recent advances in solving nonlinear models using new deep learning methods (Kahou, Fernández-Villaverde, Perla and Sood, 2021, Maliar, Maliar and Winant, 2021, Azinovic, Gaegauf and Scheidegger, 2022, Fernández-Villaverde, Nuño and Perla, 2024, Kase, Melosi and Rottner, 2025a, Kase, Rottner and Stohler, 2025b). We leave the implementation and quantitative exploration of a model with this richer fiscal limit to a future version of the paper.

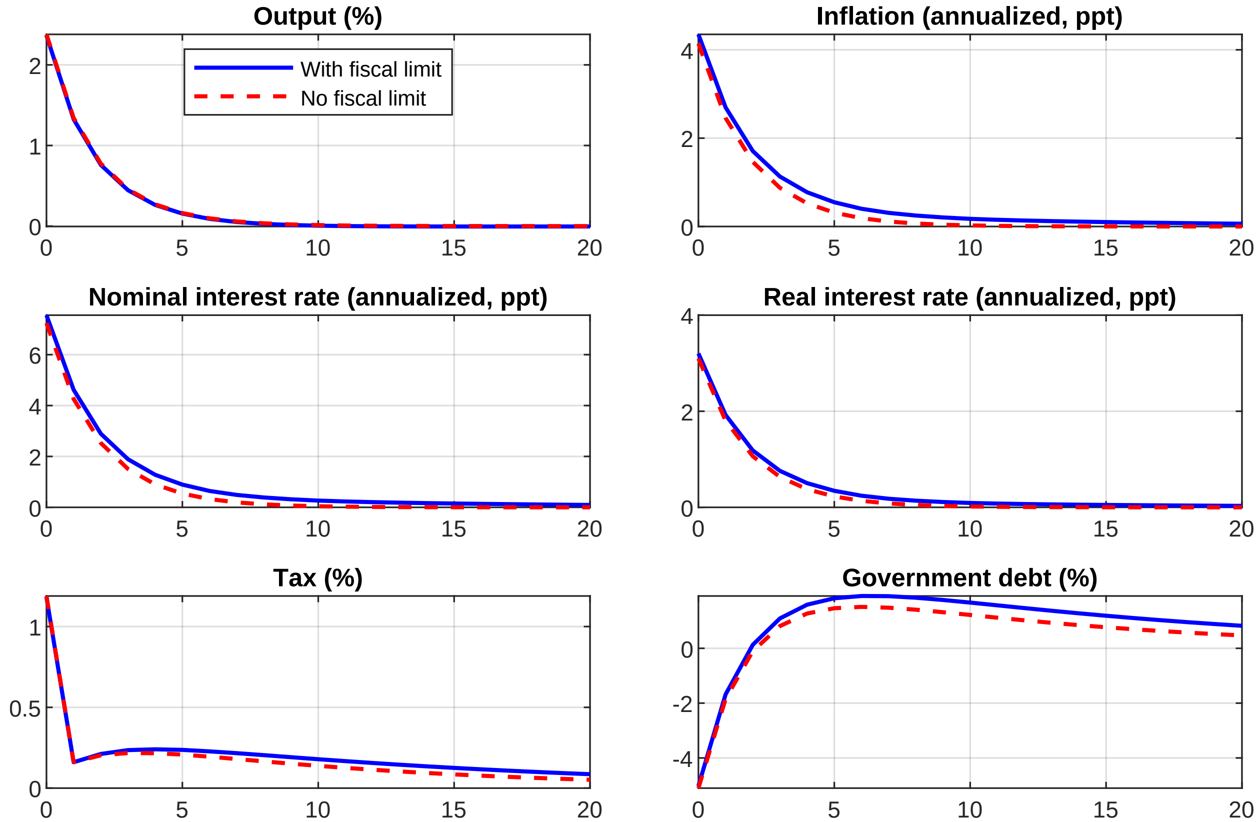

Figure 7: Responses to inflationary preference shock. Impulse response functions to a four-standard-deviation inflationary preference shock. Responses from model with fiscal limit shown in blue and without fiscal limit in dashed red. Shock happens in period 0. Figures show dynamics in deviation from pre-shock level.

Finally, our current baseline calibration might be on the conservative side. Setting the fiscal limit to $\bar{b}$=2.44 instead of 2.45 only increases the incidence of the fiscal limit from around 8% of the time to 14% of the time. At the same time, this change increases the inflationary bias significantly from 10 basis points to almost 40 basis points – highlighting how agents internalize the risk of the fiscal limit – and also leads to larger differences in the response to shocks between the model with and without the fiscal limit.

Disconnection from the fiscal theory of the price level. Across all four shocks, the real interest rate responds in the same direction as inflation (Figures 4–7), confirming that monetary policy remains active even when constrained by the fiscal limit. As a result, the fiscal inflation generated during shock propagation, especially following inflationary cost–push and demand shocks, reflects a mechanism that differs from the fiscal theory of the price level.

While fiscal dominance typically arises exogenously in much of the FTPL literature, fiscal inflation in our framework emerges endogenously. The nonlinear structure of the model further implies that fiscal inflation is state dependent, depending, in particular, on the size of the fiscal imbalance relative to the fiscal limit.

6 Monetary Policy at the Edge: The Zero Lower Bound and the Fiscal Limit

In the previous analysis and in the model, we abstract from the ZLB constraint, even though it can contribute to worsening an already fragile fiscal situation. This occurs because the fiscal constraint is endogenous and depends on output growth and inflation, both of which are affected by the real interest rate. In a recession, if the nominal interest rate is constrained by the ZLB, the real interest rate may increase, thereby compounding the fiscal imbalances already exacerbated by the downturn. In this section, we focus on the interaction between the fiscal (upper) constraint and the ZLB for the interest rate.

A negative preference shock may trigger a recession, inducing the central bank to cut the policy interest rate. The accompanying fiscal expansion, together with the decline in output and inflation, tightens the fiscal constraint, which falls sharply, as illustrated in Figure 3. In the scenario shown in that figure, the room for maneuver of monetary policy vanishes: satisfying the fiscal limit would require setting a negative nominal interest rate (see the dash–dotted black line at time 0), which violates the ZLB constraint.

Although we do not explicitly model the ZLB constraint, we can conjecture what would occur if the endogenous fiscal constraint were to push the upper bound on the nominal interest rate below the ZLB. In this case, the ZLB prevents further reductions in the policy rate, keeping the real interest rate excessively high and thereby exacerbating the recession and fiscal instability. As a consequence, the interest rate $\bar{R}_t$ consistent with satisfying the fiscal limit declines even further. In this situation, where monetary policy space is exhausted, the central bank faces two possible outcomes. The first is for the central bank to intervene by creating money to purchase the portion of government debt that exceeds the borrowing limit (Galí, 2020). The second possibility is to accept that the excess debt is not fiscally backed and adjust the fiscal reaction function (as shown in Bianchi, Faccini and Melosi, 2023a). The latter outcome activates the mechanism of the FTPL.

7 Conclusions

This paper studies how high public debt can endogenously constrain monetary policy through a fiscal limit that places an upper bound on feasible interest rate increases. Within a nonlinear New Keynesian framework, we show that even when Ricardian equivalence holds, fiscal policy remains passive, and monetary policy satisfies the Taylor principle, the proximity to a fiscal limit can generate an inflationary bias by limiting the central bank's ability to respond forcefully to inflationary shocks. This mechanism differs fundamentally from the Fiscal Theory of the Price Level and does not rely on unbacked debt or regime switching; instead, inflation arises from the central bank's endogenous restraint when further tightening would put too much pressure on government debt.

An important avenue for future research is to assess the empirical relevance of fiscal limits in shaping monetary policy and inflation dynamics. In particular, future work will aim to estimate and evaluate the empirical performance of a nonlinear model with an endogenous fiscal limit and to quantify the contribution of fiscal limits to observed inflation dynamics. Pursuing this agenda requires building on the methodological advances developed in Kase et al. (2025a).

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A New Keynesian Model with a Fiscal Limit and Constrained Monetary Policy

A.1 Model equations

Household problem The representative household chooses $\{C_t, N_t, B_t\}_{t=0}^{\infty}$ to maximize expected discounted utility:

$$\max_{\{C_t, N_t, B_t\}} \quad \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \zeta_t \left(\frac{C_t^{1-\sigma}}{1-\sigma} - \psi \frac{N_t^{1+\eta}}{1+\eta} \right) \tag{17}$$

subject to the flow budget constraint

$$P_t C_t + Q_t B_t = W_t N_t + B_{t-1} - P_t T_t + P_t D_t, \qquad \text{where } Q_t = \frac{1}{R_t}. \tag{18}$$

Let λ_t be the Lagrange multiplier on equation (18) the first order conditions are given by

$$\zeta_t C_t^{-\sigma} = \lambda_t P_t \tag{19}$$

$$\zeta_t \psi N_t^{\eta} = \lambda_t W_t \tag{20}$$

$$Q_t \lambda_t = \beta \, \mathbb{E}_t[\lambda_{t+1}] \tag{21}$$

Using $Q_t = 1/R_t$, and combining we get

$$\frac{W_t}{P_t} = \psi \, N_t^{\eta} C_t^{\sigma} \tag{22}$$

$$C_t^{-\sigma} = \beta R_t \, \mathbb{E}_t \left[\frac{\zeta_{t+1}}{\zeta_t} C_{t+1}^{-\sigma} \frac{P_t}{P_{t+1}} \right] \tag{23}$$

The preference shock ζ follows an AR(1) process in logs

$$\ln(\zeta_t) = \rho_\zeta \ln(\zeta_{t-1}) + \sigma^\zeta \epsilon_t^\zeta, \quad \text{where } \epsilon_t^\zeta \sim N(0,1). \tag{24}$$

Firm problem The firm problem is standard. The final goods producers buy intermediate goods and aggregate them into a homogeneous final good using a CES technology as follows:

$$Y_t = \left(\int_0^1 Y_t(j)^{\frac{\epsilon-1}{\epsilon}} \, dj \right)^{\frac{\epsilon}{\epsilon-1}}, \tag{25}$$

where $Y_t(j)$ is the output of intermediate goods firm firm j. The price index for the aggregate homogeneous good is:

$$P_t = \left(\int_0^1 P_t(j)^{1-\epsilon} \, dj \right)^{\frac{1}{1-\epsilon}}, \tag{26}$$

and profit maximization implies that the demand for an individual good $j \in (0,1)$ is:

$$Y_t(j) = \left(\frac{P_t(j)}{P_t}\right)^{-\epsilon} Y_t. \tag{27}$$

The intermediate good firms use labor as the only factor of production

$$Y_t(j) = N_t(j) \tag{28}$$

and demand labor to produce the amount of differentiated goods to be sold to households in a monopolistic competitive market

$$\min_{N_t(j)} \quad W_t N_t(j) \tag{29}$$

$$\text{s.t.} \quad N_t(j) \geq \left(\frac{P_t(j)}{P_t}\right)^{-\epsilon} Y_t \tag{30}$$

Defining $\theta(j)$ as the Lagrange multiplier this yields

$$\theta_t(j) = W_t \qquad \forall j \tag{31}$$

Each intermediate goods firm j sets the price of its differentiated good j so as to maximize its profits and subject to price adjustment costs a la Rotemberg

$$\max_{P_t(j)} \quad \left(\frac{P_t(j)}{P_t}\right)^{1-\epsilon} Y_t - MC_t \left(\frac{P_t(j)}{P_t}\right)^{-\epsilon} Y_t - \frac{\varphi}{2}\left(\frac{P_t(j)}{\Pi P_{t-1}(j)} - 1\right)^2 Y_t \tag{32}$$

where $MC_t \equiv \frac{W_t}{P_t}$ are real marginal costs. The parameter $\varphi > 0$ measures the cost of price adjustment in units of the final good. The first order condition is

$$\begin{aligned}(\epsilon - 1)\left(\frac{P_t(j)}{P_t}\right)^{-\epsilon} \frac{Y_t}{P_t} &= \epsilon\, MC_t \left(\frac{P_t(j)}{P_t}\right)^{-\epsilon-1} \frac{Y_t}{P_t} - \varphi\left(\frac{P_t(j)}{\Pi P_{t-1}(j)} - 1\right)\frac{Y_t}{\Pi P_{t-1}(j)} \\ &+ \varphi \mathbb{E}_t \Lambda_{t,t+1}\left(\frac{P_{t+1}(j)}{\Pi P_t(j)} - 1\right)\frac{P_{t+1}(j)}{\Pi P_t(j)}\frac{Y_{t+1}}{P_t(j)}.\end{aligned} \tag{33}$$

where the stochastic discount factor is

$$\Lambda_{t,t+1} = \beta \mathbb{E}_t\left[\left(\frac{\zeta_{t+1}}{\zeta_t}\right)\left(\frac{C_{t+1}}{C_t}\right)^{-\sigma}\right]. \tag{34}$$

In equilibrium all firms choose the same price. Thus, the New Keynesian Phillips curve is

$$\varphi\left(\frac{\Pi_t}{\Pi} - 1\right)\frac{\Pi_t}{\Pi} = (1-\epsilon) + \epsilon MC_t + \varphi \mathbb{E}_t\left[\Lambda_{t,t+1}\left(\frac{\Pi_{t+1}}{\Pi} - 1\right)\frac{\Pi_{t+1}}{\Pi}\frac{Y_{t+1}}{Y_t}\right] + \ln(\mu_t). \tag{35}$$

where μ is a cost-push (markup) shock that follows an AR(1) process in logs

$$\ln(\mu_t) = \rho_\mu \ln(\mu_{t-1}) + \sigma^\mu \epsilon_t^\mu, \quad \text{where } \epsilon_t^\mu \sim N(0,1). \tag{36}$$

Finally, in equilibrium we have

$$Y_t = N_t. \tag{37}$$

Fiscal and Monetary Policy The government collects taxes T_t and issues one-period bonds satisfying the following budget constraint

$$Q_t B_t = B_{t-1} - P_t T_t \tag{38}$$

We can rewrite the government budget constraint by dividing by $P_t Y_t$ as

$$b_t = R_t \left(b_{t-1} \frac{Y_{t-1}}{\Pi_t Y_t} - \tau_t \right) \tag{39}$$

Taxes are adjusted based on the following fiscal rule responding to debt and output deviations

$$\tau_t = \tau + \delta(b_{t-1} - b) + \delta_Y (Y_t - Y) \tag{40}$$

where $\tau_t \equiv \frac{T_t}{Y_t}$, $b_t \equiv \frac{B_t}{P_t Y_t}$ is the debt-to-GDP ratio and τ, b and Y denote steady-state values.

The monetary authority sets the nominal interest rate based on a standard monetary rule but taking into account the fiscal limit $b_t \leq \bar{b}$ such that the interest rate is constrained by an upper bound

$$R_t \leq \bar{R}_t \equiv \frac{\bar{b}}{b_{t-1} \frac{Y_{t-1}}{\Pi_t Y_t} - \tau_t}. \tag{41}$$

Taken together this implies the monetary authority sets the interest rate as

$$R_t = \min \left[R_t^N, \bar{R}_t \right]. \tag{42}$$

where R_t^N is the notional interest rate based on a standard monetary rule responding to inflation and output from their corresponding targets/steady-state values

$$R_t^N = R \left(\frac{\Pi_t}{\Pi} \right)^{\phi_\Pi} \left(\frac{Y_t}{Y} \right)^{\phi_Y}. \tag{43}$$

The resource constraint is

$$C_t = Y_t \left[1 - \frac{\varphi}{2} \left(\frac{\Pi_t}{\Pi} - 1 \right)^2 \right]. \tag{44}$$

Taken together, the model can be summarized by equations (22), (23), (24), (31), (34), (35), (36), (37), (39), (40), (41), (43) and (44), which we repeat for convenience below:

$$\frac{W_t}{P_t} = \psi N_t^{\eta} C_t^{\sigma} \tag{45}$$

$$C_t^{-\sigma} = \beta R_t \mathbb{E}_t \left[\frac{\zeta_{t+1}}{\zeta_t} C_{t+1}^{-\sigma} \frac{1}{\Pi_{t+1}} \right], \tag{46}$$

$$\theta_t = W_t, \tag{47}$$

$$\Lambda_{t,t+1} = \beta \mathbb{E}_t \left[\left(\frac{\zeta_{t+1}}{\zeta_t} \right) \left(\frac{C_{t+1}}{C_t} \right)^{-\sigma} \right], \tag{48}$$

$$\varphi \left(\frac{\Pi_t}{\Pi} - 1 \right) \frac{\Pi_t}{\Pi} = (1 - \epsilon) + \epsilon MC_t + \varphi \mathbb{E}_t \left[\Lambda_{t,t+1} \left(\frac{\Pi_{t+1}}{\Pi} - 1 \right) \frac{\Pi_{t+1}}{\Pi} \frac{Y_{t+1}}{Y_t} \right] + \ln(\mu_t), \tag{49}$$

$$Y_t = N_t, \tag{50}$$

$$b_t = R_t \left(b_{t-1} \frac{Y_{t-1}}{\Pi_t Y_t} - \tau_t \right), \tag{51}$$

$$\tau_t = \tau + \delta(b_{t-1} - b) + \delta_Y (Y_t - Y), \tag{52}$$

$$R_t = \min \left[R_t^N, \frac{\bar{b}}{b_{t-1} \frac{Y_{t-1}}{\Pi_t Y_t} - \tau_t} \right], \tag{53}$$

$$R_t^N = R \left(\frac{\Pi_t}{\Pi} \right)^{\phi_\Pi} \left(\frac{Y_t}{Y} \right)^{\phi_Y}, \tag{54}$$

$$C_t = Y_t \left[1 - \frac{\varphi}{2} \left(\frac{\Pi_t}{\Pi} - 1 \right)^2 \right], \tag{55}$$

$$\ln(\zeta_t) = \rho_\zeta \ln(\zeta_{t-1}) + \sigma^\zeta \epsilon_t^\zeta, \tag{56}$$

$$\ln(\mu_t) = \rho_\mu \ln(\mu_{t-1}) + \sigma^\mu \epsilon_t^\mu. \tag{57}$$

A.2 Model solution

The model is solved with global methods. The agents take the presence of the fiscal limit into account and form their expectations accordingly. Therefore, the possibility of a bounded interest rate due to the fiscal space in the future affects potentially the equilibrium outcome in times of unconstrained monetary policy. We use time iteration with piecewise linear interpolation of policy functions as in Richter et al. (2014).[3] Expectations are calculated using numerical integration based on Gauss-Hermite quadrature.

The state variables $\mathbb{X}_t$ are b_{t-1}, Y_{t-1}, μ_t and ζ_t while the policy variables are Π_t, labor N_t and the upper bound on the interest rate due to the fiscal limit $\bar{R}_t$:

$$\Pi_t = g^1(b_{t-1}, Y_{t-1}, \mu_t, \zeta_t) \tag{58}$$

$$N_t = g^2(b_{t-1}, Y_{t-1}, \mu_t, \zeta_t) \tag{59}$$

$$\bar{R}_t = g^3(b_{t-1}, Y_{t-1}, \mu_t, \zeta_t) \tag{60}$$

[3]This approach can handle the nonlinearities associated with the monetary policy rule.

where $g = (g^1, g^2, g^3)$ and $g^i : R^1 \to R^1$. To solve the model, we approximate the unknown policy functions with piecewise linear functions $\tilde{g}^i$ that can be written as:

$$\Pi_t = \tilde{g}^1(b_{t-1}, Y_{t-1}, \mu_t, \zeta_t) \tag{61}$$

$$N_t = \tilde{g}^2(b_{t-1}, Y_{t-1}, \mu_t, \zeta_t) \tag{62}$$

$$\bar{R}_t = \tilde{g}^3(b_{t-1}, Y_{t-1}, \mu_t, \zeta_t) \tag{63}$$

The time iteration algorithm to solve for the policy functions is summarized below:

(i) Define a discretized grid for the states $\left\{\left[\underline{b}, \overline{b}\right], \left[\underline{Y}, \overline{Y}\right], \left[\underline{\mu}, \overline{\mu}\right], \left[\underline{\zeta}, \overline{\zeta}\right]\right\}$ and the integration nodes $\epsilon = \left\{\left[\underline{\epsilon}^{\mu,I}, \overline{\epsilon}^{\mu,I}\right], \left[\underline{\epsilon}^{\zeta,I}, \overline{\epsilon}^{\zeta,I}\right]\right\}$.

(ii) Guess the piece-wise linear policy functions $\tilde{g}(\tilde{b}_{t-1}, Y_{t-1}, \mu_t, \zeta_t)$.

(iii) Solve for all time t variables for a given state vector. The policy variables are:

$$\Pi_t = \tilde{g}^1(b_{t-1}, Y_{t-1}, \mu_t, \zeta_t) \tag{64}$$

$$N_t = \tilde{g}^2(b_{t-1}, Y_{t-1}, \mu_t, \zeta_t) \tag{65}$$

$$\bar{R}_t = \tilde{g}^3(b_{t-1}, Y_{t-1}, \mu_t, \zeta_t) \tag{66}$$

so that the remaining variables are given as (where we use the real wage $w_t =\equiv \frac{W_t}{P_t}$):

$$\tilde{Y}_t = N_t \tag{67}$$

$$\tilde{C}_t = \tilde{Y}_t(1 - 0.5\varphi\left(\frac{\Pi_t}{\Pi} - 1\right)^2) \tag{68}$$

$$\tilde{w}_t = \psi N_t^\eta \tilde{C}_t^\sigma \tag{69}$$

$$R_t^N = R\left(\frac{\Pi_t}{\Pi}\right)^{\phi_\Pi}\left(\frac{\tilde{Y}_t}{\tilde{Y}}\right)^{\phi_Y} \tag{70}$$

$$\tilde{R}_t = \min\left[\bar{R}_t, R_t^N\right] \tag{71}$$

$$\tilde{\tau}_t = \tau + \delta(b_{t-1} - b) + \delta_Y(\tilde{Y}_t - Y) \tag{72}$$

$$\tilde{b}_t = \tilde{R}_t\left(b_{t-1}\frac{Y_{t-1}}{\Pi_t \tilde{Y}_t} - \tilde{\tau}_t\right) \tag{73}$$

$$MC_t = \tilde{w}_t \tag{74}$$

Given these variables we can also compute

$$\bar{R}_t^{new} = \frac{\bar{b}}{b_{t-1}\frac{Y_{t-1}}{\Pi_t \tilde{Y}_t} - \tilde{\tau}_t} \tag{75}$$

Calculate the state variable for period $t+1$ at each integration node i:

$$\mu_{t+1}^i = \exp\left(\rho_\mu \log(\mu_t) + \epsilon_{t+1}^{\mu,i}\right) \tag{76}$$

$$\zeta^i_{t+1} = \exp\left(\rho_\zeta \log(\zeta_t) + \epsilon^{\zeta,i}_{t+1}\right) \tag{77}$$

For each integration node $\mu^i_{t+1}, \zeta^i_{t+1}$, calculate the policy variables and solve for output, consumption and the stochastic discount factor:

$$\Pi^i_{t+1} = \tilde{g}^1(\tilde{b}_t, \tilde{Y}_t, \mu^i_{t+1}, \zeta^i_{t+1}) \tag{78}$$

$$N^i_{t+1} = \tilde{g}^2(\tilde{b}_t, \tilde{Y}_t, \mu^i_{t+1}, \zeta^i_{t+1}) \tag{79}$$

$$\tilde{Y}^i_{t+1} = N^i_{t+1} \tag{80}$$

$$\tilde{C}^i_{t+1} = \tilde{Y}^i_{t+1}(1 - 0.5\varphi\left(\frac{\Pi^i_{t+1}}{\Pi} - 1\right)^2) \tag{81}$$

$$\tilde{\Lambda}^i_{t,t+1} = \beta\left(\frac{\zeta^i_{t+1}}{\zeta_t}\right)\left(\frac{\tilde{C}^i_{t+1}}{\tilde{C}_t}\right)^{-\sigma} \tag{82}$$

Calculate the errors for the Euler Equation, the New Keynesian Phillips curve and for $\bar{R}_t$

$$err_1 = 1 - \tilde{R}_t E_t\Big[\tilde{\Lambda}_{t,t+1}\frac{1}{\tilde{\Pi}_{t+1}}\Big] \tag{83}$$

$$err_2 = \varphi\left(\frac{\Pi_t}{\Pi} - 1\right)\frac{\Pi_t}{\Pi} - (1-\epsilon) - \epsilon MC_t - \tag{84}$$

$$\varphi E_t \tilde{\Lambda}_{t,t+1}\left(\frac{\tilde{\Pi}_{t+1}}{\Pi} - 1\right)\left(\frac{\tilde{\Pi}_{t+1}}{\Pi}\right)\frac{\tilde{Y}_{t+1}}{\tilde{Y}_t} + \ln(\mu_t) \tag{85}$$

$$err_3 = \bar{R}_t - \bar{R}^{new}_t$$

where the expectations in the first two equations are numerically integrated across the integration nodes. The nodes and weights are based on Gaussian-Hermite quadrature.

(iv) Use a numerical root finder to minimize the errors for the equations.

(v) Update the policy functions until the errors at each point of the discretized state are sufficiently small.

We discretize the two endogenous state variables b and Y in 15 evenly-spaced points with bounds at $[-4, +3]\%$ and $[-3, +3]\%$ around their respective deterministic steady state. The markup and preference shocks are discretized in 15 evenly-spaced points with bounds chosen to be $\pm 4\sigma^\mu$ and $\pm 4\sigma^\zeta$ around the respective deterministic steady state. This results in a total of 50625 nodes. The Gauss-Hermite quadrature provides the integration nodes $\left[\epsilon^{\mu,i}, \epsilon^{\zeta,i}\right]$ and the corresponding weights $\xi(i)$ for all integration nodes $i \in \{1, 2, \ldots, I\}$. We use 9 nodes for both shocks so that we evaluate the expectations using $I = 81$ weighted points.

B A Simplified Model

We derive a simplified model to provide a graphical characterization of the inflation bias and inflationary spirals associated with the fiscal limit. We assume that the markup shock is the only exogenous variation, which follows Markov Process with two realizations for the markup shock: $\mu_t = \{\mu_t^L, \mu_t^H\}$. The transition matrix is given as:

$$P = \begin{bmatrix} p_1 & 1-p_1 \\ 1-p_2 & p_2 \end{bmatrix} \tag{86}$$

We specify the rule as

$$\tau_t = \begin{cases} b_{t-1}\frac{R_{t-1}}{\Pi_t}\frac{Y_{t-1}}{Y_t} - b_t^L & \text{if } \mu_t^L \\ b_{t-1}\frac{R_{t-1}}{\Pi_t}\frac{Y_{t-1}}{Y_t} - b_t^H & \text{if } \mu_t^H \end{cases} \tag{87}$$

which is a state-dependent fiscal policy rule. Importantly, the rule can be characterized as a passive rule, actually even a superpassive one. The reason is that debt is determined and not explosive due to the fiscal rule. The setup of our rule implies that b^L and b^H are constant and depend on the realization of the markup shock. Thus, the only state variable is the markup shock.

The last assumption is that the relevant fiscal space depends on the amount to repay at the beginning of the next period without taxation and without accounting for changes in output, that is, we have

$$\bar{b} = b_t E_t \frac{\bar{R}_t}{\Pi_{t+1}} \Leftrightarrow \bar{R}_t = \bar{b}\Pi_{t+1}/b_t \tag{88}$$

This simplification has the advantage that we do not need to incorporate next period values here. Note that the amount of states would actually be unaffected, as we know the mapping for the taxes. Note that we deviate slightly here from the main model by assuming that the fiscal limit needs to hold in expectation.

Note that these assumptions are sufficient to write this as a two-state process that only depends on the realization of the markup shock.

B.1 System of Equations

The system of equations in the low markup state is

$$R^L = \left[R\left(\frac{\Pi_t^L}{\Pi}\right)^{\phi_\Pi}, \bar{R}^L \right], \tag{89}$$

$$MC^L = \psi Y^{L^{\sigma+\eta}}, \tag{90}$$

$$b^L = b_{t-1}\frac{R_{t-1}}{\Pi^L} - \tau^L \tag{91}$$

$$\tau^L = b_{t-1}\frac{R_{t-1}}{\Pi} - b^L \tag{92}$$

$$\xi\left(\frac{\Pi^L}{\Pi}-1\right)\frac{\Pi^L}{\Pi}=(1-\epsilon)+\epsilon MC^L+\xi\beta\left[p_1\left(\frac{\Pi^L}{\Pi}-1\right)\frac{\Pi^L}{\Pi}+(1-p_1)\left(\frac{Y^H}{Y^L}\right)^{1-\sigma}\left(\frac{\Pi^H}{\Pi}-1\right)\frac{\Pi^H}{\Pi}\right]+\mu^L \tag{93}$$

$$1=\beta R^L\left[p_1\frac{1}{\Pi^L}+(1-p_1)\left(\frac{Y^H}{Y^L}\right)^{-\sigma}\Pi^H\right] \tag{94}$$

$$\bar{R}^H L=\frac{\bar{b}}{b^L}\left[p_1\Pi^L+(1-p_1)\Pi^H\right] \tag{95}$$

Note that the setup of our passive tax rule implies, that b^L is a constant. In that way, we are removing that changes in debt affect the next period. We thus do not need to calculate the taxation and the law of motion of debt which is given by being in the right state. In the high markup shock, we have

$$R^H=\left[R\left(\frac{\Pi_t^H}{\Pi}\right)^{\phi_\Pi},\bar{R}^H\right], \tag{96}$$

$$MC^H=\psi Y^{H\sigma+\eta}, \tag{97}$$

$$b^H=b_{t-1}\frac{R_{t-1}}{\Pi^H}-\tau^H \tag{98}$$

$$\tau^H=b_{t-1}\frac{R_{t-1}}{\Pi}-b^H \tag{99}$$

$$\xi\left(\frac{\Pi^H}{\Pi}-1\right)\frac{\Pi^H}{\Pi}=(1-\epsilon)+\epsilon MC^H+\xi\beta\left[p_2\left(\frac{\Pi^H}{\Pi}-1\right)\frac{\Pi^H}{\Pi}+(1-p_2)\left(\frac{Y^L}{Y^H}\right)^{1-\sigma}\left(\frac{\Pi^L}{\Pi}-1\right)\frac{\Pi^L}{\Pi}\right]+\mu^H \tag{100}$$

$$1=\beta R^H\left[p_2\frac{1}{\Pi^H}+(1-p_2)\left(\frac{Y^L}{Y^H}\right)^{-\sigma}\Pi^L\right] \tag{101}$$

$$\bar{R}^H=\frac{\bar{b}}{b^H}\left[p_2\Pi^H+(1-p_2)\Pi^L\right] \tag{102}$$

Again, we do not need to calculate b^H and τ^H here.

C Additional figures

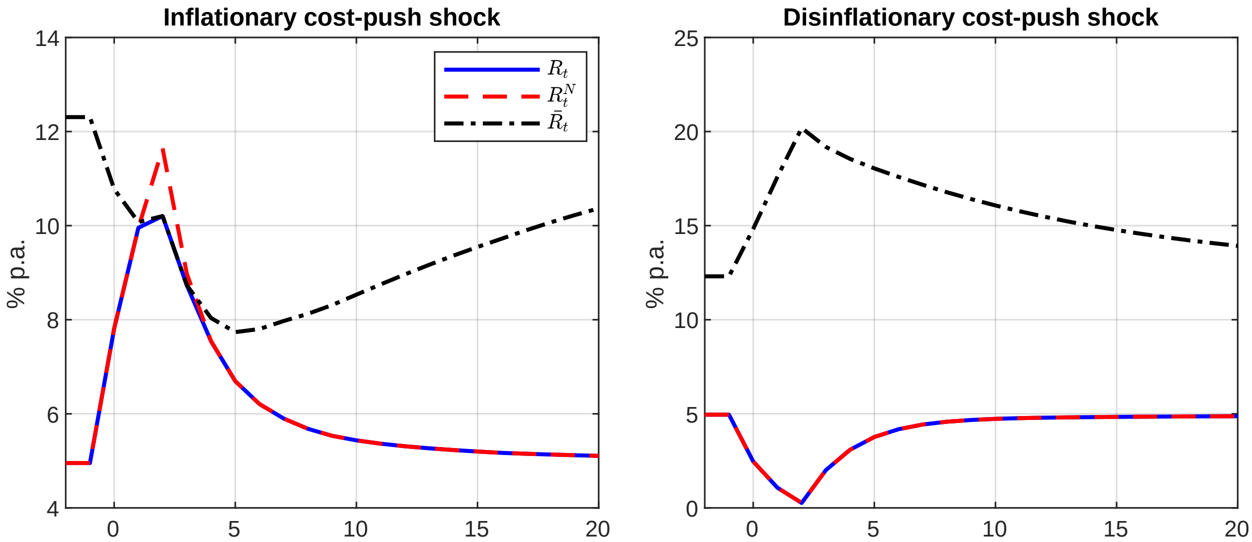

Figure 8: Interest rate dynamics in response to sequence of cost-push shocks. Dynamics of nominal, notional and upper bound interest rate in response to a sequence of three 1.5 standard-deviation inflationary (left panel) and disinflationary (right panel) cost-push shocks. Interest rates transformed to net interest rates in % per annum. Shocks happen in period 0, 1 and 2.

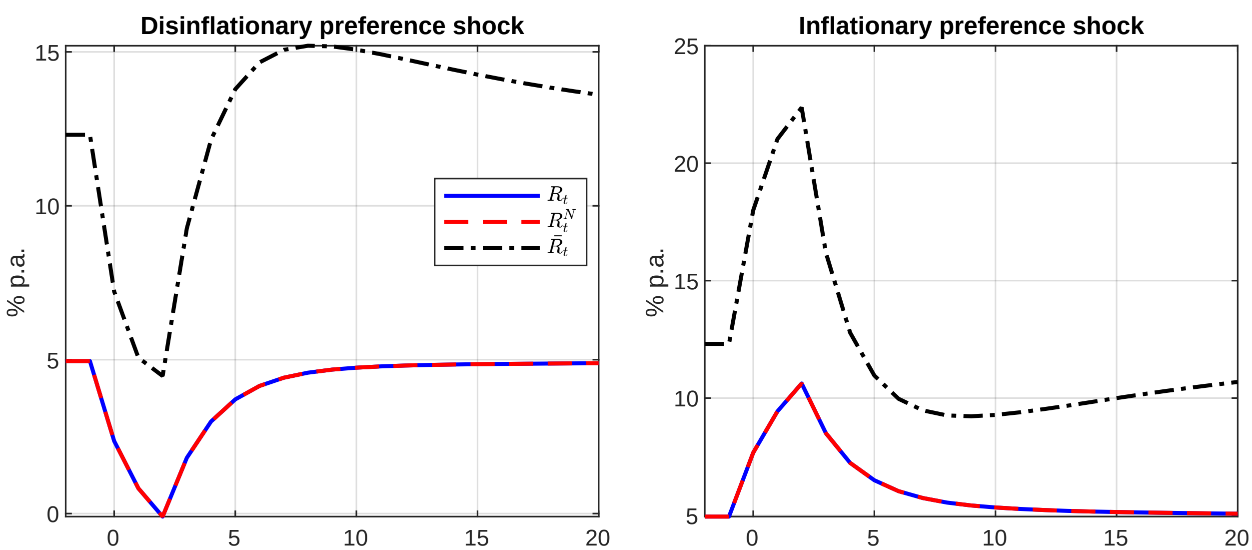

Figure 9: Interest rate dynamics in response to preference shock. Dynamics of nominal, notional and upper bound interest rate in response to a sequence of three 1.5 standard-deviation disinflationary (left panel) and inflationary (right panel) preference shock. Interest rates transformed to net interest rates in % per annum. Shocks happen in period 0, 1 and 2.