The Perils of Narrowing Fiscal Spaces*

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

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Abstract

We develop a nonlinear model in which trend inflation is shaped by the interaction between the size of the primary deficit and the risk of supply disruptions. The key friction is limited fiscal responsibility: the government stabilizes debt in the long run but, unwilling to let debt accumulate too fast, it pressures the central bank to restrain interest-rate increases rather than adjust its own budget. The fiscal limit binds asymmetrically across shocks: inflationary supply shocks are especially likely to push monetary policy against the constraint. As supply-shock volatility rises and fiscal space narrows, the constraint binds more often; anticipating this, agents raise their inflation expectations, and trend inflation rises before the constraint ever binds. Movements in supply-shock volatility and fiscal space together account for much of the ratcheting up and down of US trend inflation between 1965 and 1990. Interpreted through the model, the post-pandemic rise in long-run inflation expectations reflects a higher probability of fiscally constrained monetary policy.

Keywords: Macroeconomic risks, supply shocks, monetary and fiscal policy, limited fiscal responsibility, fiscal capacity, trend inflation, nonlinear models.

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*Emails: hanno.kase@ecb.europa.eu, leonardo.melosi@eui.eu, s.g.rast@dnb.nl, & 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

Most of the time, inflation rises and falls with shocks, returning to its starting point once they dissipate. Sometimes, however, it ratchets, settling on a persistently different plateau after the shocks have faded. The postwar United States offers one clear episode in each direction—an upward ratchet from the mid-1960s to the early 1980s and a downward ratchet over the following two decades—and, possibly, a new upward ratchet now under way.

The upper panel of Figure 1 traces this history. Inflation rested on a low plateau through the early 1960s, climbed in successive steps through the 1970s, stepped down to successively lower plateaus from the second half of the 1980s onward, and has remained above target since the pandemic.

The lower panel points to the two forces that, we argue, lie behind this pattern: the stance of fiscal policy and the risk of supply disruptions. The upward ratchet began in the mid-1960s, as the Vietnam War and Great Society programs turned persistent primary surpluses into deficits, while Cold War tensions and rising resource nationalism gradually heightened the risk of supply disruptions–a risk that later materialized in the oil shocks of the 1970s.

The downward ratchet was driven by the same two forces operating in reverse: superpower détente and the collapse of OPEC's pricing power began to moderate disruption risk, while fiscal consolidation gradually rebuilt fiscal space. The decline in risk was as gradual as its rise. Non-OPEC supply expanded, OPEC made its first-ever price cut, and superpower tensions eased. The fall of the Berlin Wall, the creation of NAFTA and the WTO, and China's accession to the WTO then entrenched a low-risk regime. Deeper global integration diversified supply, allowed trade to absorb local disruptions.

Neither force appears sufficient on its own. In the 1950s and early 1960s, disruption risk was elevated, but fiscal discipline kept inflation anchored. Even the Korean War commodity shock, which briefly pushed inflation very close to double digits, left no lasting effect on trend inflation. Conversely, in the two decades before the pandemic, primary deficits were sometimes large, but globalization kept disruption risk low and trend inflation did not rise.

Since 2021, however, the two forces have again coincided. Exceptionally large peacetime deficits have met renewed disruption risk from the pandemic, the war in Ukraine, and the fragmentation of global trade, which turned the interdependencies created by globalization into vulnerabilities. Inflation has remained above the central bank's target ever since.

We develop a nonlinear model in which large deficits may induce the government to resist interest-rate increases, and greater supply-disruption risk strengthens this pressure. Neither margin is present in conventional models: trend inflation is unaffected by macroeconomic risk, the monetary–fiscal policy mix does not depend on the state of public finances, and inflation

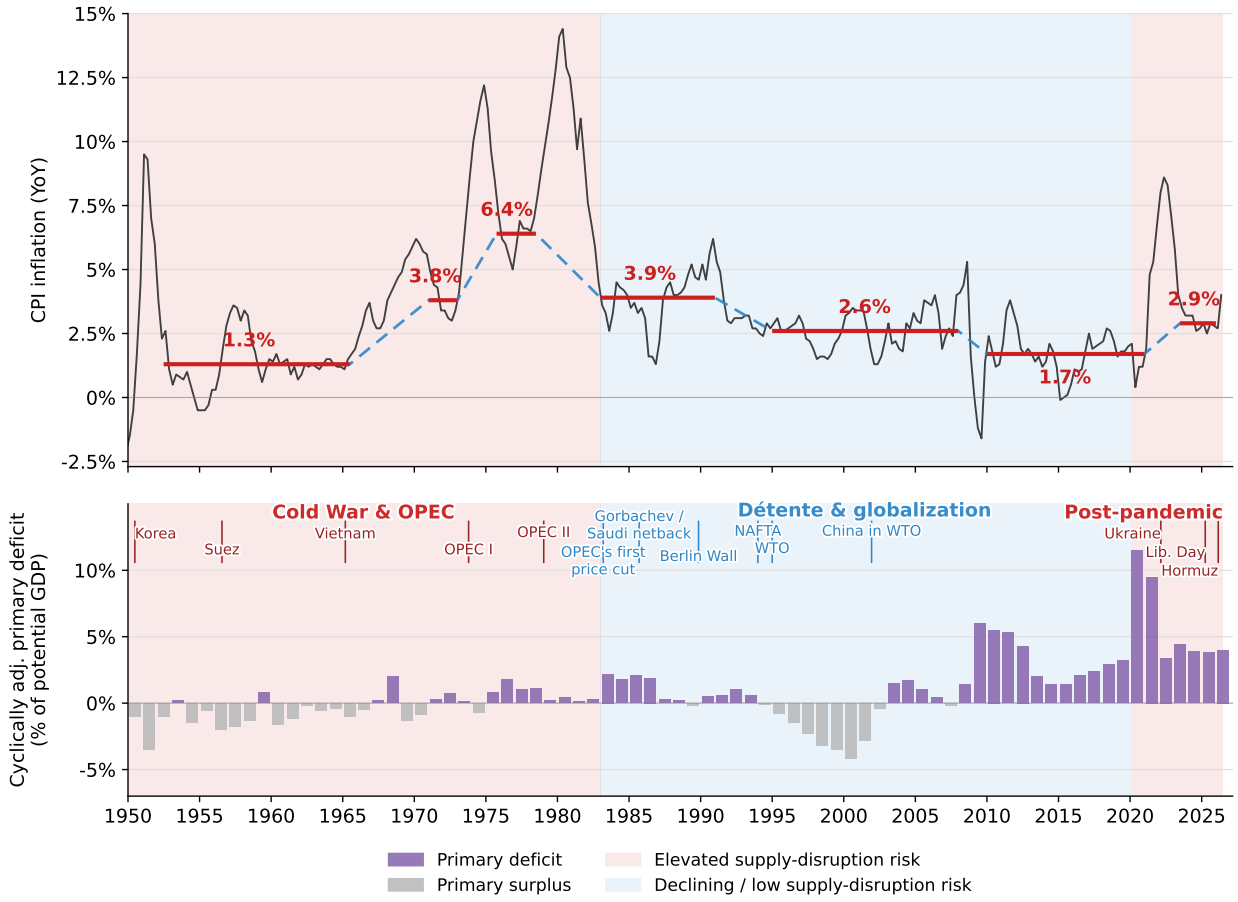


Figure 1: Top Panel: Ratcheting inflation. Bottom Panel: Deficits and supply-disruption risks

therefore returns to target once shocks dissipate. In our model, by contrast, mounting pressure on the central bank causes inflation to converge not to its target, but to a higher, endogenously determined level. Trend inflation rises. Moreover, when the fiscal limit binds, inflation becomes more responsive to shocks.

The pressure on monetary policy arises because the government, though committed to stabilizing debt in the long run, resists short-run deficits so large that they would eventually require costly fiscal adjustment. The government acts on this resistance by pressing the central bank to ease monetary policy rather than by adjusting its own budget. We call this friction *limited fiscal responsibility*. We model it as a fiscal limit on the total deficit the government is willing to accept. The economy's distance from this limit –the fiscal space– evolves endogenously, depending on the primary deficit, inflation, the interest rate, economic growth, and the stock of public debt. Monetary tightening consumes fiscal space by weakening activity while raising debt-service costs. The fiscal limit therefore imposes a state-contingent ceiling on the nominal interest rate, which is lower when past shocks have depleted fiscal

space.

Inflationary supply disturbances set monetary and fiscal policy on a collision course. Unlike inflationary demand shocks, they depress economic activity, widening the deficit just as tighter monetary policy is needed to rein in inflation. To contain debt accumulation and the ensuing post-recession fiscal adjustment, the government presses for a looser monetary stance. The central bank therefore raises rates less aggressively, amplifying the inflationary response while cushioning the contraction in activity.

The mechanism operates through expectations even before the limit binds. When deficits are large and supply-disruption risk is high, agents anticipate that future monetary tightening will more often be curtailed by the fiscal limit. They incorporate this prospect of weaker future responses into current inflation expectations, raising trend inflation.

Trend inflation is therefore an equilibrium object, jointly shaped by fiscal behavior and macroeconomic risk–both empirically measurable. Inflation can ratchet upward even if the government's tolerance for deficits is unchanged, because the risk that the fiscal limit will bind raises inflation expectations today.

The same mechanism generates state dependence in short-run inflation dynamics. Because fiscal space is rebuilt only gradually, an economy that has recently experienced a sequence of adverse supply shocks while failing to address persistent primary deficits confronts the next disturbance with less room for monetary tightening than one with a more benign history and sounder public finances. Absent fiscal adjustment to rebuild the lost space, short-horizon inflation expectations remain elevated and inflation persists even as the latest shock dissipates.

Our quantitative analysis delivers two main results. First, fiscal-limit risk depends strongly on the economic environment. It rises when supply shocks become more volatile and when the fiscal limit is tighter. Raising supply-shock volatility from half to one-and-a-half times its baseline level, or lowering the fiscal limit by two percentage points of GDP, raises the probability that the constraint binds from virtually zero to more than 10 percent. Thus, greater supply-side volatility makes the fiscal constraint on monetary policy bind more often.

Second, the fiscal limit binds asymmetrically across shocks: inflationary supply shocks are the ones that push monetary policy against the constraint. An adverse markup shock raises inflation while contracting output, so the tightening needed to contain it deepens the recession and increases the debt burden, moving debt toward the fiscal limit and intensifying fiscal pressure on the central bank. The central bank still raises rates, but by less: inflation rises more on impact, while the real interest rate falls rather than rises. The resulting output contraction is milder and debt dynamics are more favorable—consistent with limited fiscal responsibility. Higher prices and lower real rates erode the real value of outstanding liabilities, bringing the debt-to-GDP ratio close to its pre-shock level, albeit at the cost of persistently

above-target inflation.

Demand shocks, by contrast, do not create this tension. Inflationary demand shocks relax the fiscal constraint by raising both prices and output, while disinflationary demand shocks call for rate cuts rather than hikes. Nor are disinflationary supply shocks problematic: as inflation falls and output expands, the central bank cuts rates while the fiscal constraint eases. A binding constraint on monetary tightening is therefore the distinctive signature of adverse inflationary supply shocks.

The model accounts for the major movements in U.S. trend inflation between 1965 and 1990. To assess its empirical performance, we run a particle filter that recovers the underlying shocks needed to explain the joint dynamics of output, inflation, and debt-to-GDP growth, with the latter providing information about the evolution of fiscal space. We hold the fiscal limit fixed throughout the 25-year sample. We then conduct two counterfactual exercises, each using a version of the model that shuts down the interaction between supply-shock volatility and the fiscal limit

In the first, we show that the model can replicate the ratcheting up of inflation from the mid-1960s through the 1970s and its subsequent decline in the 1980s. Viewed through the lens of the model, the Great Inflation emerges as a period in which eroding fiscal space progressively raised the likelihood that monetary policy would be unable to respond to inflationary shocks, feeding the upward drift in trend inflation; the disinflation of the 1980s, conversely, coincided with a restoration of fiscal space that re-anchored expectations by restoring the central bank's perceived room to act.

In the second exercise, we turn to the post-pandemic period and add long-run inflation expectations to the set of observables. We use the model to assess how much of their increase reflects a narrowing of fiscal space and the resulting reduction in the central bank's room to raise interest rates. We find that fiscal space narrowed considerably after the pandemic and that this decline is essential for explaining the rise in long-run inflation expectations. Through the lens of the model, their post-pandemic drift therefore reflects the anticipation that fiscal pressures may constrain the monetary authority's ability to raise rates sufficiently to contain inflation.

Related Literature Our paper contributes to the large literature on monetary–fiscal interactions and 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)). Much of this literature characterizes equilibrium through the interaction of active and passive

policy regimes. Under monetary dominance, an active Taylor rule determines inflation and the price level, while passive fiscal policy adjusts expected primary surpluses to satisfy the intertemporal government budget constraint. Under fiscal dominance, fiscal policy is active and the price level adjusts to ensure government solvency. More recent work often models transitions between these configurations through regime switching. Unlike the fiscal theory of the price level, our mechanism does not rely on a reversal of policy roles. Fiscal policy is always passive in Leeper's sense, while monetary policy is active in all but rare states in which a tight fiscal limit coincides with very large inflationary shocks. These episodes are short-lived. It is their risk–not doubts about long-run debt stabilization–that moves trend inflation.

Bianchi et al. (2023a) move beyond the stark dichotomy between monetary and fiscal dominance by allowing monetary-led and fiscally-led policy rules to coexist. They show that persistent inflation arises when policymakers respond to transfer shocks with a fiscally-led policy mix, raising the share of unfunded debt. While limited fiscal responsibility is conceptually related to unfunded debt, the mechanism through which it generates inflationary pressures in the short and long run is different: in our model, trend inflation is endogenous and varies with the interaction between macroeconomic risk and the fiscal stance. Capturing these effects requires a fully nonlinear solution of the model, whereas the methodology for computing unfunded government debt relies on linearity. A further difference is that in our framework the policy mix is never fiscally led: within the limits of its fiscal responsibility, the government remains committed to stabilizing debt through fiscal adjustments, and inflationary pressures emerge from the anticipation that these limits may bind rather than from an actual switch to fiscal dominance.

Smets and Wouters (2024) generalize the analysis of Bianchi et al. (2023a) by allowing the policy mix to turn fiscally led in response to shocks beyond transfers, and find that supply disruptions more often complicate monetary-fiscal coordination: fiscal backing weakens more in response to supply shocks than to demand shocks. In Smets and Wouters (2024), the increase in unfunded debt is captured by exogenous shocks, orthogonal to other business cycle disturbances—so the finding that supply shocks raise the unfunded share more than demand shocks is a measured regularity. This paper provides a structural explanation for it: supply shocks consume more fiscal space because they contract output—and thereby the fiscal limit—precisely when the central bank would need to raise rates to fight inflation.

A related literature studies what happens when the central bank's ability to control inflation is undermined by conflict with, or pressure from, the fiscal and political sphere. Bianchi et al. (2023b) use President Trump's tweets criticizing the Fed to identify the effects of political pressure on monetary policy. The tweets lowered expected policy rates, with

effects that grew at longer horizons, raised stock prices, and reduced long-term Treasury yields; their VAR evidence further suggests that this pressure affected actual monetary policy and propagated to financial markets and the macroeconomy. We build on the same logic but take a more structural approach by modeling an endogenous source of conflict between the two authorities. Bianchi and Melosi (2019) model an open conflict between a monetary authority committed to fighting inflation and a fiscal authority unwilling to stabilize debt: while the clash remains unresolved, debt accumulates, and outcomes depend on agents' beliefs about which authority will prevail—inflationary if they expect the monetary authority to capitulate, deflationary if they expect the fiscal authority to yield. Drechsel (2026) documents that such conflicts are a recurring feature of the data: political pressure on the Fed to ease policy has repeatedly materialized and raises inflation strongly and persistently, transmitting chiefly through inflation expectations.

Kaplan et al. (2023) embed the fiscal theory of the price level in a heterogeneous-agent incomplete-market model with flexible prices, where precautionary saving allows the government to sustain persistent deficits up to an endogenous limit and larger deficits raise inflation for any given monetary policy. Their fiscal limit reflects households' demand for safe assets; ours is a constraint on fiscal adjustment in a nonlinear New Keynesian model, whose interaction with macroeconomic risk—rather than with household heterogeneity—determines the room for monetary tightening and, through the anticipation channel, the drift of trend inflation.

Angeletos et al. (2024) and Angeletos et al. (2025a) show that, in New Keynesian models with departures from Ricardian equivalence, fiscal deficits can generate inflation in the spirit of the fiscal theory of the price level even though monetary policy remains active. Kaplan (2025) surveys this broader agenda, showing that in heterogeneous-agent economies the long-run fiscal stance itself constrains long-run inflation and the policy rate. We likewise study fiscal inflation outside the canonical fiscally led regime, but in our model it arises from the anticipation that limited fiscal responsibility may constrain future monetary policy. In complementary work, Angeletos et al. (2025b) show that slow fiscal adjustment can improve cyclical stabilization when fiscal space is ample. We instead study the evolution of fiscal space itself: its erosion constrains monetary policy and de-anchors long-run inflation expectations. Read jointly, the two papers thus point to a trade-off between the short-run stabilization benefits of fiscal inaction and the de-anchoring risk highlighted in our paper.

Our model builds on the contribution of Davig et al. (2010, 2011), who introduce the notion of a fiscal limit and show that the anticipation of future fiscal stress affects inflation and weakens monetary control before the limit is ever reached. We extend their insight in three directions: fiscal space evolves endogenously with the state of the economy, so that the

probability of fiscally constrained monetary policy is time-varying and state-dependent; this variation makes trend inflation endogenous, generating the two-way ratchet at the center of our analysis; and we take the model to the data, attributing the major movements in US trend inflation to the evolution of fiscal space.

Bi (2012) and Bi et al. (2018) study nonlinear economies with state-dependent fiscal limits, showing that sovereign risk premia rise—and monetary policy trade-offs emerge—before the limit is reached. In their framework, the proximity of the fiscal limit manifests in default risk; in ours, the government always honors its debt within the bounds of its fiscal responsibility, and the fiscal limit manifests instead in the room for monetary tightening, so that its anticipation moves long-run inflation expectations and trend inflation.

Corsetti and Maćkowiak (2024) study a central bank that maintains price stability in the face of a fiscal imbalance, gambling that a fiscal correction arrives before inflation becomes unavoidable; the anticipated collapse prices into long-term yields, and self-fulfilling expectations can decide the outcome. We share the emphasis on anticipation, but study a complementary margin: rather than the resolution of a given imbalance, we model fiscal space as evolving continuously with macroeconomic shocks, so that the risk of fiscally constrained monetary policy moves trend inflation and long-run expectations in both directions over the cycle.

2 The Model with Limited Fiscal Responsibility

In this section, we introduce a New Keynesian model featuring a fiscal limit on the government's total deficit. 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

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

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 as follows

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

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:

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

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:

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

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–equivalently, the inverse price of a one-period bond, ($R_t = Q_t^{-1}$)–in response to deviations of inflation and output from their respective 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 $P_t Y_t$ as

$$b_t = R_t \underbrace{\left(b_{t-1} \frac{Y_{t-1}}{\Pi_t Y_t} - \tau_t\right)}_{\equiv \Theta_t} = R_t \, \Theta_t, \tag{12}$$

where Θ_t denotes the government's financing need in period t: the inherited stock of debt expressed relative to current nominal output—and therefore adjusted for realized inflation and output growth—net of the primary surplus.

Crucially, Θ_t does not depend on R_t. Since R_t is the reciprocal of the price of a one-period bond, equation (12) implies that the government must issue debt equal to its financing need divided by the price at which the debt is sold, $b_t = \Theta_t/Q_t$. Thus, when the bond price falls—for example, because the central bank raises the policy rate—the government must issue more debt to meet the same financing need.

With one-period discount bonds, the interest committed on debt issued in period t is the issuance discount $(1 - Q_t)B_t$. As a share of output,

$$\iota_t \equiv (1 - Q_t)\, b_t = \left(1 - \tfrac{1}{R_t}\right) b_t = (R_t - 1)\Theta_t. \tag{13}$$

We assume that the fiscal limit is a ceiling $\bar{\xi}$ on the *total deficit*—the interest bill net of the primary surplus—above which the government cannot borrow further, that is,

$$\iota_t - \tau_t = (R_t - 1)\Theta_t - \tau_t \leq \bar{\xi}. \tag{14}$$

The fiscal space, that is, the gap between the total deficit and $\bar{\xi}$, 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 total deficit closer to its ceiling $\bar{\xi}$.

The key assumption of the model is that if the total deficit exceeds the fiscal limit $\bar{\xi}$, the

central bank intervenes by correcting the policy interest rate downward to avert political pressures on monetary policy. As a result, the fiscal limit translates directly into a constraint on monetary policy. Formally, solving (14) for the policy rate, the fiscal constraint faced by the monetary authority is given by:

$$R_t \;\leq\; \bar{R}_t \;\equiv\; 1 + \frac{\bar{\xi} + \tau_t}{\Theta_t}. \tag{15}$$

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

$$R_t = \min\left[R_t^N, \bar{R}_t\right]. \tag{16}$$

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, while the primary surplus determines how much room remains under the deficit ceiling to absorb the resulting interest bill, 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 declines, the government has less to borrow, a given interest rate generates a smaller interest bill, and 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 rises, 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.

The primary surplus τ_t is a second source of endogeneity, and it enters (15) directly: a higher surplus leaves more room under the deficit ceiling for interest payments and thereby raises $\bar{R}_t$, while a lower surplus lowers it. Since the surplus falls with economic activity through the fiscal rule, a contraction tightens the constraint on this account as well.

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. The primary surplus moves in the same direction as output, reinforcing the effect.

By contrast, the effects of markup shocks on Θ_t, taken alone, 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 primary surplus, by contrast, responds unambiguously: the contraction in activity lowers τ_t and tightens the constraint. As this channel dominates, an inflationary markup shock lowers $\bar{R}_t$ on impact.

The degree of countercyclicality in fiscal policy, captured by the parameter δ_Y, is therefore a key determinant of how sensitive the fiscal constraint is to output fluctuations. For example, following a 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.

Finally, consider the role of inherited debt. A higher b_{t-1} raises Θ_t, and hence the interest bill due at any given policy rate, tightening the constraint. Through the fiscal rule, however, it also raises taxes, which works in the opposite direction. Fiscal space erodes with debt—so that the fiscal limit indeed acts as a limit—only if the first effect dominates, which requires a sufficiently weak response of taxes to debt. Our calibration satisfies this restriction.

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 $\delta = 0.02$ 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 value of $\delta = 0.02$ implies that the government stabilizes debt in the long-run. 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 annualized GDP deflator 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 weakly negative but 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 is set to $\bar{\xi}$=0.061, corresponding to 6.1% deficit-to-GDP ratio. This is the 90th percentile of the US total deficit-to-GDP ratio over the post-1960 sample, excluding the Covid-19 period.

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	0.02	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	(Π-1)*4	2%	Steady-state debt-to-output	b	2.4
Fiscal limit	$\bar{\xi}$	0.061			

Capturing time-variation in fiscal responsibility and supply-shock risks Both the deficit that the fiscal authority is prepared to tolerate and the volatility of supply-side disturbances vary over time in practice. We capture this by treating the fiscal limit $\bar{\xi}$ and the volatility of the markup shock σ^μ as pseudo-states in line with Kase et al. (2025) and Krane et al. (2026) and solving the model under anticipated utility: agents take the prevailing values of the two parameters as permanent when forming expectations, while the economy moves across the corresponding policy functions over time. We therefore solve the model on a grid over the two pseudo-states. For fiscal tolerance, we let $\bar{\xi}$ vary by ± 0.02 around its baseline value, that is, between 4.1 and 8.1 percent of GDP. For supply-shock risk, we use the

time-varying volatility of structural supply shocks obtained from a TVP-BVAR estimated on US GDP deflator inflation and output gap and identified following the algorithm of Arias et al. (2026).[1] The estimated volatility is shown in Figure 2 together with realized inflation. Rather than importing the estimated volatility in levels, which is not comparable across the two models, we retain only its relative variation: in each period we scale the calibrated σ^{μ} by the ratio of the estimated median volatility to its sample average, so that supply-shock volatility is time-varying in the model but averages to its calibrated value. The cost of the anticipated-utility approach is that agents do not anticipate future movements in either pseudo-state. Given the smooth, low-frequency variation of both pseudo-states, we regard this as a reasonable first approximation, and leave a specification in which agents anticipate their evolution to a future version of the paper.

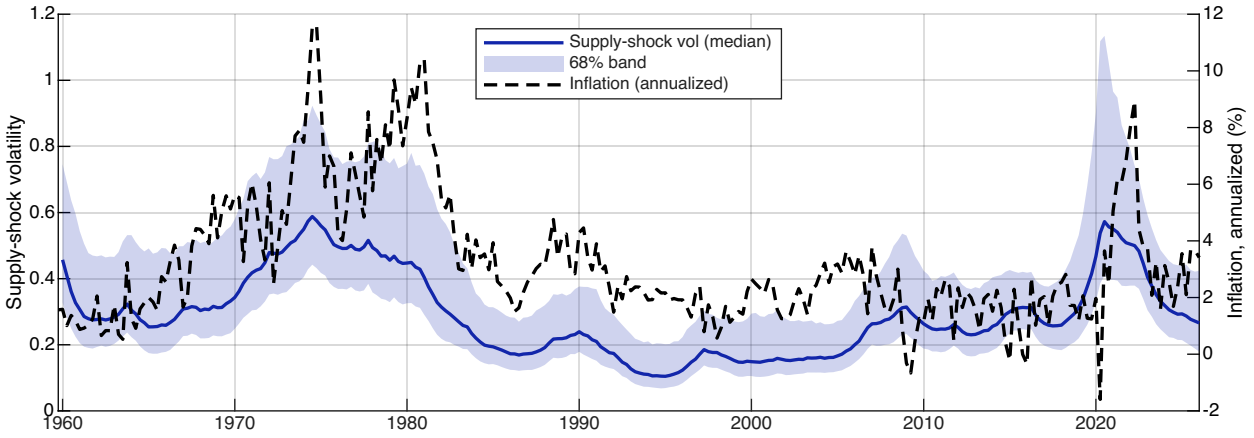


Figure 2: Supply shock volatility and inflation over time. Estimated structural supply shock volatility from bivariate TVP-BVAR and annualized GDP deflator inflation. Sample period from 1960Q1-2025Q4.

3 Inflationary Bias and Spiral of the Fiscal Limit

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

[1] For estimates of debt-based fiscal limits, see Ghosh et al. (2013), Collard et al. (2015) and Renne and Pallara (2024).

shock states. We specify the rule as

$$\tau_t = \begin{cases} b_{t-1}\frac{1}{\Pi_t}\frac{Y_{t-1}}{Y_t} - \frac{b_t^L}{R_t} & \text{if } \mu_t^L \\ b_{t-1}\frac{1}{\Pi_t}\frac{Y_{t-1}}{Y_t} - \frac{b_t^H}{R_t} & \text{if } \mu_t^H \end{cases} \tag{17}$$

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:

$$\bar{R}_t = \frac{\bar{b}E_t\Pi_{t+1}}{b_t} \tag{18}$$

Relative to the model from the previous section, we specify the limit as a ceiling on gross debt service — the expected real repayment due next period — rather than on the total deficit, which under the superpassive rule would not constrain the policy rate. 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 3 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 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.[2]

[2]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.

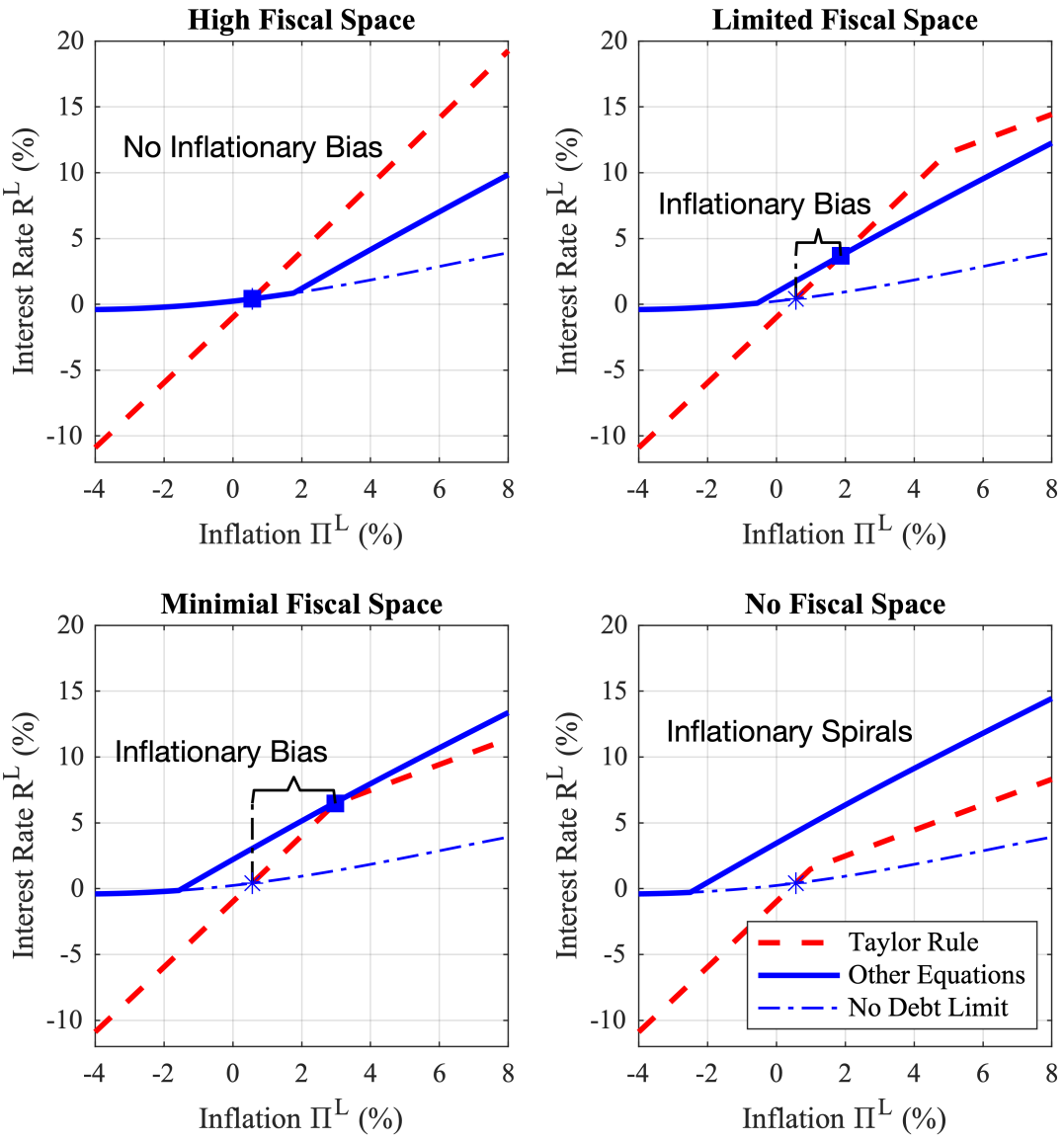


Figure 3: Inflationary outcomes and fiscal space in the stylized model. Equilibrium interest rate and inflation when there is a low (deflationary) markup shock for different fiscal limits: High fiscal space $\bar{b} = 1.03$, limited fiscal space $\bar{b} = 1.015$, minimal fiscal space $\bar{b} = 1.0075$, 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.

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 debt from violating the fiscal limit 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 lead the government to violate the fiscal limit. 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 on the primary surplus, which determines how much room remains under the deficit ceiling; together these create additional room for monetary policy tightening in the current period.

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 policy first. The size of the shock is set to 3 standard deviations.

First, consider a negative (favorable) markup shock, which lowers inflation and boosts output. Such a shock does not pose significant fiscal sustainability concerns, as higher economic growth—ceteris paribus—reduces the current fiscal imbalance and, through the fiscal rule, raises the primary surplus, more than offsetting the effect of lower inflation on the real value of inherited debt. The fiscal constraint therefore rises, allowing greater scope for potential monetary tightening.'

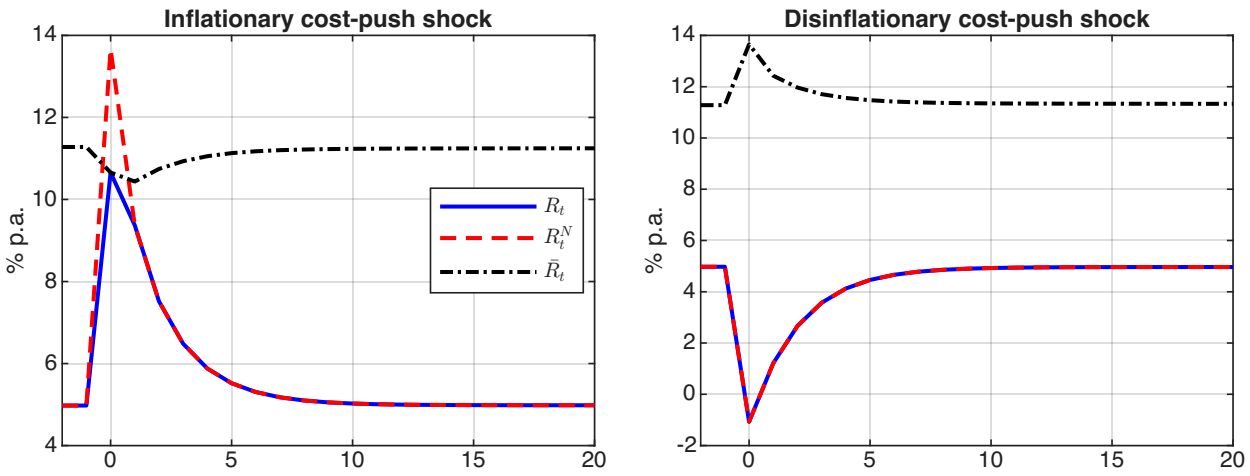


Figure 4: Interest rate dynamics in response to cost-push shock. Dynamics of nominal, notional and upper bound interest rate in response to a three-standard-deviation inflationary (left panel) and disinflationary (right panel) cost-push shock. Interest rates transformed to net interest rates in % per annum. Shock happens in period 0.

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 does not trigger 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 4. 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. Although higher inflation erodes the real value of outstanding debt, this channel is relatively weak under a deficit ceiling; the dominant effect runs through economic activity, as weaker growth raises the financing need and, through the fiscal rule, lowers the primary surplus. The fiscal constraint therefore declines on impact—precisely when the monetary rule calls for tightening. Consequently, although the central bank raises the policy rate, 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 breaching the deficit ceiling, the central bank tightens less aggressively, allowing higher inflation and supporting output growth, which in turn raises the upper bound, $\bar{R}_t$.

We now turn to demand shocks. The results are reported in Figure 5. Consider first a positive demand shock, which raises both output and inflation. Both effects raise the upper bound: the expansion induces the fiscal authority to raise taxes, and stronger nominal output

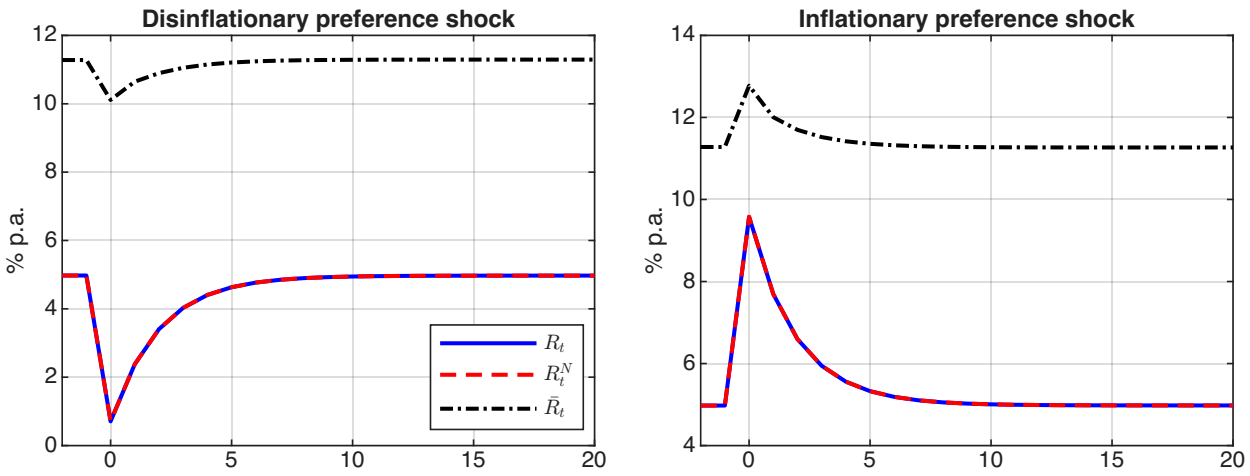


Figure 5: Interest rate dynamics in response to preference shock. Dynamics of nominal, notional, and upper bound interest rate in response to a three-standard-deviation disinflationary (left panel) and inflationary (right panel) preference shock. Interest rates are transformed to net interest rates in % per annum. Shock happens in period 0.

erodes the financing need. As shown in the right panel of Figure 5, $\bar{R}_t$ indeed increases—but by less than the policy rate, because the notional rate is driven mainly by inflation, to which the deficit ceiling responds only weakly. Fiscal space therefore narrows somewhat, although the limit remains slack: an expansionary demand shock consumes fiscal space without threatening the constraint.

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 (15). The policy rate, however, declines by considerably more than the fiscal constraint, as shown in the left panel of Figure 5: while the fiscal expansion lowers $\bar{R}_t$ somewhat, the disinflation calls for a far larger cut in the notional rate, so that fiscal space widens on net. A disinflationary recession thus poses no challenge to the fiscal limit, even though it worsens the fiscal position.

The IRFs shown in Figures 4 and 5 show the role of the fiscal limit under a given fiscal limit configuration ($\bar{\xi}$) and supply shock volatility. Figure 6 shows how the average probability of hitting the fiscal limit depends on the tightness of the fiscal limit and supply shock volatility. Instead of using one particular shock, for each fiscal limit and supply shock configuration we simulate the model for 100,000 periods and then compute the average number of periods at the fiscal limit. The highest probability of a binding limit appears when both fiscal space is limited (low $\bar{\xi}$) and the supply shock volatility is high.

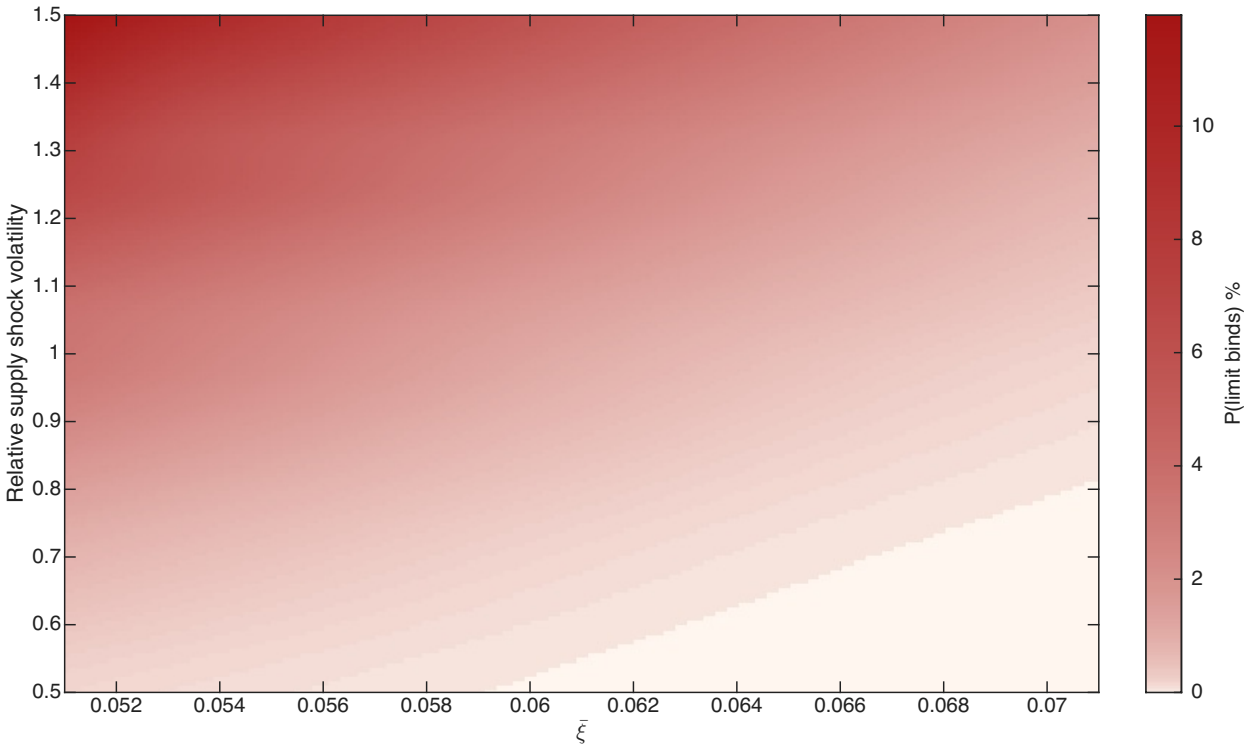


Figure 6: Probability of binding fiscal limit under different fiscal limit and supply shock volatility configurations Average probability of binding fiscal limit as fiscal limit ($\bar{\xi}$) and supply shock volatility varies. Relative supply shock volatility of 1 corresponds to sample average. Estimates are obtained via simulating the model 100,000 periods for each fiscal limit and supply shock configuration and then computing the average number of periods at the fiscal limit.

Given a configuration of fiscal limit and supply shock volatility, whether the limit actually binds or not depends on the state of the economy, in particular current and past realizations of shocks that move inflation, output and fiscal variables. Figure 7 illustrates this for 4 different combinations of fiscal space and supply shock volatility. In line with Figure 6 the probability of hitting the fiscal limit within the next two quarters is highest in an environment of tight fiscal space (low $\bar{\xi}$) and high supply shock volatility (see bottom-right panel). For each panel, the probability that the fiscal limit binds is primarily driven by the supply state (y-axis) with the probability increasing with more inflationary supply state. This means that the main driver of the constraint on monetary policy is either a single large inflationary supply shock or a sequence of adverse supply shocks that push the economy into the bottom region of the panel. The demand state plays a secondary role. For a given adverse supply state, the probability of hitting the fiscal limit is slightly higher during an expansionary demand state, which puts additional upward pressure on interest rates.

Overall, this section shows that the combination of tight fiscal space and high supply-shock volatility can make the fiscal limit a serious constraint on monetary policy. In such

an environment, adverse supply shocks are the main force pushing the economy against the limit, while demand shocks pose little challenge.

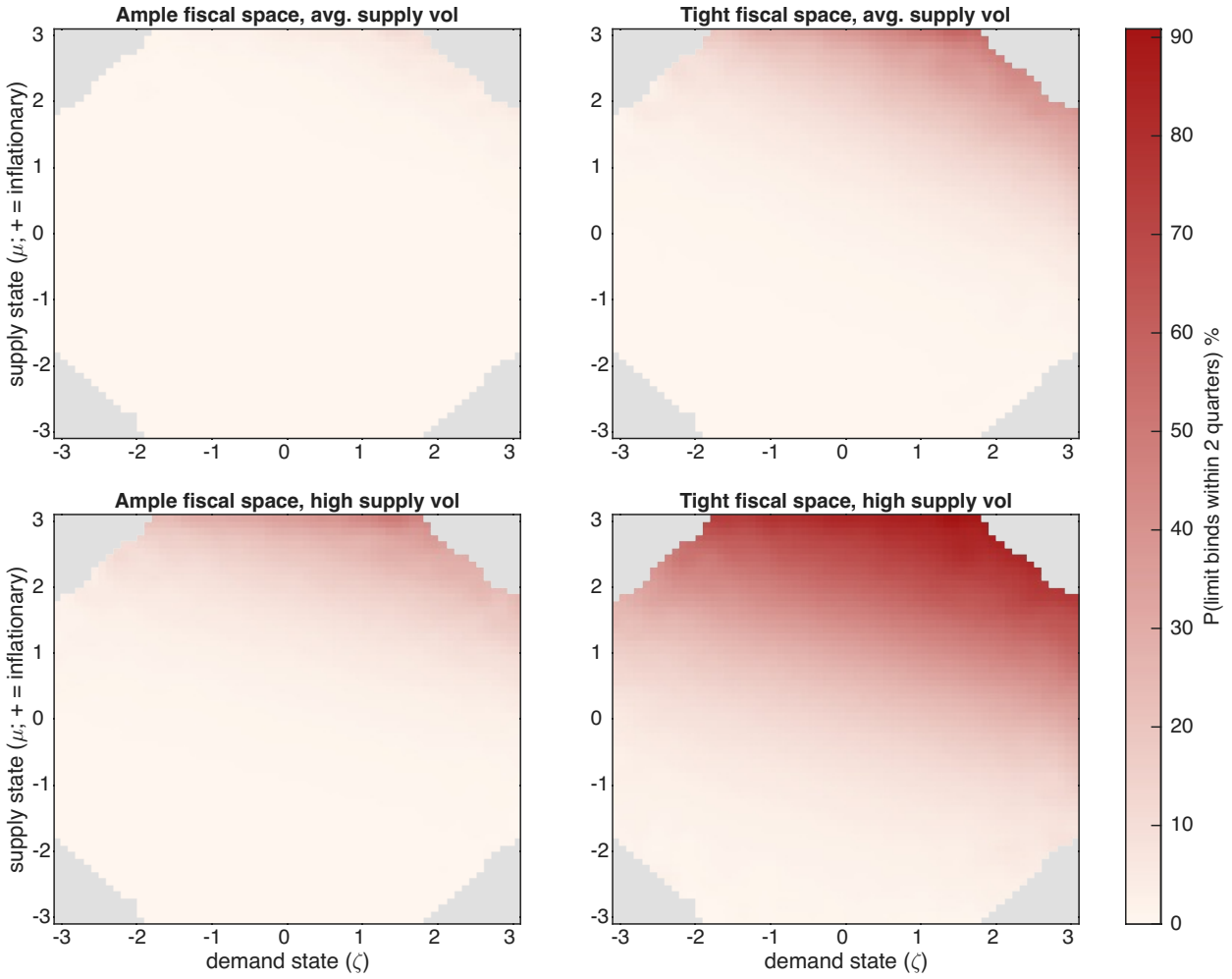


Figure 7: Probability of binding fiscal limit under different demand and supply shock configurations as fiscal space and supply-side risks vary. Probability of binding fiscal limit within next two quarters conditional on demand (ζ) and supply (μ) state. Top left: ample fiscal space and average supply shock volatility, top right: tighter fiscal space (i.e. lower $\bar{\xi}$) and average supply shock volatility, bottom left: average fiscal space and higher supply shock volatility, bottom right: tighter fiscal space and higher supply shock volatility. Estimates are obtained via simulating the model 4 million periods for each fiscal limit and supply shock configuration and then within each demand/supply state cluster computing the average number of periods at the fiscal limit. Grey area indicates states that are outside of ergodic distribution of model simulations.

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 8 displays the impulse response

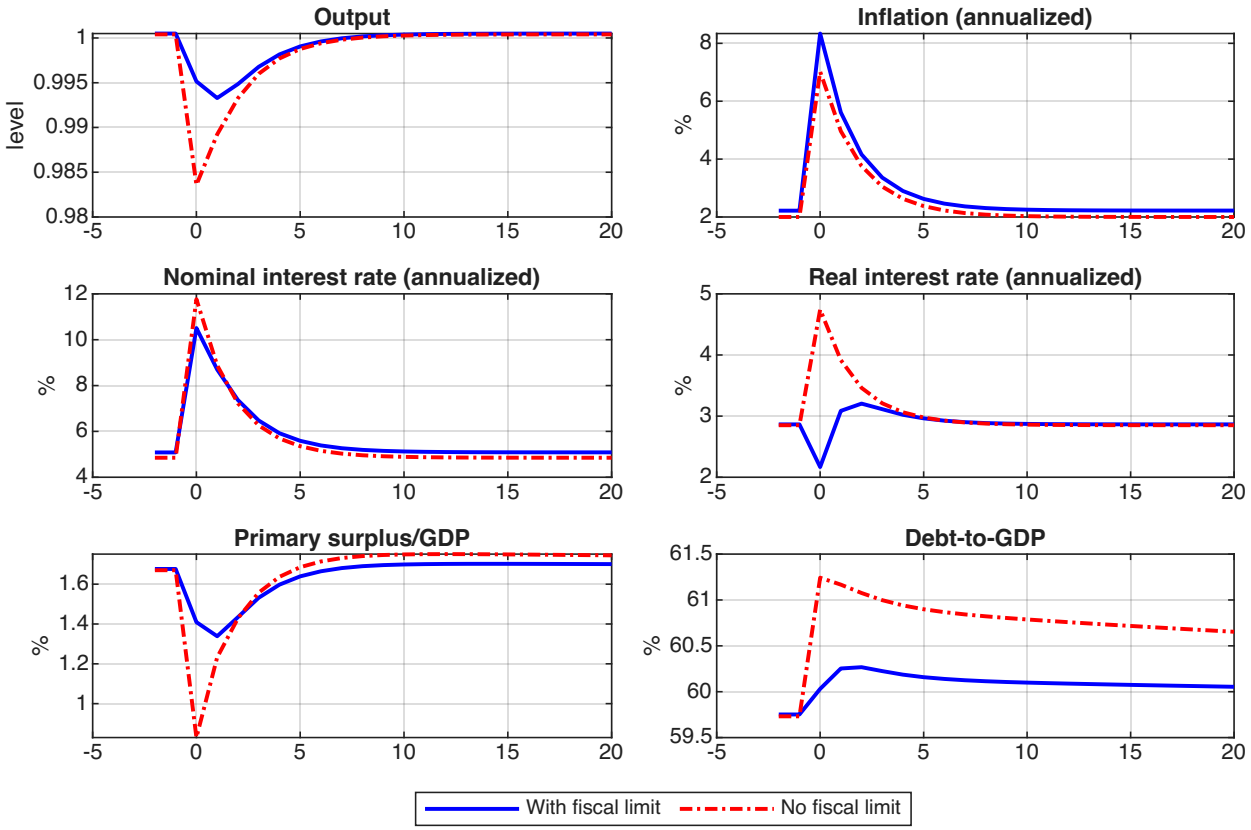


Figure 8: Responses to inflationary cost-push shock. Impulse response functions to a three-standard-deviation inflationary cost-push shock. Responses from the model with a fiscal limit shown in blue and without a fiscal limit in dashed red. Shock happens in period 0.

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.

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.

The accommodative stance of monetary policy is evident in the response of the real interest rate, which is lower when the fiscal limit binds (blue solid line). This outcome is directly driven by the fiscal constraint. Once the fiscal limit ceases to bind later on, the real interest rate converges to 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 remains above its counterfactual no-limit path for roughly the first three quarters. As accommodative monetary policy supports economic activity and inflation, the primary surplus-to-GDP ratio declines by less and the debt-to-GDP ratio increases but significantly less than in counterfactual scenario.

The expectation channel. Figures 15-17 in the appendix 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. 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.

Active vs passive monetary policy. The literature on monetary-fiscal interactions typically distinguishes between active and passive fiscal and monetary policy. In our setting fiscal policy always remains passive and follows the rule in equation (9). When the fiscal limit is not binding, monetary policy is active and follows the Taylor rule. When the limit binds, by contrast, it responds by less to inflation. Figure 9 shows the implied distribution of ϕ_π when simulating the model under random shocks for 100.000 periods. Under our calibration, we find that even when the fiscal limit is binding the implied response of the interest rate to inflation is mostly above 1, in line with predominantly active monetary policy. Because binding episodes are short-lived and agents expect the economy to return to the unconstrained region, the Taylor principle holds in the long-run sense even though the within-episode response is temporarily dampened.

6 Trend inflation and inflation risks

The previous section has focused on the effects of supply and demand shocks on the economy in the model with a fiscal limit. In this section we illustrate the implications for inflation outcomes over a longer period. Importantly, trend or long-run average inflation are equilibrium outcomes in our model. As in the previous section, we simulate the model for 100,000 periods. Figure 10 shows the distribution of inflation outcomes. In a model without fiscal limit and average supply shock volatility the distribution of inflation outcomes is centered symmetrically around 2%. Instead, in the model with fiscal limit (blue) the average inflation outcome

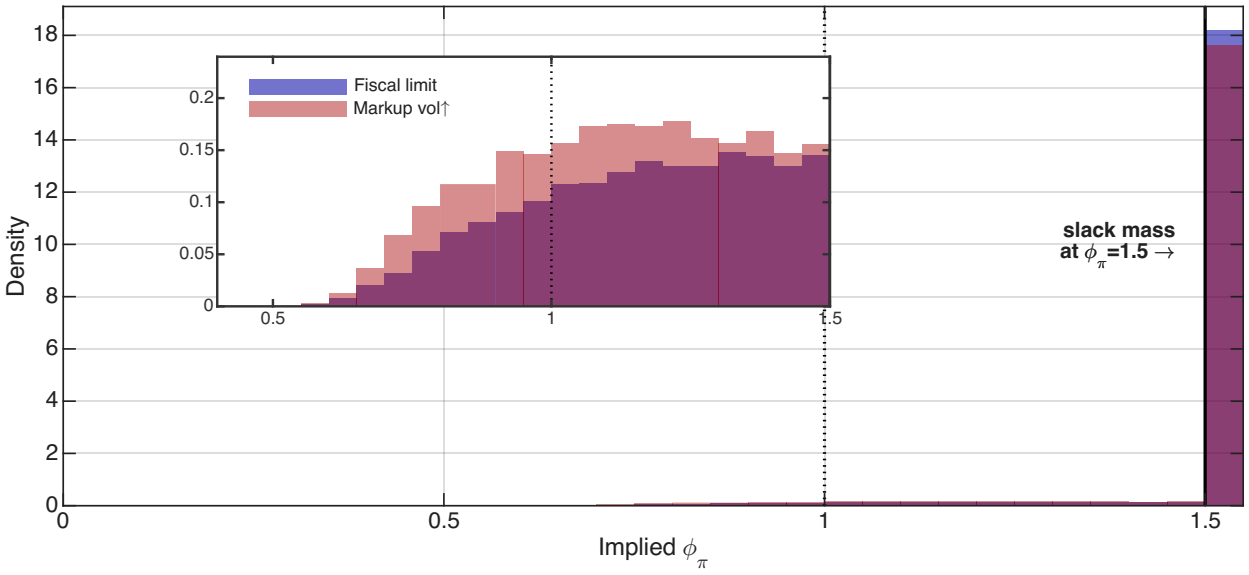


Figure 9: Distribution of implied Taylor rule coefficient ϕ_π. Distribution is computed by solving Taylor rule for ϕ_π and using model-simulated outcomes for inflation, output gap and the interest rate.

is shifted to the right and the overall distribution exhibits upper tail risks. Under the combination of constrained fiscal space and higher supply shock volatility (red) the average inflation outcome is shifted even further to the right as under a given fiscal limit the higher shock volatility makes it more likely that the constraint binds.

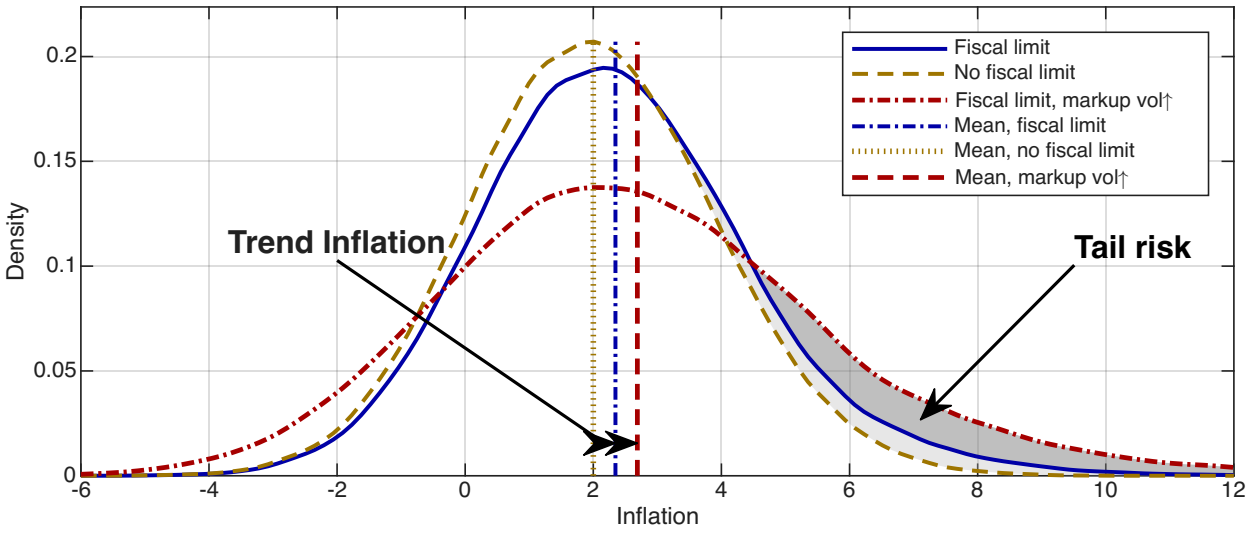


Figure 10: Distribution of inflation outcomes under model with and without fiscal limit. Model simulated for 100,000 periods under three model configurations: (i) no fiscal limit (yellow), (ii) fiscal limit and average supply shock volatility (blue) and (iii) fiscal limit and above sample average supply shock volatility (red).

While the vertical bars in Figure 10 show the average inflation outcomes, these hide

important state-dependencies and nonlinearities. Figure 11 shows the gap in inflation outcomes between the model with fiscal limit and higher supply shock volatility relative to the model without fiscal limit as the degree of fiscal space varies. The inflation outcomes relative to model without fiscal limit are clearly state-dependent and the relationship between fiscal space and inflation outcomes is highly nonlinear. To the left of zero the limit binds, and the inflation gap widens to roughly 3 percentage points; to the right, the gap reflects pure anticipation effects, decaying only slowly as fiscal space grows.

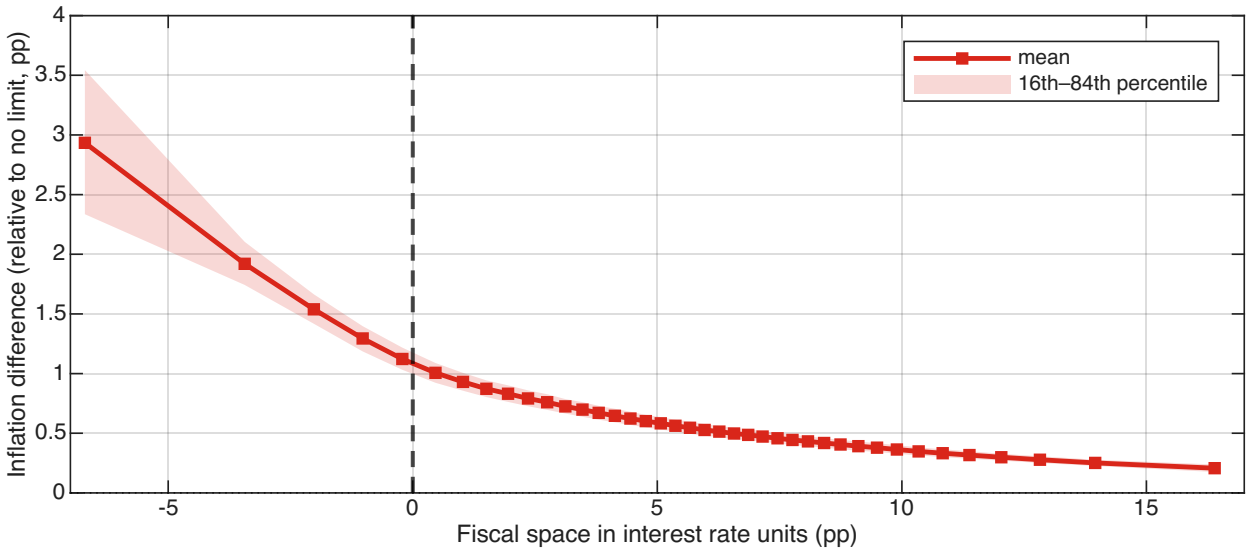


Figure 11: Fiscal inflation for varying fiscal space. Model is simulated for 100,000 periods. Fiscal space is computed as $400^*(\bar{R}_t - R_t^N)$ and inflation outcomes are grouped within fiscal space bins. The solid line shows the mean inflation difference and the shaded area the 16th-84th percentile range.

7 Quantitative Analysis of Inflation Dynamics

We now take the nonlinear model with limited fiscal responsibility to U.S. data. The quantitative analysis has two objectives. First, we recover the sequence of shocks required for the model to account jointly for inflation, economic activity, and the evolution of the public finances. Second, we use the filtered shocks to construct counterfactual inflation paths that isolate the interaction between supply-side risk and the fiscal limit. We apply this approach to two episodes: the ratcheting of inflation between the mid-1960s and the end of the 1980s, and the post-pandemic rise in long-run inflation expectations. This section develops the empirical framework and then presents the first application.

7.1 A Particle Filter for the Nonlinear Model

The global solution of the model provides a nonlinear state-space representation,

$$X_t = f(X_{t-1}, \Omega_t, \nu_t)\,, \tag{19}$$

$$Y_t = g(X_t) + \mu_t, \tag{20}$$

where X_t denotes the vector of endogenous state variables, Ω_t collects the pseudo-state variables in the sense of Kase et al. (2025), ν_t contains the structural innovations, and μ_t denotes measurement error. Equation (19) is the transition equation. The nonlinear function f is obtained directly from the global solution of the model. Equation (20) maps the model states into the observables.

The observables are GDP-deflator inflation, the output gap, and debt-to-GDP growth from 1960:Q1 through 2019:Q4. Inflation and the output gap discipline the demand and supply disturbances needed to account for the macroeconomic dynamics, while debt-to-GDP growth provides information about the evolution of fiscal space. We feed the time-varying volatility of the supply shock estimated from the TVP-BVAR into the model as a pseudo-state, relying on the assumption of anticipated utility. The particle filter then recursively updates the conditional distributions of the latent states and structural shocks as each new observation becomes available.

This procedure is particularly useful in our setting because both the transition law and the policy functions are nonlinear. The probability that the fiscal limit binds depends on the full state of the economy, so the same structural shock can have different effects depending on the inherited fiscal position and the prevailing level of supply-side risk. The particle filter takes this state dependence into account and provides filtered shock distributions that can be fed back through alternative versions of the model. We use these counterfactual simulations to assess how inflation would have evolved had the interaction between supply-shock volatility and the fiscal limit been absent. The filtered distribution of the states also yields, for each period in the sample, the probability that the fiscal limit binds conditional on the data and the model.

7.2 Inflation Dynamics in the 1970s and 1980s

Our first application asks how much of the rise and subsequent decline in U.S. inflation between the mid-1960s and the end of the 1980s can be explained by the interaction between the fiscal limit and supply-side risk. Throughout this exercise, we hold the fiscal limit fixed at its baseline value. Changes in observables therefore cannot be attributed to exogenous shifts

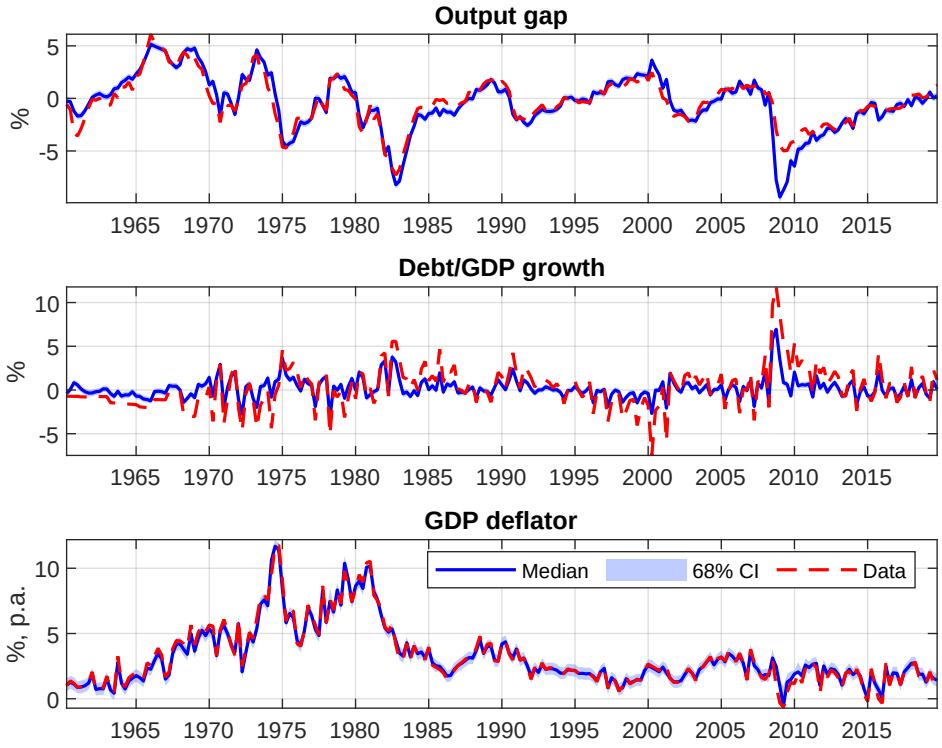


Figure 12: Estimated paths of the observables. Posterior medians and 68 percent credible intervals from the particle filter, together with the observed output gap, debt-to-GDP growth, and annualized GDP-deflator inflation. The sample runs from 1960:Q1 through 2019:Q4.

in the deficit the government is willing to tolerate. This restriction limits the filter's degrees of freedom in fitting the data. Fiscal space evolves endogenously with the filtered history of output, inflation, debt growth, and the shocks, while supply-shock volatility follows the path estimated from the TVP-BVAR.

Figure 12 reports the fitted paths of the three observables. The solid lines show the posterior medians, the shaded regions report the 68 percent credible intervals, and the dashed lines denote the data. The model closely tracks the output gap and GDP-deflator inflation over the sample. It also captures the movements in debt-to-GDP growth that are informative about the evolution of fiscal space. The joint fit is important: the filter cannot explain inflation by selecting shocks independently of the associated movements in activity and public debt.

We next feed the filtered shocks into the baseline model to construct the inflation path shown by the solid blue line in Figure 13. The dashed red line is the counterfactual path obtained from a version of the model that shuts down the interaction between supply-shock volatility and the fiscal limit. Both simulations use the shocks recovered from the particle

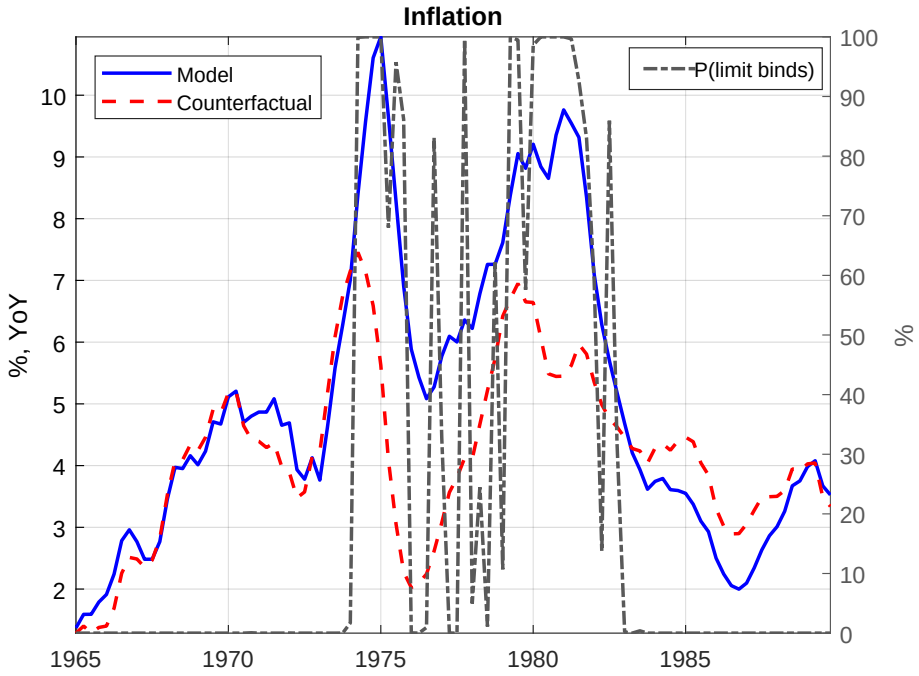


Figure 13: Inflation dynamics in the 1970s and 1980s. The solid blue line shows inflation generated by the filtered baseline model, while the dashed red line shows inflation in the counterfactual model that shuts down the interaction between supply-shock volatility and the fiscal limit. The dashed black line, measured on the right axis, reports the filtered probability that the fiscal limit binds. Inflation is measured year over year. The fiscal limit is held fixed at its baseline value throughout the exercise.

filter, so their difference isolates the contribution of the mechanism emphasized in the paper.

The two paths are similar during the second half of the 1960s, when inflation begins to rise but fiscal pressures remain comparatively contained. They separate sharply in the mid-1970s. In the full model, the combination of adverse supply disturbances, elevated supply-shock volatility, and shrinking fiscal space raises the probability that monetary tightening will be constrained. Agents anticipate the weaker response of monetary policy, and inflation rises well above the counterfactual path. Around the largest gaps, shutting down the interaction lowers inflation by roughly four percentage points.

The mechanism remains important around the second oil shock. The renewed sequence of inflationary supply disturbances arrives after the fiscal position has already deteriorated, leaving less room for monetary tightening and generating another pronounced increase in inflation relative to the counterfactual. The model therefore produces an upward ratchet rather than a sequence of purely transitory inflation spikes: past shocks deplete fiscal space, and the higher probability of future constraint keeps inflation elevated after each individual disturbance has begun to dissipate.

The dashed black line provides a useful summary of how the fiscal pressure facing monetary

policy evolves over the episode. The probability that the fiscal limit binds rises sharply during the 1970s and is particularly high around the major inflationary supply disturbances. These are also the periods in which inflation in the baseline model moves most clearly above the counterfactual path. As the probability of a binding limit declines after 1981, inflation in the baseline model moves progressively closer to the counterfactual path and eventually falls below it.

This reversal reflects the same mechanism operating in the opposite direction. The decline in supply-shock volatility reduces the likelihood that the fiscal limit will bind, lowering inflation expectations and bringing model inflation down. As fiscal space is rebuilt in the second half of the 1980s, agents anticipate greater room for future monetary tightening, pushing inflation below that in the counterfactual economy, where the interaction between supply risk and the fiscal limit is shut down. Thus, with the fiscal limit itself held fixed, the interaction between endogenous fiscal space and changing supply-side risk accounts not only for the upward ratcheting of inflation in the 1970s, but also for its downward ratcheting during the 1980s.

After 1981, the process reverses. As supply-shock volatility declines, the probability that the fiscal limit will bind falls, lowering inflation expectations and bringing model inflation down. The key twist is that the blue line eventually crosses below the red counterfactual line: the same mechanism that amplified inflation in the 1970s now reinforces disinflation. As fiscal space is rebuilt in the second half of the 1980s, agents anticipate greater room for future monetary tightening, pushing inflation below that in the counterfactual economy, where the interaction between supply risk and the fiscal limit is shut down.

To sum up, with the fiscal limit held fixed, the interaction between endogenous fiscal space and changing supply-side risk accounts not only for the upward ratcheting of inflation in the 1970s, but also for its downward ratcheting during the 1980s.

Our second application turns to the post-pandemic period. Unlike the 1970s–1980s exercise, we now allow the fiscal limit to vary over time and add average long-run PCE inflation expectations from the *Survey of Professional Forecasters* (SPF) to the set of observables. The purpose of the exercise is to infer the path of the fiscal limit required for the model to account for the observed movement in long-run expectations. In particular, we ask whether the rise in expectations can be explained by a contraction in the central bank's anticipated room for future monetary tightening.

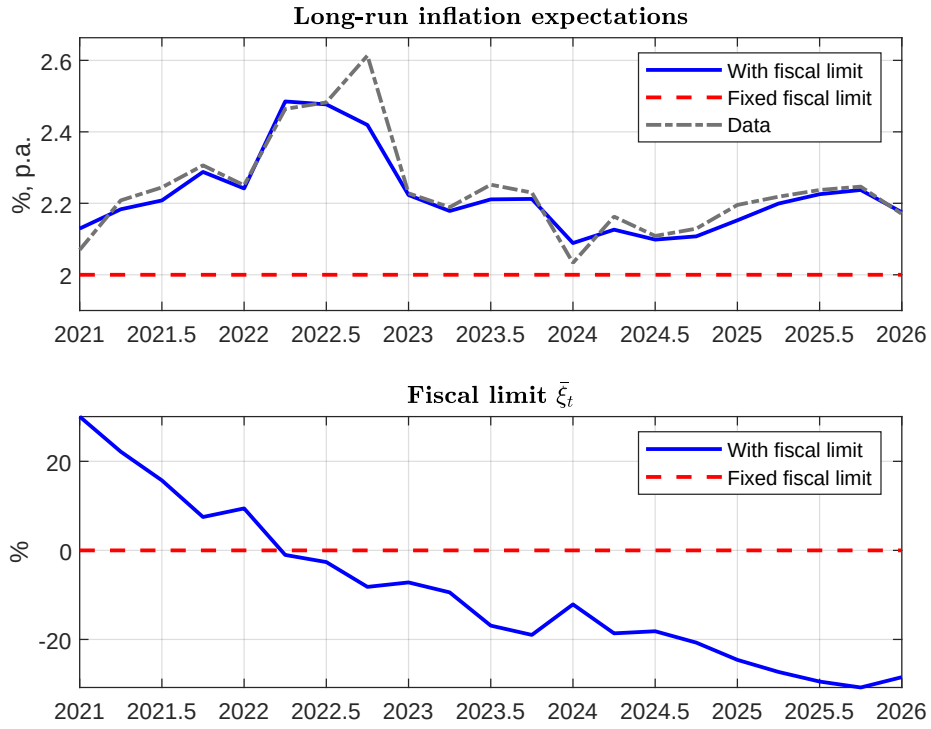


Figure 14: Long-run inflation expectations and the time-varying fiscal limit. The upper panel reports average long-run PCE inflation expectations from the Survey of Professional Forecasters, together with the model-implied paths under a time-varying fiscal limit and under a fiscal limit fixed at its baseline value. The lower panel reports the filtered fiscal limit as a percentage deviation from its baseline value.

7.3 Post-Pandemic Long-Run Inflation Expectations

Figure 14 reports the results. The upper panel compares the SPF inflation expectations with their model counterpart under a time-varying fiscal limit and with a counterfactual that holds the limit fixed at its baseline value. The fixed-limit model keeps long-run expectations essentially at the two-percent inflation target and therefore cannot account for their post-pandemic increase. By contrast, once the fiscal limit is allowed to vary, the model closely tracks both the rise in expectations through 2022 and their subsequent moderation.

The lower panel shows the corresponding filtered path of the fiscal limit. The limit moves from above its baseline value in early 2021 to below baseline during 2022 and continues to contract thereafter, reaching roughly 30 percent below baseline around 2025. Because a lower fiscal limit means that the government is willing to tolerate a smaller total deficit, this decline narrows the room available for the central bank to raise interest rates in a period when inflation is rising quickly. limit to its pre-contraction level.

Through the lens of the model, the post-pandemic rise in long-run inflation expectations reflects an anticipation effect. Agents do not need to observe the fiscal constraint binding

today. It is enough that a narrower fiscal limit makes future monetary tightening more likely to be curtailed when inflationary shocks occur. The expected weakening of the monetary response raises long-run inflation expectations in the present. The sharp difference from the fixed-limit counterfactual shows that the contraction in the fiscal limit is essential for matching the post-pandemic drift in expectations.

8 Conclusions

We develop a nonlinear model of limited fiscal responsibility in which the government remains committed to stabilizing debt in the long run but resists deficits that would eventually require costly fiscal adjustment. Because monetary tightening weakens activity and raises debt-service costs, this resistance translates into a state-contingent ceiling on the policy rate. Inflationary supply shocks are particularly consequential: they widen the deficit precisely when tighter monetary policy is needed, inducing a less aggressive interest-rate response. When fiscal space is narrow and supply-side risk is high, agents anticipate that this constraint will bind more often, raising inflation expectations before it is reached. Trend inflation is therefore an endogenous outcome of the interaction between fiscal space and supply risk.

The quantitative analysis suggests that this mechanism helps explain both the upward and downward ratcheting of U.S. inflation between 1965 and 1990 and the post-pandemic rise in long-run inflation expectations. Eroding fiscal space and elevated supply-side risk raised the perceived likelihood of constrained monetary tightening during the Great Inflation, while declining supply risk and the subsequent restoration of fiscal space helped re-anchor expectations. In the post-pandemic period, the rise in long-run expectations requires a substantial contraction in the fiscal limit. Fiscal space thus matters for price stability even when debt remains fully backed: preserving it safeguards the central bank's room to respond to inflationary supply shocks and helps keep long-run expectations anchored when supply-side risks are elevated.

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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:

$$\max_{\{C_t, N_t, B_t\}} \quad \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \, e^{\zeta_t} \left(\frac{C_t^{1-\sigma}}{1-\sigma} - \psi \frac{N_t^{1+\eta}}{1+\eta} \right) \tag{21}$$

subject to the flow budget constraint

$$P_t C_t + Q_t B_t = W_t N_t + B_{t-1} - P_t T_t + P_t D_t, \qquad \text{where } Q_t = \frac{1}{R_t}. \tag{22}$$

Let λ_t be the Lagrange multiplier on equation (22) the first order conditions are given by

$$\zeta_t C_t^{-\sigma} = \lambda_t P_t \tag{23}$$

$$\zeta_t \psi N_t^{\eta} = \lambda_t W_t \tag{24}$$

$$Q_t \lambda_t = \beta \, \mathbb{E}_t[\lambda_{t+1}] \tag{25}$$

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

$$\frac{W_t}{P_t} = \psi \, N_t^{\eta} C_t^{\sigma} \tag{26}$$

$$C_t^{-\sigma} = \beta R_t \, {}_t \left[e^{\zeta_{t+1} - \zeta_t} \, C_{t+1}^{-\sigma} \frac{P_t}{P_{t+1}} \right] \tag{27}$$

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

$$\zeta_t = \rho_\zeta \, \zeta_{t-1} + \sigma^\zeta \, \epsilon_t^\zeta, , \quad \text{where } \epsilon_t^\zeta \sim N(0,1). \tag{28}$$

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:

$$Y_t = \left(\int_0^1 Y_t(j)^{\frac{\epsilon-1}{\epsilon}} \, dj \right)^{\frac{\epsilon}{\epsilon-1}}, \tag{29}$$

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

$$P_t = \left(\int_0^1 P_t(j)^{1-\epsilon} \, dj \right)^{\frac{1}{1-\epsilon}}, \tag{30}$$

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

$$Y_t(j) = \left(\frac{P_t(j)}{P_t}\right)^{-\epsilon} Y_t. \tag{31}$$

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

$$Y_t(j) = N_t(j) \tag{32}$$

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

$$\min_{N_t(j)} \quad W_t N_t(j) \tag{33}$$

$$\text{s.t.} \quad N_t(j) \geq \left(\frac{P_t(j)}{P_t}\right)^{-\epsilon} Y_t \tag{34}$$

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

$$\theta_t(j) = W_t \qquad \forall j \tag{35}$$

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

$$\max_{P_t(j)} \quad \left(\frac{P_t(j)}{P_t}\right)^{1-\epsilon} Y_t - MC_t \left(\frac{P_t(j)}{P_t}\right)^{-\epsilon} Y_t - \frac{\varphi}{2}\left(\frac{P_t(j)}{\Pi P_{t-1}(j)} - 1\right)^2 Y_t \tag{36}$$

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

$$\begin{aligned}(\epsilon - 1)\left(\frac{P_t(j)}{P_t}\right)^{-\epsilon}\frac{Y_t}{P_t} = \epsilon\, MC_t \left(\frac{P_t(j)}{P_t}\right)^{-\epsilon-1}\frac{Y_t}{P_t} - \varphi\left(\frac{P_t(j)}{\Pi P_{t-1}(j)} - 1\right)\frac{Y_t}{\Pi P_{t-1}(j)} \\ + \varphi \mathbb{E}_t \Lambda_{t,t+1}\left(\frac{P_{t+1}(j)}{\Pi P_t(j)} - 1\right)\frac{P_{t+1}(j)}{\Pi P_t(j)}\frac{Y_{t+1}}{P_t(j)}.\end{aligned} \tag{37}$$

where the stochastic discount factor is

$$\Lambda_{t,t+1} = \beta \mathbb{E}_t \left[\left(\frac{\zeta_{t+1}}{\zeta_t}\right)\left(\frac{C_{t+1}}{C_t}\right)^{-\sigma}\right]. \tag{38}$$

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

$$\varphi\left(\frac{\Pi_t}{\Pi} - 1\right)\frac{\Pi_t}{\Pi} = (1-\epsilon) + \epsilon MC_t + \varphi \mathbb{E}_t\left[\Lambda_{t,t+1}\left(\frac{\Pi_{t+1}}{\Pi} - 1\right)\frac{\Pi_{t+1}}{\Pi}\frac{Y_{t+1}}{Y_t}\right] + \mu_t. \tag{39}$$

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

$$\mu_t = \rho_\mu \, \mu_{t-1} + \sigma^\mu \, \epsilon_t^\mu, \quad \text{where } \epsilon_t^\mu \sim N(0,1). \tag{40}$$

Finally, in equilibrium we have

$$Y_t = N_t. \tag{41}$$

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

$$Q_t B_t = B_{t-1} - P_t T_t \tag{42}$$

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

$$b_t = R_t \left(b_{t-1} \frac{Y_{t-1}}{\Pi_t Y_t} - \tau_t \right) \tag{43}$$

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

$$\tau_t = \tau + \delta(b_{t-1} - b) + \delta_Y (Y_t - Y) \tag{44}$$

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

$$R_t \leq \bar{R}_t \equiv \frac{b_{t-1} \frac{Y_{t-1}}{\Pi_t Y_t} + \bar{\xi}}{b_{t-1} \frac{Y_{t-1}}{\Pi_t Y_t} - \tau_t} \tag{45}$$

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

$$R_t = \min \left[R_t^N, \bar{R}_t \right]. \tag{46}$$

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

$$R_t^N = R \left(\frac{\Pi_t}{\Pi} \right)^{\phi_\Pi} \left(\frac{Y_t}{Y} \right)^{\phi_Y}. \tag{47}$$

The resource constraint is

$$C_t = Y_t \left[1 - \frac{\varphi}{2} \left(\frac{\Pi_t}{\Pi} - 1 \right)^2 \right]. \tag{48}$$

Taken together, the model can be summarized by equations (26), (27), (28), (35), (38),

(39), (40), (41), (43), (44), (45), (47) and (48), which we repeat for convenience below:

$$\frac{W_t}{P_t} = \psi\, N_t^{\eta} C_t^{\sigma} \tag{49}$$

$$C_t^{-\sigma} = \beta R_t\, \mathbb{E}_t\left[e^{\zeta_{t+1}-\zeta_t} C_{t+1}^{-\sigma} \frac{1}{\Pi_{t+1}}\right], \tag{50}$$

$$\theta_t = W_t, \tag{51}$$

$$\Lambda_{t,t+1} = \beta \mathbb{E}_t\left[\left(\frac{\zeta_{t+1}}{\zeta_t}\right)\left(\frac{C_{t+1}}{C_t}\right)^{-\sigma}\right], \tag{52}$$

$$\varphi\left(\frac{\Pi_t}{\Pi}-1\right)\frac{\Pi_t}{\Pi} = (1-\epsilon) + \epsilon MC_t + \varphi \mathbb{E}_t\left[\Lambda_{t,t+1}\left(\frac{\Pi_{t+1}}{\Pi}-1\right)\frac{\Pi_{t+1}}{\Pi}\frac{Y_{t+1}}{Y_t}\right] + \mu_t, \tag{53}$$

$$Y_t = N_t, \tag{54}$$

$$b_t = R_t\left(b_{t-1}\frac{Y_{t-1}}{\Pi_t Y_t} - \tau_t\right), \tag{55}$$

$$\tau_t = \tau + \delta(b_{t-1} - b) + \delta_Y(Y_t - Y), \tag{56}$$

$$R_t = \min\left[R_t^N, \frac{b_{t-1}\frac{Y_{t-1}}{\Pi_t Y_t} + \bar{\xi}}{b_{t-1}\frac{Y_{t-1}}{\Pi_t Y_t} - \tau_t}\right], \tag{57}$$

$$R_t^N = R\left(\frac{\Pi_t}{\Pi}\right)^{\phi_\Pi}\left(\frac{Y_t}{Y}\right)^{\phi_Y}, \tag{58}$$

$$C_t = Y_t\left[1 - \frac{\varphi}{2}\left(\frac{\Pi_t}{\Pi}-1\right)^2\right], \tag{59}$$

$$\zeta_t = \rho_\zeta\, \zeta_{t-1} + \sigma^\zeta\, \epsilon_t^\zeta, \tag{60}$$

$$\mu_t = \rho_\mu\, \mu_{t-1} + \sigma^\mu\, \epsilon_t^\mu \tag{61}$$

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 $\bar{R}_t$:

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

$$N_t = g^2(b_{t-1}, Y_{t-1}, \mu_t, \zeta_t) \tag{63}$$

$$\bar{R}_t = g^3(b_{t-1}, Y_{t-1}, \mu_t, \zeta_t) \tag{64}$$

[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:

$$\Pi_t = \tilde{g}^1(b_{t-1}, Y_{t-1}, \mu_t, \zeta_t) \tag{65}$$
$$N_t = \tilde{g}^2(b_{t-1}, Y_{t-1}, \mu_t, \zeta_t) \tag{66}$$
$$\bar{R}_t = \tilde{g}^3(b_{t-1}, Y_{t-1}, \mu_t, \zeta_t) \tag{67}$$

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:

$$\Pi_t = \tilde{g}^1(b_{t-1}, Y_{t-1}, \mu_t, \zeta_t) \tag{68}$$
$$N_t = \tilde{g}^2(b_{t-1}, Y_{t-1}, \mu_t, \zeta_t) \tag{69}$$
$$\bar{R}_t = \tilde{g}^3(b_{t-1}, Y_{t-1}, \mu_t, \zeta_t) \tag{70}$$

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

$$\tilde{Y}_t = N_t \tag{71}$$
$$\tilde{C}_t = \tilde{Y}_t(1 - 0.5\varphi\left(\frac{\Pi_t}{\Pi} - 1\right)^2) \tag{72}$$
$$\tilde{w}_t = \psi N_t^{\eta} \tilde{C}_t^{\sigma} \tag{73}$$
$$R_t^N = R\left(\frac{\Pi_t}{\Pi}\right)^{\phi_\Pi}\left(\frac{\tilde{Y}_t}{\tilde{Y}}\right)^{\phi_Y} \tag{74}$$
$$\tilde{R}_t = \min\left[\bar{R}_t, R_t^N\right] \tag{75}$$
$$\tilde{\tau}_t = \tau + \delta(b_{t-1} - b) + \delta_Y(\tilde{Y}_t - Y) \tag{76}$$
$$\tilde{b}_t = \tilde{R}_t\left(b_{t-1}\frac{Y_{t-1}}{\Pi_t \tilde{Y}_t} - \tilde{\tau}_t\right) \tag{77}$$
$$MC_t = \tilde{w}_t \tag{78}$$

Given these variables we can also compute

$$\bar{R}_t^{new} = \frac{\bar{b}}{b_{t-1}\frac{Y_{t-1}}{\Pi_t \tilde{Y}_t} - \tilde{\tau}_t} \tag{79}$$

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

$$\mu_{t+1}^i = \exp\left(\rho_\mu \log(\mu_t) + \epsilon_{t+1}^{\mu,i}\right) \tag{80}$$

$$\zeta_{t+1}^i = \exp\left(\rho_\zeta \log(\zeta_t) + \epsilon_{t+1}^{\zeta,i}\right) \tag{81}$$

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

$$\Pi_{t+1}^i = \tilde{g}^1(\tilde{b}_t, \tilde{Y}_t, \mu_{t+1}^i, \zeta_{t+1}^i) \tag{82}$$
$$N_{t+1}^i = \tilde{g}^2(\tilde{b}_t, \tilde{Y}_t, \mu_{t+1}^i, \zeta_{t+1}^i) \tag{83}$$
$$\tilde{Y}_{t+1}^i = N_{t+1}^i \tag{84}$$
$$\tilde{C}_{t+1}^i = \tilde{Y}_{t+1}^i(1 - 0.5\varphi\left(\frac{\Pi_{t+1}^i}{\Pi} - 1\right)^2) \tag{85}$$
$$\tilde{\Lambda}_{t,t+1}^i = \beta\left(\frac{\zeta_{t+1}^i}{\zeta_t}\right)\left(\frac{\tilde{C}_{t+1}^i}{\tilde{C}_t}\right)^{-\sigma} \tag{86}$$

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

$$err_1 = 1 - \tilde{R}_t E_t\left[\tilde{\Lambda}_{t,t+1}\frac{1}{\tilde{\Pi}_{t+1}}\right] \tag{87}$$
$$err_2 = \varphi\left(\frac{\Pi_t}{\Pi} - 1\right)\frac{\Pi_t}{\Pi} - (1-\epsilon) - \epsilon MC_t - \tag{88}$$
$$\varphi E_t\tilde{\Lambda}_{t,t+1}\left(\frac{\tilde{\Pi}_{t+1}}{\Pi} - 1\right)\left(\frac{\tilde{\Pi}_{t+1}}{\Pi}\right)\frac{\tilde{Y}_{t+1}}{\tilde{Y}_t} + \ln(\mu_t) \tag{89}$$
$$err_3 = \bar{R}_t - \bar{R}_t^{new}$$

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:

$$P = \begin{bmatrix} p_1 & 1-p_1 \\ 1-p_2 & p_2 \end{bmatrix} \tag{90}$$

We specify the rule as

$$\tau_t = \begin{cases} b_{t-1}\frac{R_{t-1}}{\Pi_t}\frac{Y_{t-1}}{Y_t} - b_t^L & \text{if } \mu_t^L \\ b_{t-1}\frac{R_{t-1}}{\Pi_t}\frac{Y_{t-1}}{Y_t} - b_t^H & \text{if } \mu_t^H \end{cases} \tag{91}$$

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

$$\bar{b} = b_t E_t \frac{\bar{R}_t}{\Pi_{t+1}} \Leftrightarrow \bar{R}_t = \bar{b}\Pi_{t+1}/b_t \tag{92}$$

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

$$R^L = \left[R\left(\frac{\Pi_t^L}{\Pi}\right)^{\phi_\Pi}, \bar{R}^L\right], \tag{93}$$

$$MC^L = \psi {Y^L}^{\sigma+\eta}, \tag{94}$$

$$b^L = b_{t-1}\frac{R_{t-1}}{\Pi^L} - \tau^L \tag{95}$$

$$\tau^L = b_{t-1}\frac{R_{t-1}}{\Pi} - b^L \tag{96}$$

$$\xi\left(\frac{\Pi^L}{\Pi}-1\right)\frac{\Pi^L}{\Pi}=(1-\epsilon)+\epsilon MC^L+\xi\beta\left[p_1\left(\frac{\Pi^L}{\Pi}-1\right)\frac{\Pi^L}{\Pi}+(1-p_1)\left(\frac{Y^H}{Y^L}\right)^{1-\sigma}\left(\frac{\Pi^H}{\Pi}-1\right)\frac{\Pi^H}{\Pi}\right]+\mu^L \tag{97}$$

$$1=\beta R^L\left[p_1\frac{1}{\Pi^L}+(1-p_1)\left(\frac{Y^H}{Y^L}\right)^{-\sigma}\Pi^H\right] \tag{98}$$

$$\bar{R}^H L=\frac{\bar{b}}{b^L}\left[p_1\Pi^L+(1-p_1)\Pi^H\right] \tag{99}$$

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

$$R^H=\left[R\left(\frac{\Pi_t^H}{\Pi}\right)^{\phi_\Pi},\bar{R}^H\right], \tag{100}$$

$$MC^H=\psi Y^{H\sigma+\eta}, \tag{101}$$

$$b^H=b_{t-1}\frac{R_{t-1}}{\Pi^H}-\tau^H \tag{102}$$

$$\tau^H=b_{t-1}\frac{R_{t-1}}{\Pi}-b^H \tag{103}$$

$$\xi\left(\frac{\Pi^H}{\Pi}-1\right)\frac{\Pi^H}{\Pi}=(1-\epsilon)+\epsilon MC^H+\xi\beta\left[p_2\left(\frac{\Pi^H}{\Pi}-1\right)\frac{\Pi^H}{\Pi}+(1-p_2)\left(\frac{Y^L}{Y^H}\right)^{1-\sigma}\left(\frac{\Pi^L}{\Pi}-1\right)\frac{\Pi^L}{\Pi}\right]+\mu^H \tag{104}$$

$$1=\beta R^H\left[p_2\frac{1}{\Pi^H}+(1-p_2)\left(\frac{Y^L}{Y^H}\right)^{-\sigma}\Pi^L\right] \tag{105}$$

$$\bar{R}^H=\frac{\bar{b}}{b^H}\left[p_2\Pi^H+(1-p_2)\Pi^L\right] \tag{106}$$

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

C Additional figures

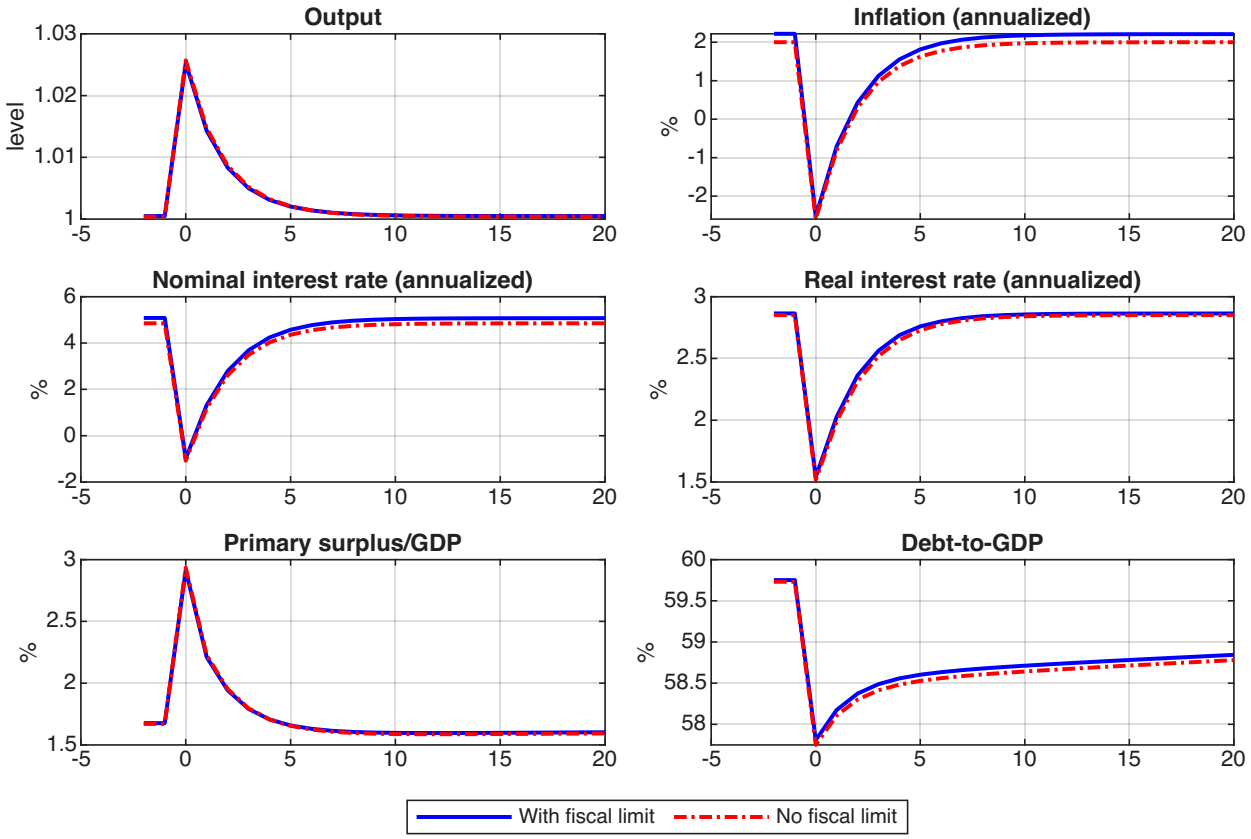


Figure 15: Responses to disinflationary cost-push shock. Impulse response functions to a three-standard-deviation disinflationary cost-push shock. Responses from the model with a fiscal limit shown in blue and without a fiscal limit in dashed red. Shock happens in period 0. Figures show dynamics in deviation from pre-shock level.

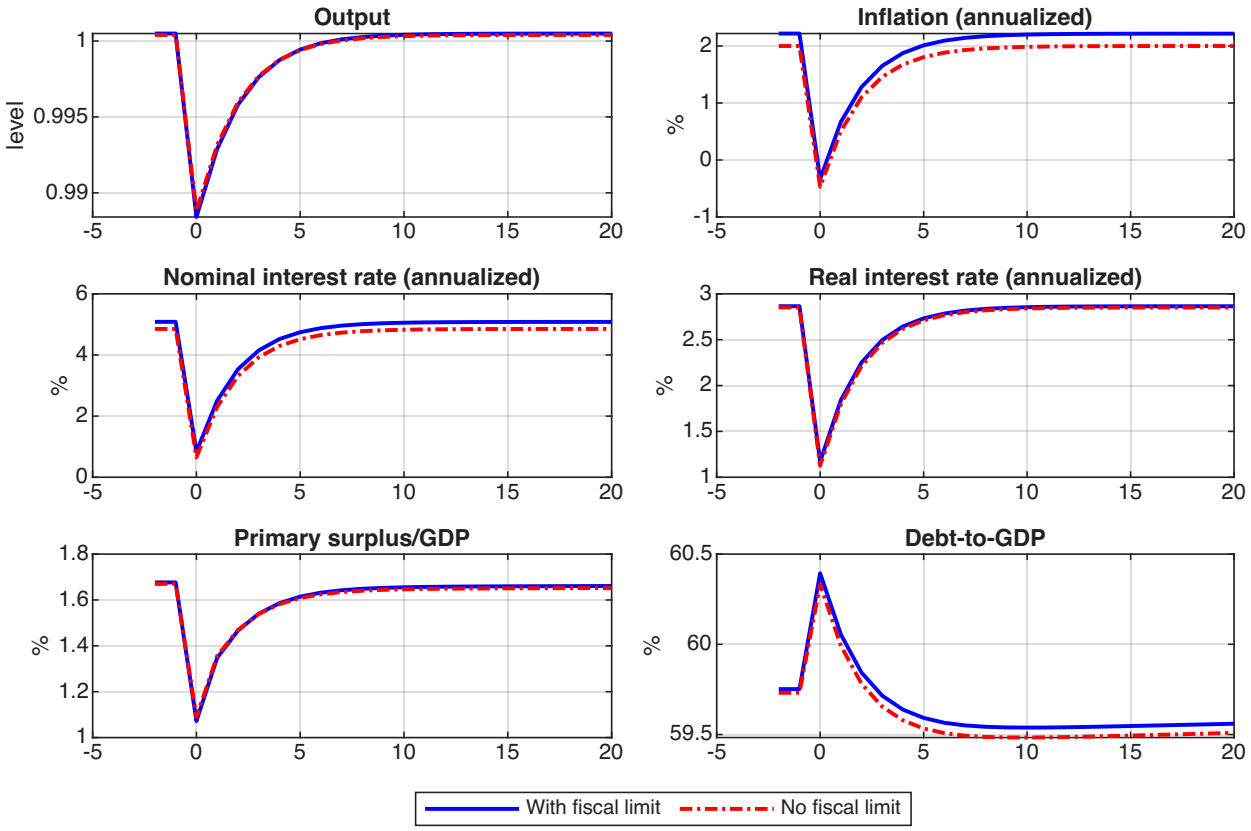


Figure 16: Responses to disinflationary preference shock. Impulse response functions to a three-standard-deviation disinflationary preference shock. Responses from model with fiscal limit shown in blue and without fiscal limit in dashed red. Shock happens in period 0. Figures show dynamics in deviation from pre-shock level.

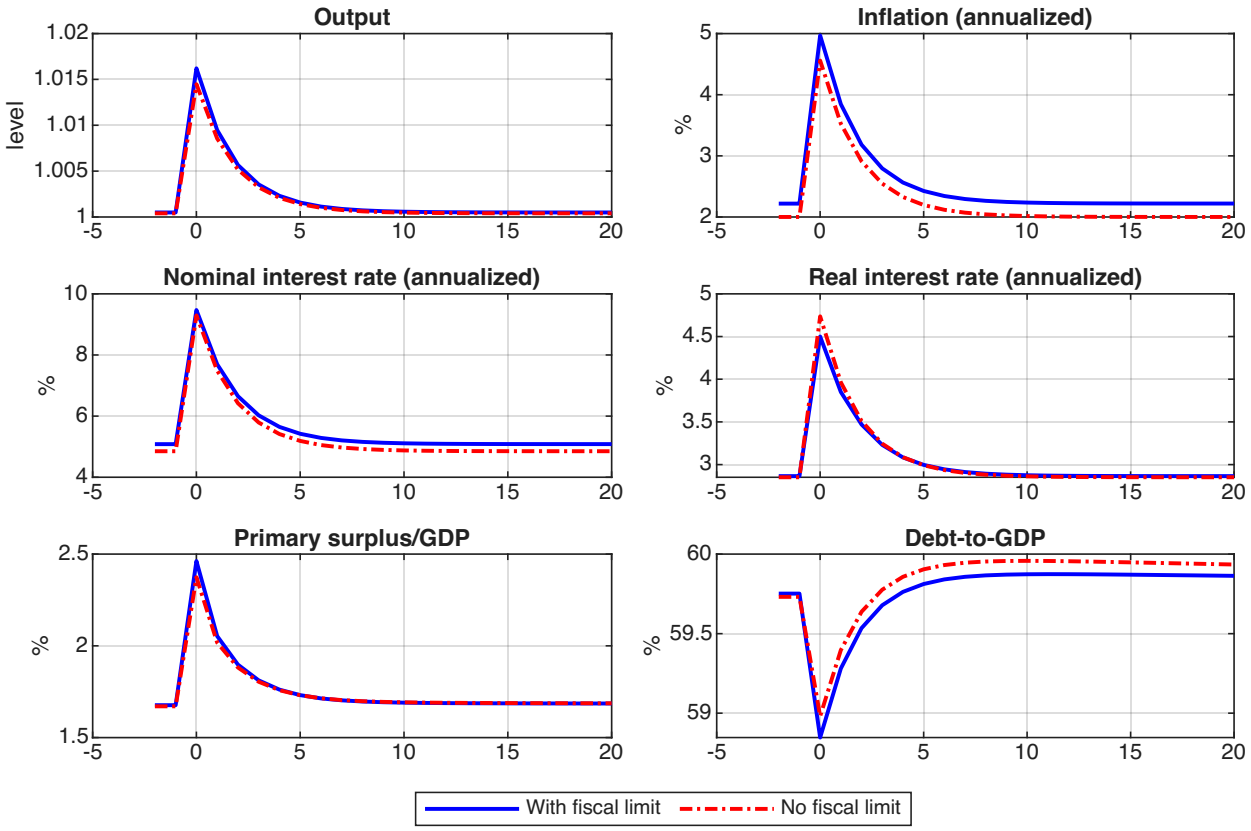


Figure 17: Responses to inflationary preference shock. Impulse response functions to a three-standard-deviation inflationary preference shock. Responses from model with fiscal limit shown in blue and without fiscal limit in dashed red. Shock happens in period 0. Figures show dynamics in deviation from pre-shock level.