Debt Service and Fiscal Sustainability *

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Abstract

How do advanced economies adjust to persistent public-spending pressures when government debt is priced endogenously? We develop a New Keynesian sovereign-debt model in which governments roll over local-currency debt and global investors price bonds using fiscal fundamentals and investors' willingness to finance additional debt. Motivated by evidence that debt-service burdens predict fiscal crises better than debt-to-GDP, the model links rollover risk to fiscal capacity. Higher spending is initially expansionary, but rising debt-service costs eventually tighten fiscal space, raise taxes, reduce output, increase inflation, and increase rollover risk. Similar debt paths can imply very different fiscal risks when markets price marginal debt differently.

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1. Introduction

How does an economy adjust when public spending rises persistently and the existing stock of public debt is already high? This question has become increasingly important for advanced economies. Public debt has risen sharply following the global financial crisis and the COVID-19 pandemic, while governments face growing spending pressures from aging populations, health care, defense, climate policy, and other long-run commitments. The United States provides a prominent example. Figure 1 reports Congressional Budget Office projections showing federal outlays rising from about 23 percent of GDP in 2025 to 28 percent by 2056. These projections raise familiar questions about taxes, debt, inflation, and output. More fundamentally, they raise a different question: how does the price at which governments refinance debt evolve as fiscal pressures build?

This paper studies the macroeconomic transition to a persistent fiscal expansion in an economy where sovereign debt prices are endogenous. Our central insight is that fiscal space is not determined by debt quantities alone. It is an equilibrium object determined jointly by the stock of debt, the revenues available to service that debt, the market price at which new debt can be issued, and the monetary-fiscal regime that shapes expected inflation and future repayment capacity. A given debt-to-GDP ratio can therefore be sustainable in one environment and fragile in another. What matters for the transition is not only how much debt the government issues, but also how markets price the marginal unit of debt that must be rolled over.

We begin by documenting that debt-service burdens are more informative about fiscal stress than debt levels. In a postwar panel of 20 advanced and 20 emerging economies, the interest-expense-to-revenue ratio predicts hyperinflation episodes, consumption crises, and GDP crises much better than the debt-to-GDP ratio. This evidence does not imply that debt is irrelevant. Rather, it suggests that debt becomes dangerous when the cost of carrying and rolling over that debt absorbs fiscal capacity. The empirical evidence therefore motivates a model in which bond prices, debt-service costs, and fiscal adjustment are jointly determined.

We develop a New Keynesian sovereign-debt model with debt rollover risk. As in many developed economies, our government issues local-currency debt and finances public spending with income taxes and new issuance. Investors price government bonds based on expected repayment, inflation, fiscal fundamentals, and market sentiment. The bond price is therefore endogenous to the government's borrowing decision. A higher level of desired debt issuance can lower the price of government debt, so that the government raises less current revenue per unit of promised future repayment. This price feedback is the key departure from standard New Keynesian models with risk-free government debt. At the same time, our treatment of default differs from the optimal sovereign default framework following Eaton and Gersovitz

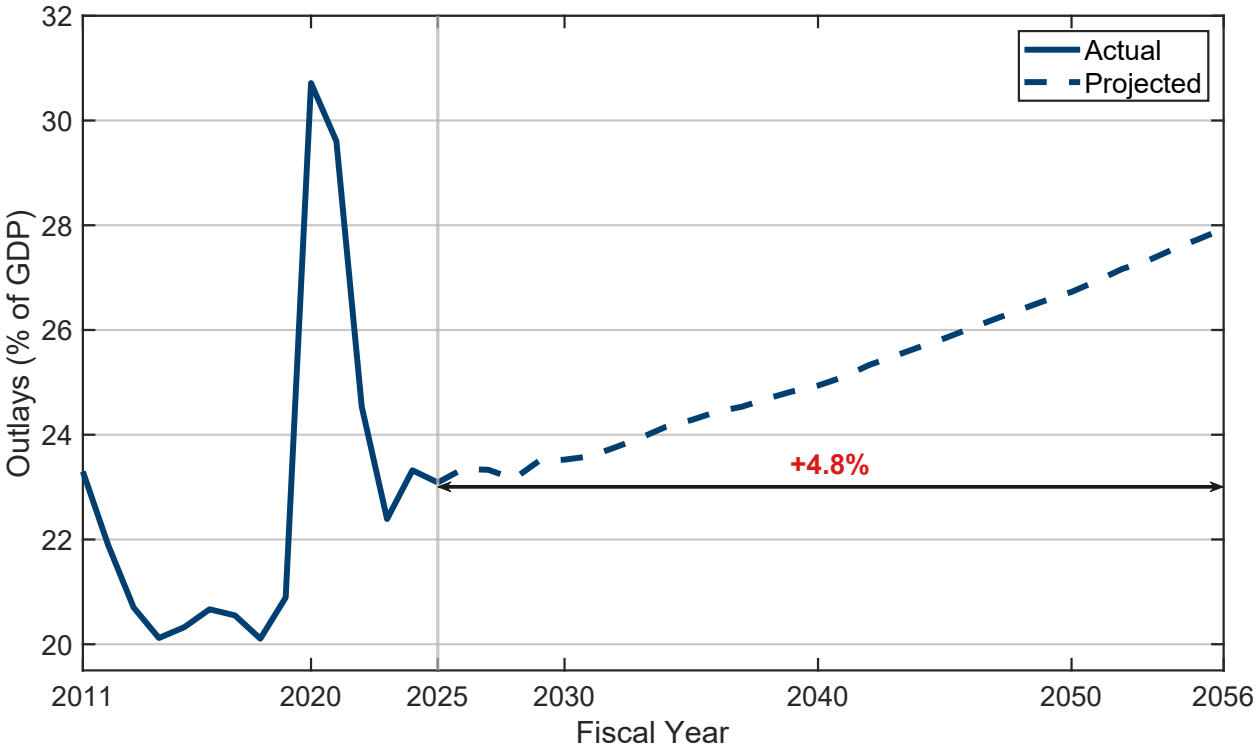


Figure 1: U.S. Federal Outlays. The figure plots federal outlays as a percentage of GDP from 2011 to 2056, using CBO long-term budget projections. The solid line denotes historical and near-term values through 2025, while the dashed line denotes projected outlays after 2025. The vertical line marks the start of the projection period. Federal outlays are projected to rise substantially over the long run, increasing by the annotated percentage between 2025 and 2056.

(1981). Instead, default risk represents rollover stress: states in which markets do not absorb government debt on favorable terms and the economy suffers a fiscal disruption.

The mechanism is simple. A persistent increase in government spending raises the need for taxes and debt issuance. As debt accumulates, the government must refinance a larger stock of obligations. If markets price the marginal unit of debt less favorably, debt-service costs rise relative to revenues. Higher debt service tightens the government budget constraint and requires additional fiscal adjustment. Higher distortionary taxation reduces output and further compresses fiscal space. Monetary policy and price-setting frictions further determine how the economy absorbs fiscal pressure. Fiscal sustainability is therefore shaped by the interaction of debt quantities, bond prices, taxes, output, and inflation.

Our quantitative model first explains why debt-service burdens are a useful summary statistic for fiscal vulnerability. While shocks to financing conditions and market sentiment can have different effects on debt-to-GDP, they consistently raise debt-service burdens and weaken macroeconomic outcomes. Consistent with the data, higher interest burdens predict lower future output growth and stronger fiscal adjustment.

We then use the model to study an announced transition to a permanently higher-spending regime motivated by long-run fiscal pressures in advanced economies. The fiscal expansion is initially expansionary. Over time, however, debt accumulation raises debt-service costs, lowers bond prices, and tightens fiscal space. Taxes increase, output declines, inflation rises, and rollover risk gradually builds. Although the transition does not culminate in an immediate crisis, it illustrates how fiscal fragility can emerge slowly as borrowing becomes progressively more expensive.

A central quantitative result is that similar debt paths can imply very different fiscal risks. We illustrate this by varying the sensitivity of market pricing while holding the spending path and the long-run debt target fixed. The resulting debt-to-GDP paths are nearly identical, but cumulative default risk differs sharply. When markets are less forgiving, the same increase in debt generates a much steeper decline in bond prices and a much larger rise in cumulative default risk. This result illustrates why debt-to-GDP is not a sufficient statistic for fiscal sustainability. The relevant object is the bond-price schedule faced by the government and the resulting burden of debt service relative to fiscal capacity.

The predicted economic transition also depends on monetary policy and the timing of fiscal adjustment. When monetary policy responds less aggressively to inflation, the initial fiscal expansion generates a larger short-run output boom. But weaker inflation stabilization also allows fiscal pressure to pass more strongly into inflation, debt accumulation, and sovereign risk. Tax policy generates a different trade-off. A lower long-run debt target reduces cumulative default risk, but it requires taxes to rise sooner and creates larger short-run distortions. A higher debt target smooths taxes in the near term but permits debt-service costs and rollover risk to build over time.

This paper makes three contributions. First, we show that debt-service capacity is a more informative measure of fiscal sustainability than debt quantities alone. We show empirically that the interest-expense-to-revenue ratio predicts fiscal crises more accurately than debt-to-GDP, suggesting that fiscal vulnerability depends not only on the stock of debt but also on the cost of servicing and refinancing it. Second, we develop a quantitative New Keynesian model in which sovereign bond prices are determined endogenously by fiscal fundamentals and investor sentiment. The model links debt-service burdens to fiscal capacity and rollover risk, providing a structural explanation for why identical debt paths can imply very different fiscal outcomes. Third, we use the model to study the macroeconomic consequences of persistent fiscal expansions. The analysis shows how endogenous debt pricing changes the transition dynamics of the economy and highlights the roles of monetary policy, fiscal adjustment, and market sentiment in shaping fiscal sustainability. Together, these results suggest that fiscal space is best understood as an equilibrium outcome rather than as a debt threshold.

The paper contributes to the literature on fiscal sustainability. Classic work emphasizes

the role of primary surpluses in satisfying the government's intertemporal budget constraint (Bohn, 1998; Reinhart and Rogoff, 2011). More recent work highlights the importance of the interest-growth differential (Blanchard, 2019; Mauro and Zhou, 2020), while asset-pricing approaches study the valuation of government debt and the riskiness of future fiscal surpluses (Jiang et al., 2024a,b). We complement this work by modeling how the price of government debt feeds back into fiscal policy and real activity. In our model, fiscal space is not only a function of promised surpluses or the stock of debt; it also depends on the market price at which new debt can be issued.

The paper also relates to the sovereign default and rollover-risk literatures. Calvo (1988) shows how changes in financing conditions can force abrupt adjustment, and Cole and Kehoe (2000) show how rollover risk can generate self-fulfilling debt crises. Quantitative sovereign default models, including Aguiar and Gopinath (2006) and Arellano (2008), study the interaction between default incentives, borrowing costs, and macroeconomic dynamics. Our model differs in three ways. We focus on advanced economies that issue primarily in local currency; we study small but nonzero default probabilities rather than repeated default episodes; and we model default risk as rollover stress generated by market financing conditions rather than as a discretionary government choice. This approach lets us study how even small priced risks can affect fiscal transitions through debt-service costs and macroeconomic adjustment.

Our framework is closely related to the fiscal-limits literature.[1] Whereas fiscal-limits models primarily characterize fiscal sustainability through fiscal fundamentals and the government's proximity to a fiscal limit, we emphasize that fiscal sustainability depends critically on the endogenous terms at which governments refinance their debt. In our framework, fiscal sustainability is jointly determined by fiscal fundamentals and the endogenous price at which new debt can be issued. Consequently, identical debt paths can imply different fiscal outcomes because governments face different bond-price schedules. This endogenous pricing channel changes both the macroeconomic adjustment to persistent fiscal expansions and the measurement of fiscal space.

Finally, the paper contributes to the macro-finance literature on fiscal risk and to the literature on monetary-fiscal interactions. Fiscal policy uncertainty and news about future surpluses are priced in asset markets and can affect investment, yields, and growth (Croce et al., 2012a,b; Gomez-Cram et al., 2025a,b). Related work studies the effects of Treasury supply and the global demand for safe dollar assets on yields, term premia, and macroeconomic activity (Bi et al., 2026; Jiang et al., 2026). We provide a quantitative mechanism linking

[1]The fiscal-limits literature characterizes fiscal sustainability through the government's ability to generate future primary surpluses and the implications of approaching fiscal limits for sovereign risk and fiscal adjustment (e.g., Davig et al., 2011; Leeper and Walker, 2011; Bi, 2012; Bi and Leeper, 2013; Ghosh et al., 2013; Elenev et al., 2026).

these asset-pricing effects to fiscal adjustment, inflation, and output. On the monetary side, classic work by Sargent and Wallace (1981), Leeper (1991), and Woodford (2001) shows that equilibrium outcomes depend on the interaction between monetary and fiscal regimes. More recent work studies fiscal limits, persistent inflation, and central-bank credibility (Corsetti et al., 2013; Bianchi and Melosi, 2022; Bianchi et al., 2023; Schreger et al., 2024). We add an endogenous sovereign bond-pricing channel: monetary policy affects fiscal sustainability not only through inflation and the real value of debt, but also through the market's assessment of future fiscal capacity.

The rest of the paper is organized as follows. Section 2 presents the motivating evidence. Section 3 develops the model. Section 4 describes the calibration and studies shocks to global financing conditions and market sentiment. Section 5 studies the transition to a higher-spending regime and examines the roles of market sentiment, monetary policy, and taxes. Section 6 discusses the bond-pricing implications. Section 7 concludes.

2. Motivating Evidence

The empirical literature on sovereign risk has traditionally emphasized the importance of the debt-to-GDP ratio. Similarly, standard sovereign default models typically allow the government to choose its debt stock and default strategically. In this section, we motivate our framework by documenting a striking empirical result: the interest-expense-to-revenue ratio predicts crises much better than the debt-to-GDP ratio. We show that this measure has stronger predictive power for several types of crises, including hyperinflation, consumption crises, and GDP crises.

To do that, we construct a database that includes a sample of 20 advanced and 20 emerging economies.[2] We leave the data summary and construction in Appendix A.1. For hyperinflation, we define an episode as a year in which annual inflation exceeds 100 percent.[3] Using this definition, we identify 68 hyperinflation years in the sample. This corresponds to an unconditional probability of 2.3%.[4] In the same spirit, we define consumption and

[2]Developed economies include Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, the United Kingdom, and the United States. Emerging economies include Argentina, Bolivia, Brazil, Chile, China, Colombia, Egypt, India, Indonesia, South Korea, Malaysia, Mexico, Nigeria, Peru, the Philippines, South Africa, Thailand, Turkey, Uruguay, and Venezuela. Expanding the sample to a broader set of countries does not affect our results.

[3]The classic definition, due to Cagan (1956), classifies hyperinflation as monthly inflation above 50 percent. Later work, including Reinhart and Savastano (2003) and Reinhart and Rogoff (2010), follows this benchmark while also distinguishing between high and very high inflation. In practice, however, institutions such as the IMF often rely on annual inflation thresholds.

[4]There are 2,951 non-missing inflation observations in the sample, so the implied probability is $68/2{,}951 = 0.023$.

Table 1: Predicting Hyperinflation

This table reports results from logit regressions where the dependent variable is an indicator for whether a country experiences a hyperinflation episode in the next year, I_{it+1}^{crisis}. We set I_{it+1}^{crisis} equal to one if inflation in the next year exceeds 100%, and zero otherwise. The sample includes 20 developed and 20 emerging economies over the period 1950–2023. Robust t-statistics are reported in parentheses. The pseudo-R^2 is reported at the bottom. p-values test the null hypothesis that the coefficient is equal to zero when each variable is included separately. When both variables are included, the reported p-value tests whether the coefficients on Int/Rev and b/Y are equal.

	(1)	(2)	(3)
Int/Rev (lag)	0.0749		0.0745
	(6.141)		(6.127)
b/Y (lag)		0.00129	0.00101
		(2.408)	(1.277)
Constant	-5.184	-4.081	-5.232
	(-18.78)	(-26.79)	(-18.61)
p-value	0.0000	0.0160	0.0000
Pseudo R^2	0.179	0.00220	0.180
Observations	2538	2538	2538

output crises as years in which annual per capita growth falls below -5%.[5] In our sample, we identify 121 consumption-crisis years, of which 21 occur in advanced economies and 100 in emerging economies. This corresponds to an unconditional probability of 4.7%.[6] We also identify 113 GDP-crisis years, of which 27 occur in advanced economies and 86 in emerging economies, implying an unconditional probability of 3.9%.[7]

The regression design is logit which follows

$$P(\Gamma_{it+1}^{crisis} = 1 \mid X_{it}) = \frac{e^{X_{it}a}}{1 + e^{X_{it}a}}, \tag{1}$$

where Γ_{it+1}^{crisis} is an indicator for a disaster event, including hyperinflation, consumption crises, and output crises, and X_{it} includes fiscal measures, interest-to-revenue ratio $(Int/Rev)_t$, debt-to-GDP ratio $(b/Y)_t$, or both.

Table 1 shows that the lagged interest-expense-to-revenue ratio predicts hyperinflation in

[5] Unlike the rare-disasters literature, which typically identifies large peak-to-trough contractions (e.g., Barro, 2006; Barro and Ursúa, 2008), we use annual growth rates to capture severe macroeconomic stress episodes that are relevant for fiscal vulnerability.

[6] There are 2,585 non-missing consumption-growth observations in the sample, so the implied probability is $121/2{,}585 = 0.047$.

[7] There are 2,917 non-missing GDP-growth observations in the sample, so the implied probability is $113/2{,}917 = 0.039$.

Table 2: Predicting Consumption and GDP Disasters

This table reports results from logit regressions where the dependent variable is an indicator for whether a country experiences a consumption crisis, C_{it}^{crisis}, or a GDP crisis, Y_{it}^{crisis}. We define consumption and GDP disasters as years in which annual per capita growth falls below -5%. The sample includes 20 developed and 20 emerging economies over the period 1950–2023. Robust t-statistics are reported in parentheses. The pseudo-R^2 is reported at the bottom. p-values test the null hypothesis that the coefficients are equal to zero.

	Consumption			GDP		
	(1)	(2)	(3)	(4)	(5)	(6)
Int/Rev (lag)	0.0250		0.0250	0.0189		0.0185
	(3.620)		(3.596)	(2.243)		(2.175)
b/Y (lag)		0.000329	-0.000141		0.000951	0.000859
		(0.460)	(-0.107)		(1.739)	(1.488)
Constant	-3.462	-3.184	-3.456	-3.560	-3.400	-3.599
	(-24.95)	(-28.65)	(-23.37)	(-23.79)	(-30.17)	(-23.65)
p-value	0.0003	0.6453	0.0005	0.0249	0.0820	0.0392
Pseudo R^2	0.0121	0.0000677	0.0121	0.00559	0.000899	0.00620
Observations	2326	2326	2326	2543	2543	2543

the following year. The coefficient on $(Int/Rev)_t$ is positive and highly significant, and the result is essentially unchanged after controlling for debt-to-GDP. By contrast, debt-to-GDP alone has little explanatory power. In Column (1), a one-standard-deviation increase in the interest burden raises the probability of hyperinflation by roughly 2 percentage points, nearly doubling the unconditional probability. The pseudo-R^2 is 0.179 in the interest-burden specification, compared with just 0.002 in the debt-size specification.

Table 2 shows a similar pattern for real activity. Higher lagged interest burdens predict a greater likelihood of consumption and GDP crises, even after controlling for debt-to-GDP. In Column (1), a one-standard-deviation increase in the interest burden raises the probability of a consumption disaster by about 1.2 percentage points. In Column (4), the same increase raises the probability of a GDP disaster by about 0.72 percentage points. Both tables show that fiscal stress appears more closely related to the burden of servicing debt than to debt levels alone.

The empirical evidence motivates the model in two ways. First, it suggests that measures of debt-service capacity summarize fiscal vulnerability more effectively than debt quantities alone. Second, it indicates that sovereign borrowing costs contain information about future macroeconomic adjustment that is absent from conventional debt measures. The model developed below provides a structural interpretation for these findings.

3. Model

In this section, motivated by our empirical results, we develop a sovereign default model with rollover risk in a New Keynesian framework. The core mechanism is that the government must roll over debt in markets that endogenously price fiscal risk. Government bonds are issued in local currency and held by global investors, exposing the government to shifts in global financial conditions and market sentiment that can amplify rollover risk. When financing conditions deteriorate or market sentiment weakens, bond prices fall, debt-service costs rise, and fiscal pressure increases. We then link this rollover mechanism to macroeconomic outcomes in the New Keynesian environment. The government chooses spending and debt, while monetary policy follows an interest-rate rule.

3.1. Household

The representative household chooses consumption C_t and labor supply N_t to maximize expected lifetime utility

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \left(\prod_{s=1}^{t} \beta_s \right) \left[\log C_t + \chi \log(1 - N_t) + \log(G_t) \right], \tag{2}$$

where the one-period discount factor, β_t, follows an AR(1) process in logs:

$$\log \beta_t = (1 - \rho_b) \log \bar{\beta} + \rho_b \log \beta_{t-1} + \sigma_b \varepsilon_{b,t}, \tag{3}$$

where $\rho_b \in (0, 1)$ governs the persistence of the process, and $\varepsilon_{b,t}$ follows a normal process.

The household's budget constraint is

$$P_t C_t + P_t I_t + D_{t+1} = (1 - \tau_t) W_t N_t + (1 + i_{t-1}) D_t + R_t^k K_t + \Pi_t, \tag{4}$$

where P_t is the price level, I_t is investment, and K_t is the capital stock. The household earns labor income $W_t N_t$, net of the labor tax τ_t, receives returns on bank deposits D_t, capital income $R_t^k K_t$, and firm profits Π_t. Households hold domestic deposits in zero net supply while the government borrows exclusively from global investors.

The capital stock evolves according to

$$K_{t+1} = (1 - \delta_k) K_t + I_t, \tag{5}$$

where $\delta_k \in (0, 1)$ is the depreciation rate.

We define real variables as nominal variables divided by the price level, that is, $w_t = W_t / P_t$ and $r_t^k = R_t^k / P_t$. Gross inflation is defined as $\pi_t = P_t / P_{t-1}$. The gross nominal interest rate on domestic deposits is given by $i_t = 1 / q_t^D$.

3.2. Production

The final good, Y_t, is produced using a unit measure of intermediate goods y_{jt}, $j \in [0,1]$, under perfect competition

$$Y_t = \left[\int_0^1 y_{jt}^{\frac{\eta-1}{\eta}} \, dj \right]^{\frac{\eta}{\eta-1}}, \tag{6}$$

where η is the elasticity of substitution between intermediate goods. The demand function is given by

$$y_{jt} = \left(\frac{p_{jt}}{P_t} \right)^{-\eta} Y_t, \tag{7}$$

where p_{jt} is the price of intermediate good j at time t, and $P_t = \left[\int_0^1 p_{jt}^{1-\eta} dj \right]^{\frac{1}{1-\eta}}$ is the price of domestic goods.

Each intermediate good is produced using capital k_{jt} and labor n_{jt} under a constant-returns-to-scale production function, given productivity $\hat{z}_t$

$$y_{jt} = \hat{z}_t \, k_{jt}^{\alpha} \, n_{jt}^{1-\alpha}, \tag{8}$$

where $\alpha \in (0,1)$. We further assume that sovereign distress induces a decline in total factor productivity. Specifically,

$$\hat{z}_t = z_t \Phi_t + \zeta z_t (1 - \Phi_t), \tag{9}$$

where $1 - \Phi_t$ is the sovereign distress probability, and $\zeta \in (0,1)$ captures the severity of the output loss in default states. We assume z_t follows an AR(1) process,

$$\log z_t = \rho_z \log z_{t-1} + \sigma_z \varepsilon_{z,t}, \tag{10}$$

where $\rho_z \in (0,1)$ and $\varepsilon_{z,t}$ follows a normal process.

Following Rotemberg (1982), we assume that intermediate-goods producers face quadratic costs when adjusting their prices. Imposing symmetry in optimal behavior and aggregating across all firms, we obtain the standard New Keynesian Phillips Curve (NKPC),

$$\frac{1}{z_t} \frac{w_t^{1-\alpha} (r_t^k)^{\alpha}}{\alpha^{\alpha}(1-\alpha)^{1-\alpha}} = \frac{\eta - 1}{\eta} + \frac{1}{\eta} \left\{ \varphi(\pi_t - \bar{\pi})\pi_t - \beta \frac{C_t}{Y_t} \mathbb{E}_t \left[\frac{Y_{t+1}}{C_{t+1}} \varphi(\pi_{t+1} - \bar{\pi})\pi_{t+1} \right] \right\}. \tag{11}$$

A detailed derivation is provided in Online Appendix B.3.

3.3. Government

A benevolent government chooses the next-period debt level, b_{t+1}, and government spending, G_t to maximize the household's expected lifetime utility, given by equation (2). The government's flow budget constraint follows

$$G_t + \frac{b_t}{\pi_t} = \tau_t w_t N_t + q_t b_{t+1}. \tag{12}$$

The left-hand side captures government outlays: current public spending G_t plus the real value of maturing debt obligations. The right-hand side captures government real resources: revenues from taxing labor income, $\tau_t w_t N_t$, plus proceeds from new debt issuance, $q_t b_{t+1}$, where q_t is the real bond price.

Government spending, G_t, supports mandatory social programs and is only partly discretionary. Every period, the government chooses the optimal fraction, g_t, of a weighted average of current and steady-state output such that:

$$G_t = g_t\big((1-\nu)Y_t + \nu\bar{Y}_t\big), \tag{13}$$

where $\nu \in [0,1]$ governs the weight of social programs.

3.4. Fiscal Space and Rollover Risk

To connect the model directly to our empirical evidence, define tax revenue as

$$T_t \equiv \tau_t w_t N_t, \tag{14}$$

so that the model counterpart of the interest-expense-to-revenue ratio is

$$\iota_t \equiv \frac{(1-q_t)b_{t+1}}{T_t}. \tag{15}$$

We summarize rollover fundamentals with per-period net borrowing requirements (or budget surplus) as a share of GDP:

$$s_t \equiv \frac{T_t}{Y_t}(1-\iota_t) - \frac{G_t}{Y_t} = \frac{1}{Y_t}\left(\frac{b_t}{\pi_t} - b_{t+1}\right). \tag{16}$$

Thus, holding spending and the revenue share fixed, a higher interest-expense-to-revenue ratio mechanically lowers fiscal capacity. This is the precise mapping between the empirical variable Int/Rev and the state variable that enters rollover risk in the model.

We assume that at the beginning of each period, the government faces a rollover-risk shock. The probability of retaining market access in any period t is an increasing function of the budget surplus and is given by

$$\Phi_t = \Phi(s_t), \tag{17}$$

where $\Phi(\cdot)$ is the CDF of the rollover threshold. With probability $1-\Phi(s_t)$, global investors shut down market access until the government restructures its debt. A lower value of s_t implies a lower probability of market access and therefore a higher probability $1-\Phi_t$ of rollover failure.[8]

[8] All actions happen in one period under a recursive equilibrium. Default is pinned down by both fundamental and market sentiment.

The Euler equation for the optimal debt choice is

$$q_t + b_{t+1}\frac{\partial q_t}{\partial b_{t+1}} = \mathbb{E}_t\left[\beta_t\Big(\frac{G_{t+1}}{G_t}\Big)^{-1}\frac{1}{\pi_{t+1}}\Phi(s_t)\right]. \tag{18}$$

Condition (18) equates the marginal benefit of issuing additional debt today, including the effect of debt issuance on bond prices, to the expected discounted marginal repayment cost tomorrow, conditional on repayment.

3.5. Debt Pricing

The government bond is priced in local currency, consistent with most advanced countries' experience, but is held by global investors through risk-neutral vehicles. The equilibrium real price of a one-period government bond satisfies

$$q_t = \mathbb{E}_t\left[\frac{\beta_t^f}{\pi_{t+1}}\Big(1-(1-\delta)(1-\Phi_t)\Big)\right], \tag{19}$$

where β_t^f is the global investor's stochastic discount factor. We discuss the calibration of β_t^f in Section 4.1. Shocks to β_t^f capture changes in global interest rates. $1-\Phi_t$ is the default probability, and $\delta \in [0,1]$ is the recovery rate in the event of default.

Differentiating the global bond pricing equation with respect to b_{t+1} gives

$$\frac{\partial q_t}{\partial b_{t+1}} = -\frac{1}{Y_t}(1-\delta)\mathbb{E}\left[\frac{\beta_t^f}{\pi_{t+1}}\phi(s_t)\right], \tag{20}$$

where $\phi(\cdot)$ is the density associated with $\Phi(\cdot)$. The derivative is negative: higher issuance lowers fiscal capacity, reduces the rollover probability, and lowers the bond price. Within each period, the government chooses next-period debt b_{t+1} while investors price the newly issued debt based on the fiscal stance implied by that choice. Hence, b_{t+1}, the debt-service-adjusted fiscal-capacity signal s_t, the rollover probability Φ_t, and the bond price q_t are jointly determined in a within-period equilibrium.

The yield spread between the bond's implied gross real return and the risk-free gross real return implied by the global investor's discount factor is given by

$$\Delta_t = \frac{1}{q_t} - \mathbb{E}\left[\frac{\pi_{t+1}}{\beta_t^f}\right], \tag{21}$$

which captures the compensation lenders require for bearing sovereign default risk. Higher rollover risk lowers the bond price and therefore increases this spread.

3.6. Debt-Service Burden and Rollover Risk

Equations (15)–(17) make explicit that rollover risk is tied to debt-service capacity rather than to the debt stock alone. A larger debt stock increases rollover risk only to the extent that it raises required issuance or lowers bond prices enough to reduce s_t. Conversely, two economies with similar debt-to-GDP ratios can face different levels of rollover risk if they face different bond-price schedules, because the same promised debt then implies different interest burdens ι_t and different fiscal-capacity signals s_t.

Default in the model should therefore be read as a rollover-failure event rather than as a discretionary repudiation of debt. With probability $1 - \Phi_t$, investors do not roll over government debt on normal terms and the economy incurs the fiscal disruption summarized by the productivity loss in Equation (9). This formulation connects the empirical evidence to the model: high values of Int/Rev indicate that debt service is absorbing fiscal capacity, which lowers s_t, reduces the market-access probability, and feeds back into bond prices, taxes, output, and inflation.

3.7. Monetary Authority

The monetary authority implements policy by setting the short-term nominal interest rate according to a Taylor rule. The rule raises the policy rate when inflation exceeds its target and when output rises above its steady-state level. Formally,

$$(1 + i_t) \;=\; (1 + \bar{i}) \left(\frac{\pi_t}{\overline{\pi}}\right)^{\psi_1} \left(\frac{Y_t}{\overline{Y}}\right)^{\psi_2} m_t, \tag{22}$$

where $(1 + \bar{i})$ is the steady-state nominal rate consistent with the inflation target $\overline{\pi}$, and $\overline{Y}$ denotes steady-state output. The parameters $\psi_1 > 1$ and $\psi_2 \geq 0$ govern the strength of the systematic response to inflation and output, respectively. The government interest rate rule is subject to monetary policy shocks m_t. Specifically, m_t follows an AR(1) process,

$$\log m_t = \rho_m \log m_{t-1} + \sigma_m \varepsilon_{m,t}, \tag{23}$$

where $\rho_m \in (0, 1)$ and $\varepsilon_{m,t}$ follows a normal process.

3.8. Equilibrium and Aggregation

We focus on a Markov perfect equilibrium. The government chooses next-period debt taking as given the sovereign bond-pricing function and the behavior of private agents. The exogenous state vector $\mathcal{S} = \{z, \beta, \beta^f, m\}$, collects shocks to productivity, domestic discount factor, global financial conditions, and monetary policy. The endogenous state variables are government debt b and the aggregate capital stock K. Hence, the aggregate state is

$\mathcal{X} = (b, K, \mathcal{S})$. For notational simplicity, we suppress time subscripts from this point onward and use primes to denote next-period variables.

An equilibrium consists of policy functions for households, firms, the government, the monetary authority, and global lenders such that: (i) households and firms optimize taking prices and policy as given; (ii) the government optimizes taking the sovereign bond-pricing function as given; (iii) global lenders price sovereign debt rationally using the default rule induced by government policy; and (iv) all markets clear.

Market clearing. The goods market clears:

$$Y = C + I + G + \frac{b}{\pi} - qb' + \frac{\varphi}{2}(\pi - \bar{\pi})^2 Y, \tag{24}$$

where the last term denotes resource costs associated with Rotemberg price adjustment.

4. Quantitative Analysis

We next present the model's quantitative analysis. The quantitative exercise focuses on advanced economies as the paper's broader objective is to study the transition path of the United States and other advanced economies. We begin by describing the parameter choices and calibration procedure. We then examine impulse responses to the two main shocks in the model: a global financing shock and a market-sentiment shock. Finally, we document how the interest-expense ratio forecasts output growth, inflation, and changes in the primary surplus in the data, and show that the model reproduces the main empirical patterns.

4.1. Parameter Choices

We calibrate the model at an annual frequency. Table 3 reports the parameter values. The calibration combines standard values from the literature with parameters chosen to discipline the fiscal and sovereign-risk dimensions of the model.

Steady-state inflation is set to match the average inflation rate across the 20 advanced economies in our sample. The capital share, α, and depreciation rate, δ_k, are chosen to match the steady-state consumption-to-GDP and investment-to-GDP ratios, as well as their volatilities relative to output. These values are also broadly standard in the literature. The default-related productivity parameter, ζ, is set in line with the literature on sovereign default costs. The elasticity of substitution across varieties and the Rotemberg price adjustment cost parameter are calibrated to match inflation volatility and are consistent with standard annual-frequency values in the literature.

The steady-state discount factor for both the household and the government, $\bar{\beta}$, is pinned down by the sovereign bond-pricing conditions, equations (18) and (19), after setting the

Table 3: Calibration

This table provides the values of the calibrated parameters. The model is calibrated at an annual frequency for 20 advanced economies. All data are drawn from the World Bank, and we calibrate the parameters using data from 1960 to 2023.

Parameter	Description	Value
Production		
$\bar{\pi}$	steady-state inflation	1.048
α	capital share of production	0.2
δ_k	capital depreciation rate	0.1
ζ	default fraction of productivity	0.95
η	varieties elasticity	25
φ	price adjustment cost	75
χ	labor disutility	2.557
Discount rates		
β	household discount factor	0.961
β^f	global investor discount factor	0.972
Monetary policy		
ψ_1	inflation response in the interest rate rule	1.5
ψ_2	output response in the interest rate rule	0.3
Fiscal government		
δ	bond recovery rate	0.6
μ	mean of the market sentiment distribution	-0.2447
σ	volatility of the market sentiment distribution	0.07
ν	cyclicality of government spending	0.869
Shocks		
ρ_z	persistence of productivity	0.4708
σ_z	volatility of productivity	0.0146
ρ_b	persistence of discount factor	0.6
σ_b	volatility of discount factor	0.012
κ	mean reversion of global discount rate	0.2238
σ_r	diffusion volatility of global discount rate	0.011
ρ_m	persistence of monetary policy	0.8074
σ_m	volatility of monetary policy	0.0131

steady-state default probability to 0.001 and the debt-to-GDP ratio to 0.62 to match the data for advanced economies.

For calibration purposes, we specify the global discount factor through a stochastic pro-

Table 4: Aggregate Moments

This table reports moments implied by the estimated model economy and moments from the data. Second moments are computed using log-transformed variables. The model is calibrated at an annual frequency. Moments for developed and emerging economies are constructed from the World Development Indicators. Consumption is measured as expenditure by households and NPISH on goods and services for the direct satisfaction of human needs and wants, whether individual or collective. Investment is measured as acquisitions less disposals of produced assets for fixed capital formation, inventories, and valuables. Government spending is measured as general government final consumption expenditure, which includes government purchases of goods and services, compensation of employees, and most spending on national defense and security. All data are drawn from the World Bank, and we compute the moments using annual observations from 1960 to 2023. The sample consists of 20 advanced economies.

Parameter	Description	Model	Data
First moments			
b'/Y	debt-to-output ratio	0.6130	0.6240
Int/Rev	interest-to-revenue ratio	0.0800	0.0884
π	gross inflation	1.0483	1.0483
$1-\Phi_t$	default probability	0.0010	0.0009
Second moments			
$\sigma(b'/Y)/\sigma(Y)$	relative volatility of debt-to-output	7.0665	6.2753
$\sigma(\text{Int/Rev})/\sigma(Y)$	relative volatility of interest-to-revenue	8.4979	6.2404
$\sigma(C)/\sigma(Y)$	relative volatility of consumption	0.4960	1.0487
$\sigma(I)/\sigma(Y)$	relative volatility of investment	3.7042	3.4624
$\sigma(Y)$	volatility of output	0.0296	0.0230

cess for the implied discount rate:

$$r = r_{-1} + \kappa\left(\bar{r} - r_{-1}\right) + \sigma_r \varepsilon_r, \tag{25}$$

where

$$r = -\log \beta^f. \tag{26}$$

Here, $\bar{r} > 0$ denotes the long-run mean, $\kappa > 0$ governs the speed of mean reversion, $\sigma_r > 0$ controls conditional volatility, and ε_r follows a normal process. This specification ensures that the global discount factor remains strictly positive. Additional details on the calibration of the shock parameters are provided in Online Appendix B.5, which covers shocks to productivity, the household discount factor, global financial markets, and monetary policy.

The monetary policy parameters are estimated using post-1980 U.S. data, jointly with the persistence and volatility of monetary policy shocks. Similarly, the cyclicality of government spending is calibrated jointly with the persistence and volatility of government impatience

shocks. The bond recovery rate is calibrated to standard values in the literature and does not materially affect the results.

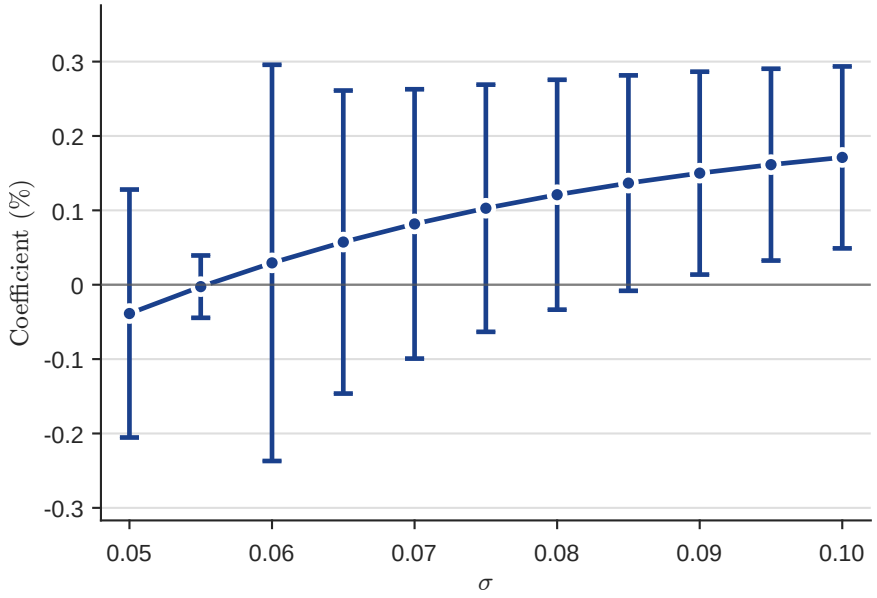


Figure 2: Model Simulated Default Probability and Int/Rev Coefficients. This figure plots coefficients from regressions of model-simulated default probability, $1 - \Phi_t$, on Int/Rev, for different values of σ. Coefficients are multiplied by 100 and reported in percent. Error bars denote one-standard-error bands.

We discipline the volatility of the rollover-risk distribution by matching the model-implied relationship between Int/Rev and next-period default risk to its empirical counterpart. In the data, as shown in Table B.5, a one-unit increase in lagged Int/Rev raises the predicted probability of a debt crisis by about 0.068 percentage points. Figure 2 reports the corresponding coefficients from regressions of model-simulated default probabilities on Int/Rev for different values of σ. Based on this exercise, we set $\sigma = 0.07$ in the baseline calibration. Given this value of σ, we choose the mean of the distribution to match a steady-state default probability of 0.001.

The aggregate moments reported in Table 4 match the main features of the advanced-economy sample reasonably well. Overall, the calibration captures the moments most relevant for analyzing how debt-service pressures shape macroeconomic outcomes.

4.2. Responses to Global Financing and Sentiment Shocks

With the model calibrated to the data, we now study the main shocks in a global financial market setting. We focus on two shocks that capture different mechanisms of sovereign default. The first is a global financing shock, which operates through the global interest rate and changes the government's borrowing cost directly. The second is a market-sentiment

shock, which changes lenders' sensitivity to government fundamentals and affects the penalty from additional borrowing.

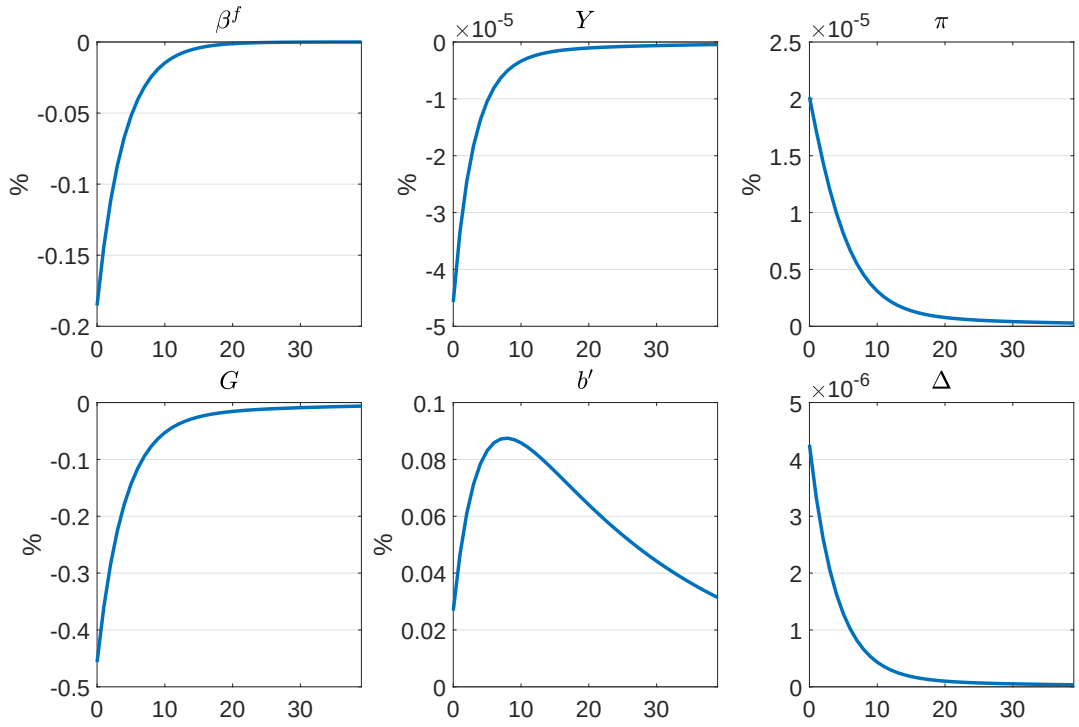


Figure 3: An Interest Rate Shock. This figure plots the effect of an unanticipated one-standard-deviation shock in global discount factor, β^f, on the key variables of the model.

First, we study a shock to the global discount factor, which can be interpreted as an external interest-rate shock. Figure 3 shows the response to an unexpected one-standard-deviation decline in the global discount factor, β_t^f. The shock lowers the government bond price and raises the sovereign spread, tightening borrowing conditions for the government. Since the tax rate is fixed here, the government cannot adjust through higher tax rates and instead cuts government spending sharply. Output falls, and inflation rises. Debt nevertheless increases. The reason is that the decline in β_t^f raises the effective cost of borrowing and increases the government's interest burden. Even with a large spending cut, the government must issue additional debt to satisfy its budget constraint. Overall, the shock generates a combination of fiscal austerity, higher inflation, and temporary debt accumulation.

We next study a different disturbance – a market-sentiment shock. Specifically, we consider a shock that increases the volatility of market sentiment toward government fundamentals, that is, a rise in σ. As shown in Figure 4, because we do not adjust μ to keep the default probability unchanged, global lenders price the bond less favorably, which is directly

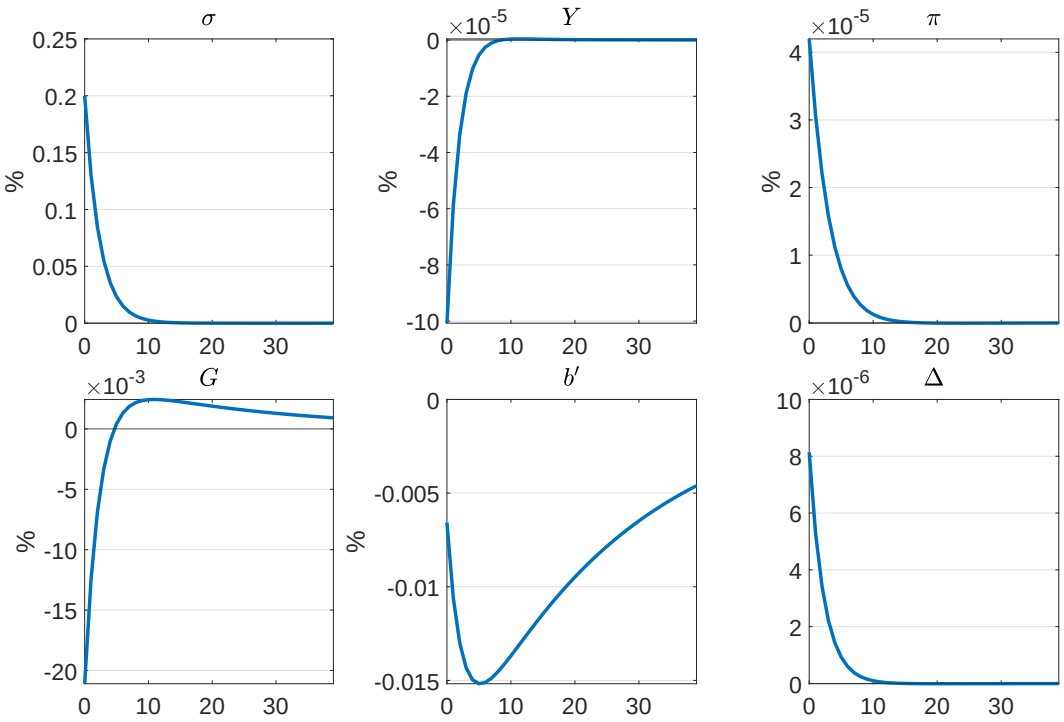


Figure 4: A Market Sentiment Shock. This figure plots the effect of an unanticipated one-standard-deviation shock in global market sentiment volatility, σ, on the key variables of the model.

reflected in a higher sovereign spread. The shock makes global lenders more sensitive to the government's borrowing position. In other words, it increases the marginal penalty from additional debt issuance. As a result, both government spending and debt decline. On the private-sector side, output falls and inflation rises. This response resembles a sudden-stop episode, in which bondholders lose confidence in the sovereign and the government is forced to reduce borrowing.

These two shocks illustrate why the interest-to-revenue ratio contains more information about the government's fiscal condition than the debt-to-GDP ratio. In Figure 5, we plot the responses of output, Int/Rev, and b'/Y together for the two shocks. For visibility, we use normalized responses, where each variable is first expressed as a percent deviation from its steady state and then normalized by its own peak absolute response over the plotted horizon. For both shocks, a higher Int/Rev is associated with lower output. The relation between b'/Y and output varies between the two panels. Under the global discount factor shock in the left panel, b'/Y and output both rise on impact, although output quickly declines afterward. Under the market-sentiment shock in the right panel, b'/Y falls together with output. This

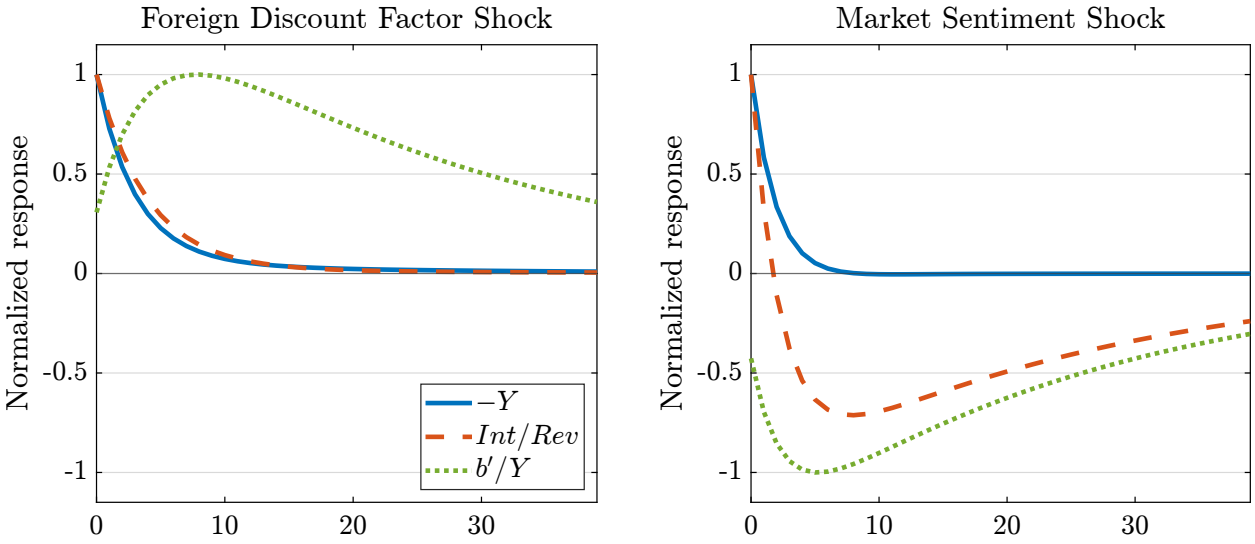


Figure 5: Shocks Impact on Output. This figure plots the effects of unanticipated one-standard-deviation shocks to the global discount factor, β^f in the left panel, and to market sentiment volatility, σ in the right panel. The responses shown are inverse output, $-Y$ (blue solid line), the interest-to-revenue ratio, Int/Rev (red dashed line), and the debt-to-GDP ratio, b'/Y (green dotted line). Each variable is first computed as a percent deviation from its steady state and is then normalized by its own peak absolute response over the 40-period horizon.

shows that debt-to-GDP can move differently depending on the shock, and Int/Rev gives a more consistent signal of fiscal stress.

4.3. Debt Dynamics

In this subsection, we study how the interest-expense ratio forecasts output growth, inflation, and fiscal adjustment. In the model, Int/Rev is computed as the interest burden ι_t defined in Equation (15). We first document these relations in the data. Then, we use our model to simulate the economy and examine if it reproduces the empirical patterns. We estimate panel regressions

$$\Upsilon_{it+\tau} = \alpha_\tau^\Upsilon + \beta_\tau^\Upsilon (Int/Rev)_{it} + \lambda_i + u_{it+\tau}^\Upsilon, \tag{27}$$

where $\Upsilon_{i,t+\tau}$ denotes GDP growth $\Delta_\tau y_{i,t+\tau}$, inflation $\pi_{i,t+\tau}$, or fiscal adjustment $\Delta_\tau p_{i,t+\tau}$. λ_i denotes country fixed effects. We then run the same regressions on simulated data from the model using Monte Carlo simulation. In each Monte Carlo replication, we simulate 300 periods, discard the first 200 as burn-in, and estimate the regressions using the remaining 100 observations. We repeat this procedure 1,000 times and report the average coefficients, t-statistics, and R^2 values across replications.

Table 5 shows that the model captures the main empirical relations. On the empirical side, Panel A shows that higher interest burdens predict lower future GDP growth. A

Table 5: GDP, Inflation, Primary Surplus, and Int/Rev

This table reports regressions in which the dependent variable is cumulative GDP growth, $\Delta_\tau y_{i,t+\tau}$, in Panel A, cumulative inflation, $\pi_{i,t+\tau}$, in Panel B, and the cumulative change in the cyclically adjusted primary surplus balance, $\Delta p_{i,t+\tau}$, in Panel C. Columns (1)–(3) report results for the data sample that includes 20 advanced economies. The sample period is 1950–2023 for Panels A and B, and 1990–2023 for Panel C. Columns (4)–(6) report simulated results from our model. We apply Monte Carlo simulations. In each replication, we simulate 300 periods, discard the first 200 periods as burn-in, and use the remaining 100 periods for estimation. The independent variable for all regressions is the interest-to-revenue ratio (Int/Rev) observed in year t. t-statistics are reported in parentheses. Regression R^2-statistics are reported at the bottom. Statistics are averages across 1,000 simulation replications for model simulation.

Panel A: GDP

	Data			Model		
	(1)	(2)	(3)	(4)	(5)	(6)
	$\Delta_1 y_{it+1}$	$\Delta_3 y_{it+3}$	$\Delta_5 y_{it+5}$	$\Delta_1 y_{t+1}$	$\Delta_3 y_{t+3}$	$\Delta_5 y_{t+5}$
Int/Rev	-0.0819	-0.249	-0.429	-0.252	-0.481	-0.482
	(-4.748)	(-6.075)	(-6.494)	(-2.860)	(-2.201)	(-1.536)
Country FEs	✓	✓	✓			
R^2	0.0407	0.0741	0.0926	0.0934	0.0761	0.0646
Observations	1456	1416	1376	99	97	95

Panel B: Inflation

	Data			Model		
	(1)	(2)	(3)	(4)	(5)	(6)
	$\Delta_1 \pi_{it+1}$	$\Delta_3 \pi_{it+3}$	$\Delta_5 \pi_{it+5}$	$\Delta_1 \pi_{t+1}$	$\Delta_3 \pi_{t+3}$	$\Delta_5 \pi_{t+5}$
Int/Rev	0.0217	-0.0758	-0.470	-0.504	-0.976	-0.982
	(0.837)	(-0.923)	(-3.003)	(-3.244)	(-2.373)	(-1.601)
Country FEs	✓	✓	✓			
R^2	0.0766	0.107	0.129	0.114	0.0828	0.0645
Observations	1456	1416	1376	99	97	95

Panel C: Primary Surplus

	Data			Model		
	(1)	(2)	(3)	(4)	(5)	(6)
	$\Delta_1 p_{it+1}$	$\Delta_3 p_{it+3}$	$\Delta_5 p_{it+5}$	$\Delta_1 p_{t+1}$	$\Delta_3 p_{t+3}$	$\Delta_5 p_{t+5}$
Int/Rev	0.0726	0.205	0.283	0.153	0.599	1.127
	(4.369)	(6.777)	(7.605)	(3.013)	(4.613)	(5.958)
Country FEs	✓	✓	✓			
R^2	0.0397	0.0964	0.131	0.106	0.194	0.276
Observations	598	558	518	99	97	95

one-percentage-point increase in interest expense lowers GDP growth by 8 basis points after one year and lowers five-year cumulative growth by 43 basis points. Panel B shows that higher interest burdens also predict lower future inflation. The short-run coefficient is small and statistically insignificant, but the effect becomes larger over longer horizons. At the five-year horizon, the coefficient is -0.47, implying that a one-percentage-point increase in Int/Rev lowers cumulative inflation by roughly one-half percentage point. Panel C shows that governments respond to higher interest burdens by raising primary surpluses. A one-percentage-point increase in Int/Rev raises the cyclically adjusted primary surplus by 0.07 percentage points after one year, 0.21 percentage points after three years, and 0.28 percentage points after five years. The model generates the same qualitative patterns. Higher interest burdens are associated with weaker output growth, lower inflation, and stronger fiscal adjustment.

The inflation results reported in the predictive regressions and those obtained along the transition answer different questions. The predictive regressions describe average historical responses to periods of elevated financing pressure, whereas the transition experiment studies an anticipated and persistent fiscal expansion. Because the underlying shocks differ, the inflation responses need not coincide.

5. Impact of Persistent Fiscal Pressures with Endogenous Debt Pricing

In this section, we use our model to understand how the U.S. economy might transition to a permanently higher-spending regime under alternative scenarios. The experiment is set up as follows. In line with the current state and projections for the U.S economy, we start our experiment assuming an initial crisis probability of 0.01% and set steady-state inflation to 2%.

Government spending starts at 20% of GDP and debt is 100% of GDP. We assume that government spending increases linearly by five percentage points to a new steady-state over 10 years.

Government accumulates debt up to 150% of GDP to finance the increase in spending before any tax adjustments take effect. We assume these will follow the tax rule

$$\tau_t = \bar{\tau} \exp\left[\phi_b \log\left(\frac{b_t}{\overline{b}}\right)\right], \tag{28}$$

where $\bar{\tau}$ is the steady-state tax rate, $\overline{b}$ is the steady-state debt level, and ϕ_b is the tax adjustment parameter. This tax rule is related to the more detailed specification in Elenev, Landvoigt and Van Nieuwerburgh (2026). Given the terminal values for spending and debt,

we pin down the long-run tax rate as the value that closes the government budget constraint in the new steady state.[9]

We treat the spending path and terminal debt target as an announced fiscal plan and solve for the equilibrium transition under the model's private-sector and bond-pricing conditions. Throughout the experiment, all non-fiscal structural parameters are held fixed at their calibrated values, which are disciplined using data from 20 developed economies in Section 4.

Finally, we define the cumulative default probability as

$$D(t) = 1 - \prod_{j=1}^{t} \Phi(s_j). \tag{29}$$

5.1. Baseline Estimates

Figure 6 summarizes the implied transition for our baseline parameterizations. An increase in government spending is initially expansionary. During the first ten periods, output rises while inflation falls. As spending continues to increase, however, the government finances the larger fiscal burden through a combination of additional debt issuance and higher taxes. Default probability begins to rise, and the associated increase in default risk lowers effective productivity through the output costs of sovereign distress. Output then falls, eroding the tax base. This forces the government to raise taxes further, which depresses economic activity even more. Output falls by 1.2%, and inflation rises from 2% to 2.7% in the long run.

We then examine three alternative scenarios. First, we study how the transition depends on the volatility of the market-sentiment distribution. Second, we examine the role of weaker monetary institutions. Third, we consider a lower long-run debt-to-GDP ratio, setting terminal debt at 130 percent of GDP rather than 150 percent. We discuss each scenario in detail below.

5.2. The Role of the Market Sentiment

To start off, we study the role of market pricing in shaping the transition to a higher-spending regime. The motivation is simple. Fiscal capacity is not determined only by the path of spending, taxes, and debt. It also depends on how investors price that path. Two economies can have nearly identical debt-to-GDP ratios, but face very different borrowing conditions and default risk if markets sentiment differs.

In the model, this market-pricing channel is summarized by the distribution $\Phi(\cdot)$. We parameterize this distribution as normal, with mean μ and standard deviation σ. For each

[9] Formally, $\phi_b = \frac{\log(\tau_{\text{end}}) - \log(\tau_{\text{initial}})}{\log(b_{\text{end}}) - \log(b_{\text{initial}})}$.

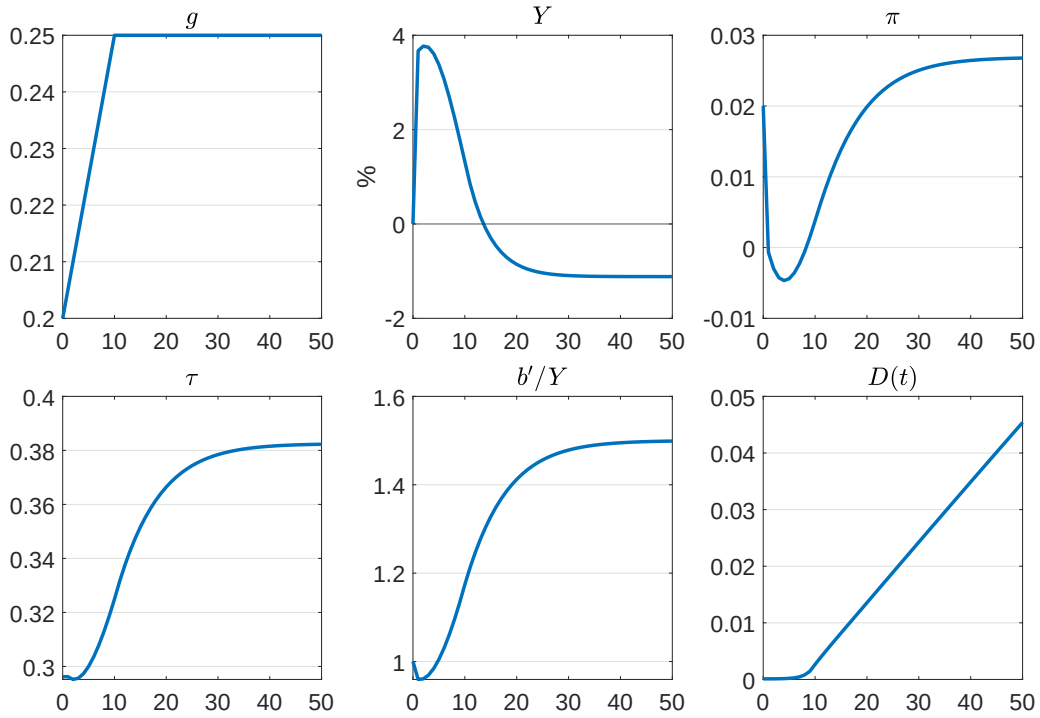


Figure 6: Transition Path. This figure plots the economy's transition under an announced path for the government spending share, g, from its initial steady-state value 20% of GDP to higher long-run levels 25% of GDP. Agents are perfectly informed about the full transition path. The panels show the responses of output (top middle), inflation (top right), the labor tax rate (bottom left), debt-to-GDP (bottom middle), and cumulative default risk (bottom right). Output and debt-to-GDP are reported as percentage deviations from the initial steady state. All other variables are reported in levels.

value of σ, we choose μ so that the initial steady state features the same default probability, approximately 0.01 percent. Hence, all three economies start from the same steady-state default probability and bond price, i.e., the same fundamentals. What differs is how sensitive market prices are to deviations from the steady state. This setting is different from the market sentiment shock in Figure 4.

Figure 7 compares the three economies. The solid blue line represents the baseline economy with $\sigma = 0.07$. We then gradually reduce σ to 0.05, as the dashed red line, and to 0.03, as the dotted green line. The spending path and the long-run debt target are held fixed across the three scenarios. Under this setup, the debt-to-GDP paths are nearly identical. This is precisely the point of this experiment that even though the debt level is the same, the default probability could be very different. In the last panel, cumulative default risk more than triples when we move from $\sigma = 0.07$ to $\sigma = 0.03$.

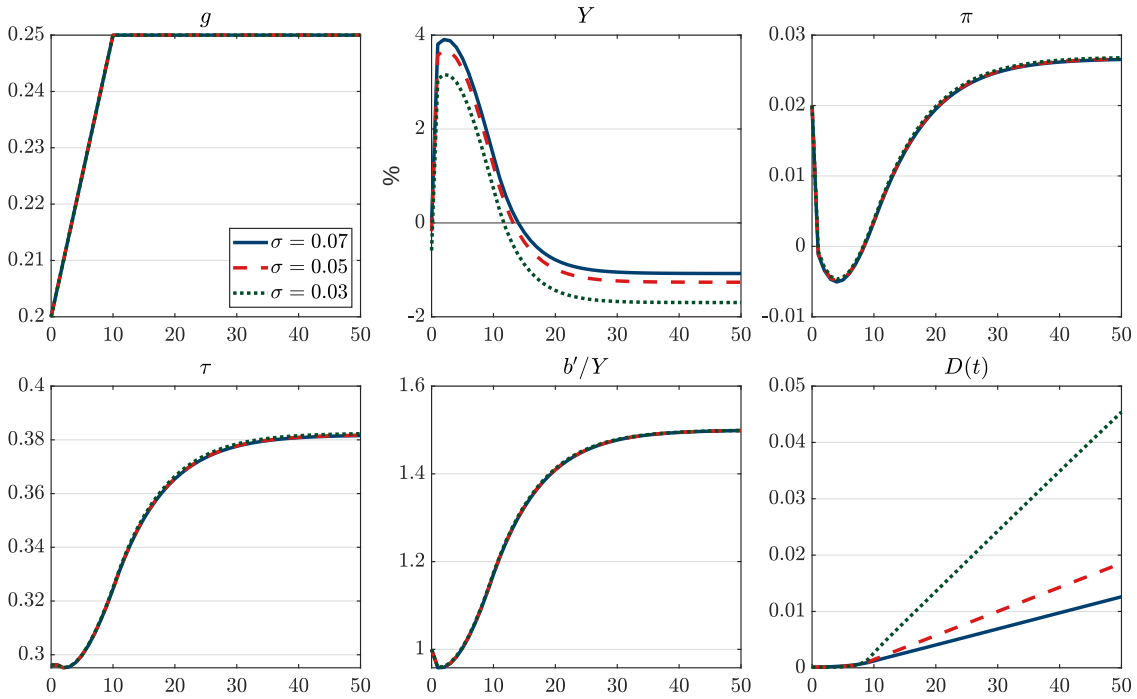


Figure 7: Transition Path and Market Volatility. This figure plots the economy's transition under an announced path for the government spending share, g, from its initial steady-state value of 20% of GDP to a higher long-run level of 25% of GDP. Agents are perfectly informed about the full transition path. The panels show the responses of output (top middle), inflation (top right), the labor tax rate (bottom left), debt-to-GDP (bottom middle), and cumulative default risk (bottom right). Output and debt-to-GDP are reported as percentage deviations from the initial steady state. All other variables are reported in levels. The solid blue line corresponds to $\sigma = 0.07$, the dashed red line corresponds to $\sigma = 0.05$, and the dotted green line corresponds to $\sigma = 0.03$.

Here, a lower value of σ makes the distribution tighter around its mean. Since μ is recalibrated to keep the initial default probability fixed, a decline in fiscal fundamentals away from the steady state moves the economy more quickly into the tail of the distribution. A low-σ market is not necessarily riskier at the initial steady state; rather, it is less forgiving once debt begins to rise. Small changes in fiscal fundamentals generate larger changes in default probabilities and bond prices.

Subsequently, these differences in default probability feed back into the government budget constraint through the bond-pricing equation. When markets assign a higher probability of default, bond prices fall, financing becomes more expensive, and the government must adjust more through taxes to pay for the higher interest expenses. Private allocations also respond. Output and inflation move only modestly across the three cases, but the direction is consistent with the fiscal-risk channel that higher default premia tighten the government's

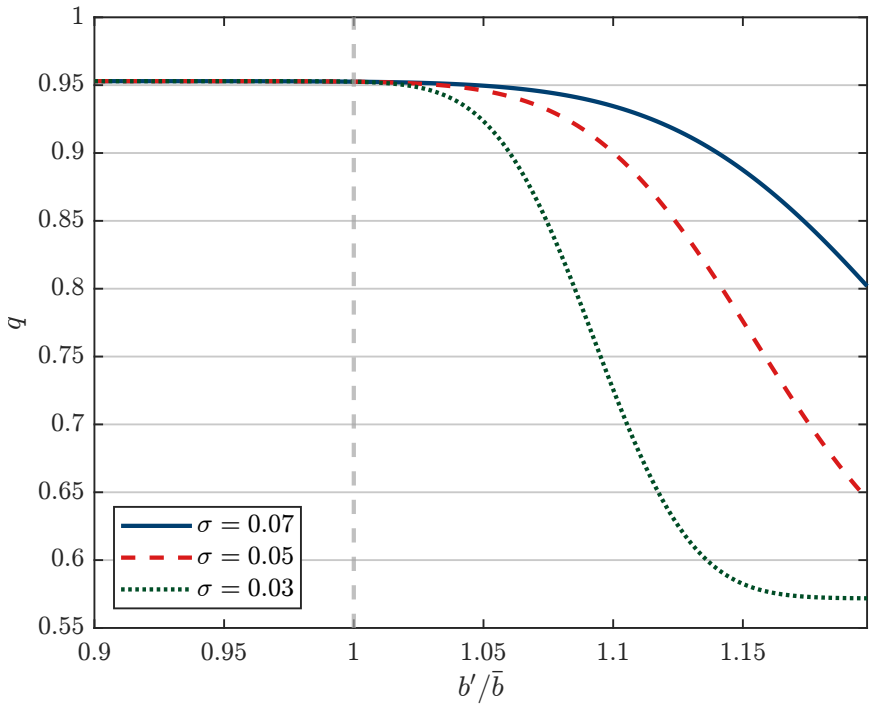


Figure 8: Bond Prices and Debt. The figure plots the bond price q against next-period debt normalized by steady-state debt, $b'/\bar{b}$, for different values of σ, holding all other variables at their steady-state values. The vertical dashed line marks $b'/\bar{b} = 1$. The solid blue line corresponds to $\sigma = 0.07$, the dashed red line corresponds to $\sigma = 0.05$, and the dotted green line corresponds to $\sigma = 0.03$.

financing conditions and alter the path of fiscal adjustment.

To make the mechanism more transparent, Figure 8 plots the bond-price schedules against next-period debt normalized by steady-state debt, $b'/\bar{b}$. The schedules are identical around $b'/\bar{b} = 1$. Then, away from the steady state, the schedules separate substantially. For $b'/\bar{b} > 1$, the lower-σ schedules fall more steeply, meaning that the same increase in debt produces a larger decline in the bond price. This nonlinear repricing of debt is what generates the large differences in cumulative default risk in Figure 7.

5.3. The Role of Monetary Independence

We next study how monetary institutions shape the transition. This exercise is motivated by a large literature on monetary-fiscal interactions.[10] It is also related to the debate over central bank independence. When fiscal pressures are modest, an independent central bank

[10]In classic work, Sargent and Wallace (1981) show that monetary policy may lose control over inflation when fiscal policy is not backed by sufficient future surpluses. Similarly, Leeper (1991) distinguishes between active and passive monetary-fiscal regimes, and Woodford (2001) argues that price stability requires not only an appropriate monetary rule but also fiscal backing. More recent work, such as Schreger et al. (2024) and Arellano et al. (2026), also emphasizes that monetary credibility can affect fiscal capacity by changing the real value of debt, borrowing incentives, and expectations about future inflation and default risk.

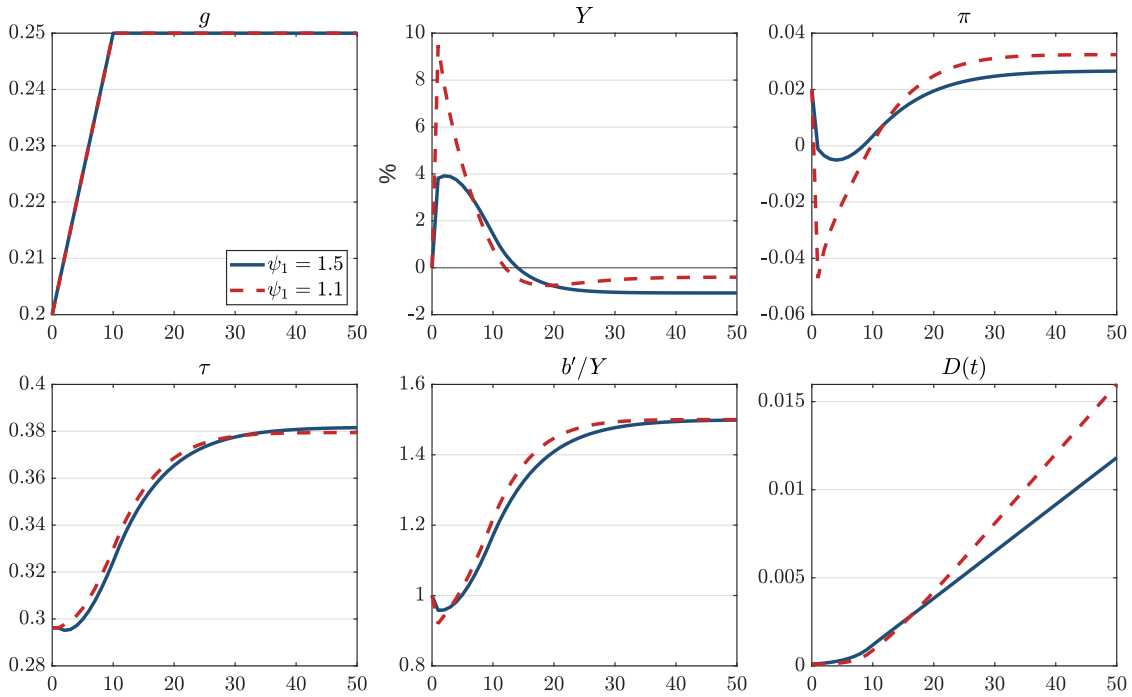


Figure 9: Transition Path and Monetary Independence. This figure plots the economy's transition under an announced path for the government spending share, g, from its initial steady-state value of 20% of GDP to a higher long-run level of 25% of GDP. Agents are perfectly informed about the full transition path. The panels show the responses of output (top middle), inflation (top right), the labor tax rate (bottom left), debt-to-GDP (bottom middle), and cumulative default risk (bottom right). Output and debt-to-GDP are reported as percentage deviations from the initial steady state. All other variables are reported in levels. The solid blue line represents $\psi_1 = 1.5$, and the dashed red line represents $\psi_1 = 1.1$.

can typically focus on inflation stabilization without directly confronting the government's financing needs.

Figure 9 compares the transition paths under two monetary-policy regimes. The solid blue line corresponds to the baseline Taylor-rule coefficient, $\psi_1 = 1.5$, and the dashed red line corresponds to a weaker monetary institution, $\psi_1 = 1.1$. The government-spending path is the same in both cases, rising from 20 percent to 25 percent of GDP, and agents are fully informed about the full transition path.

The weaker monetary-policy regime generates a more pronounced short-run expansion in output. Because monetary policy responds less aggressively to inflation, the initial fiscal expansion is more strongly accommodated, producing a larger boom in activity. At the same time, inflation becomes more volatile and eventually rises above the baseline path. Debt-to-GDP rises somewhat faster under the weaker monetary regime, and cumulative default risk is higher throughout the transition. A more accommodating monetary institution relaxes

the near-term financing pressure created by higher spending, but it does so by allowing more inflation risk and greater debt accumulation. Markets internalize this future path. As a result, the same spending commitment is associated with a higher perceived probability of default when monetary policy is less effective at anchoring inflation and disciplining fiscal behavior.

5.4. The Role of Taxes

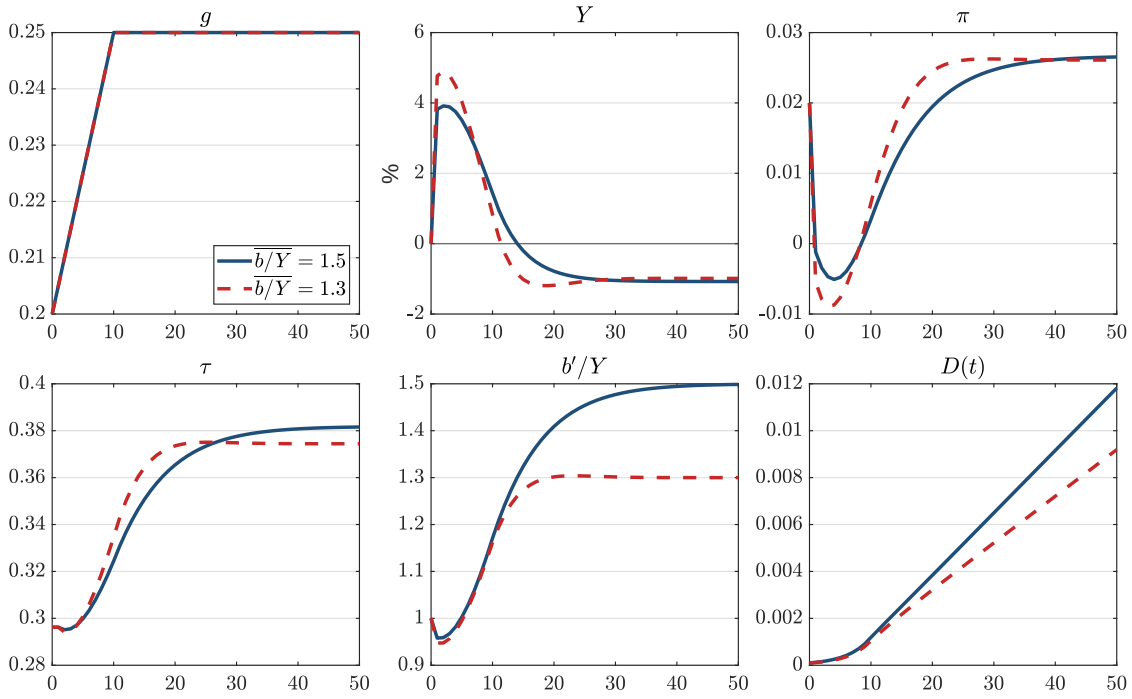


Figure 10: Transition Path and Target Debt Accumulation. This figure plots the economy's transition under an announced path for the government spending share, g, from its initial steady-state value of 20% of GDP to a higher long-run level of 25% of GDP. Agents are perfectly informed about the full transition path. The panels show the responses of output (top middle), inflation (top right), the labor tax rate (bottom left), debt-to-GDP (bottom middle), and cumulative default risk (bottom right). Output and debt-to-GDP are reported as percentage deviations from the initial steady state. All other variables are reported in levels. The solid blue line represents $\overline{b/Y} = 1.5$, and the dashed red line represents $\overline{b/Y} = 1.3$.

Lastly, we study how the target debt accumulation changes the transition dynamics.[11] Essentially, we ask what happens when the government accommodates the increase in spending with less long-run debt accumulation. Figure 10 plots the transition paths under two

[11]Note that debt accumulation and tax changes go hand in hand in our experiment. Hence, differences in debt accumulation largely reflect differences in the tax rules.

scenarios. The solid blue line corresponds to the higher debt target, with $\overline{b/Y} = 1.5$, and the dashed red line corresponds to the tighter debt target, with $\overline{b/Y} = 1.3$.

Lower debt accumulation limits the long-run increase in debt and cumulative default risk, as given by the setup, but it requires taxes to rise more quickly during the transition. Output shows larger swings initially, but its eventual decline is smaller than under a higher debt ceiling. Inflation behaves similarly that it fluctuates more early in the transition but is slightly lower in the terminal state. A higher debt level allows the government to smooth tax adjustment over time.

6. Bond Prices and Fiscal Space

When government debt is risk-free, an additional unit of promised debt raises current resources one-for-one at the risk-free price. With endogenous rollover risk, additional issuance also changes the price at which the debt is sold. This distinction is central for fiscal sustainability. To see this, note that the marginal financing value of debt is

$$\frac{\partial(q_t b_{t+1})}{\partial b_{t+1}} = q_t + b_{t+1}\frac{\partial q_t}{\partial b_{t+1}}. \tag{30}$$

Because the bond price falls when additional issuance weakens debt-service capacity, this marginal value is below the bond price itself. In highly fragile states, a larger face value of debt may generate little additional current revenue because investors demand a lower price. This is the mechanism through which endogenous debt pricing tightens fiscal space.

The bond-price schedule also explains why debt-to-GDP is not a sufficient statistic for fiscal risk. Two economies can issue the same amount of debt and have similar debt-to-GDP ratios, but face different fiscal risks if investors price marginal borrowing differently. In one economy, the bond-price schedule may be relatively flat, so additional debt raises financing resources with little effect on rollover risk. In another, the schedule may be steep, so the same increase in debt sharply lowers the bond price, raises debt-service costs, and reduces market access.

To connect the model to conventional asset-pricing measures, we compute the default-risk spread implied by the price of a risky long-term zero-coupon bond. Let q_t^{30} denote the model-implied price of a 30-period zero-coupon claim, and let $q_t^{30,\mathrm{rf}}$ denote the corresponding risk-free price. We define the annualized spread as

$$\Delta_t^{30} = \left(\frac{1}{q_t^{30}}\right)^{1/30} - \left(\frac{1}{q_t^{30,\mathrm{rf}}}\right)^{1/30}.$$

Along the transition path, the risky bond price reflects cumulative rollover risk:

$$q_t^{30} = \frac{\prod_{j=0}^{29}\beta_{t+j}^f}{\prod_{j=1}^{30}\pi_{t+j}}\left[1-(1-\delta)\left(1-\prod_{j=1}^{30}\Phi(s_{t+j})\right)\right],$$

while the corresponding risk-free price is

$$q_t^{30,\mathrm{rf}} = \frac{\prod_{j=0}^{29} \beta_{t+j}^f}{\prod_{j=1}^{30} \pi_{t+j}}.$$

The term $\prod_{j=1}^{30} \Phi(s_{t+j})$ is the probability that the government retains market access throughout the life of the bond, computed along the equilibrium transition path. The recovery parameter δ determines the payoff in rollover-failure states.

In the baseline calibration with $\sigma = 0.07$, the model implies a 30-period default-risk spread of 0.95 basis points. When $\sigma = 0.03$, the implied spread rises to 3.37 basis points. These spreads are small relative to the level of long-term Treasury yields, but that comparison is not the relevant benchmark.

The small level of the default-risk spread is consistent with the interpretation of the model as an advanced-economy fiscal-risk framework. The gradual deterioration in fiscal space makes default or rollover failure increasingly priced in. The slope of the bond-price schedule means additional borrowing raises less current revenue per unit of future repayment. That price feedback increases the resources required to finance a given spending path, raises future tax needs, and amplifies the effects of fiscal expansions on output, inflation, and rollover risk.

This distinction also clarifies the role of the market sentiment. Changes in σ do not simply change the level of spreads. They change how quickly bond prices respond to deteriorating fiscal capacity. A lower value of σ makes the bond-price schedule steeper around the relevant region of the state space. As a result, two economies with nearly identical debt paths can face different debt-service burdens and different cumulative rollover risks.

7. Conclusion

This paper studies fiscal sustainability when government debt is priced endogenously. The central message is that debt-to-GDP alone is an incomplete measure of fiscal vulnerability. Fiscal sustainability depends not only on the amount of debt outstanding but also on the cost of refinancing that debt relative to the government's fiscal capacity.

We motivate this idea by showing that the interest-expense-to-revenue ratio is a substantially better predictor of fiscal crises than debt-to-GDP. We then develop a New Keynesian model in which sovereign bond prices, fiscal policy, and monetary policy jointly determine debt-service costs and fiscal capacity. The model provides a structural interpretation for the empirical evidence and explains why debt-service burdens contain information that debt stocks alone do not.

Our quantitative analysis shows that a persistent increase in government spending can produce a long period of apparently sustainable debt accumulation before fiscal pressures

become increasingly costly. As debt-service costs rise, fiscal space contracts, taxes increase, output declines, inflation rises, and rollover risk gradually increases. Fiscal deterioration therefore need not emerge through an abrupt crisis; it can develop slowly as financial markets become less willing to finance additional borrowing on favorable terms.

The analysis also highlights the importance of policy and market expectations. Monetary policy, the timing of fiscal adjustment, and investor sentiment all influence fiscal sustainability because they affect the terms on which governments refinance their debt. As a result, economies with similar debt-to-GDP ratios can face very different fiscal risks.

Debt alone does not determine fiscal sustainability. Fiscal sustainability is an equilibrium outcome determined jointly by debt-service costs, fiscal capacity, and the price at which governments refinance their obligations.

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Appendix

A.1. Data and Summary Statistics

Table A.1: Summary Statistics

This table reports summary statistics for the central government interest-expense-to-revenue, $(Int/Rev)_t$, the central government debt-to-GDP, $(b/Y)_t$, cumulative GDP growth, $\Delta_1 y_{t+1}$, cumulative inflation, π_{t+1}, and cyclically adjusted primary surplus changes, $\Delta_1 p_{t+1}$. Our sample runs from 1950 to 2023, except for cyclically adjusted primary surplus changes, which are available from 1990 to 2023. We obtain the data from the World Bank, the Penn World Table, the IMF, and the Reinhart and Rogoff databases. Additional details on data construction are provided in the Appendix.

	Developed				Emerging			
	N	Mean	Median	Std. dev.	N	Mean	Median	Std. dev.
$(Int/Rev)_t$	1459	7.95	6.59	5.62	1151	12.67	9.45	12.29
$(b/Y)_t$	1474	55.27	45.20	77.63	1271	37.03	31.68	28.42
$\Delta_1 y_{t+1}$	1460	3.12	2.98	3.11	1458	4.32	4.79	4.99
π_{t+1}	1460	4.65	3.16	4.77	1453	14.39	8.14	15.93
$\Delta_1 p_{t+1}$	598	-0.02	0.02	1.74	427	-0.09	-0.03	1.55

We construct an unbalanced panel of country-level fiscal and macroeconomic variables for 40 economies—20 developed and 20 emerging—using data from the World Bank, the IMF, the Penn World Table, and Reinhart and Rogoff. The sample spans 1950 to 2023, allowing us to exploit a long postwar period while avoiding wartime distortions.

Table A.1 reports summary statistics for the main variables. The first two rows show the interest-expense-to-revenue ratio, $(Int/Rev)_t$, and the debt-to-GDP ratio, $(b/Y)_t$, where revenue and debt refer to the central government. When central government debt data are unavailable, we impute them using the growth rate of general government debt. Appendix A.2 provides full details on data construction.

Advanced economies carry higher debt on average—about 55 percent of GDP—but face relatively modest interest burdens, with interest payments averaging 8 percent of revenue. Emerging economies, in contrast, have lower debt levels (around 37 percent of GDP) but substantially higher servicing costs, with interest expenses averaging 13 percent of revenue. The dispersion of these measures also differs across groups: debt ratios vary widely among advanced economies, whereas in emerging markets interest burdens are much more volatile, consistent with greater heterogeneity in borrowing conditions and policy credibility.

We also construct macroeconomic outcome variables to characterize how economies evolve under different debt burdens. Specifically, we measure cumulative GDP growth, inflation, and changes in cyclically adjusted primary surpluses. Definitions are provided in Appendix A.2. At a descriptive level, emerging economies exhibit higher average growth and inflation than developed economies, patterns that we return to in the empirical analysis.

A.2. Data Construction

We compute real GDP growth using three data sources: the World Bank, the Penn World Table, and the Maddison Project Database. Growth rates are first calculated within each source individually. We then merge the three datasets, prioritizing data from the World Bank, followed by the Penn World Table, and finally the Maddison Project Database. Similarly, we compute inflation using four data sources: the World Bank, the IMF, the Reinhart and Rogoff dataset, and the Penn World Table. As with the real GDP growth calculation, we first calculate inflation within each dataset and then merge the results. We prioritize data from the World Bank, followed by the IMF, the Reinhart and Rogoff dataset, and finally the Penn World Table.

Consistent with our real GDP growth data, we obtain the interest-expense–to-revenue ratio from the World Bank. Interest payments include payments on government debt, including long-term bonds, loans, and other debt instruments. The World Bank data cover the period from 1972 to 2023. To extend the series back to the 18th century, we construct historical estimates using the IMF Public Finances in Modern History dataset. Specifically, we use interest payments on public debt as a share of GDP (Int/GDP) divided by government revenue as a share of GDP (Rev/GDP) to compute the interest-expense–to–revenue ratio.

We measure country i's τ-year-ahead cumulative GDP growth in year t as

$$\Delta_\tau y_{it+\tau} = \frac{y_{it+\tau} - y_{it}}{y_{it}}, \tag{A.1}$$

where y_{it} represents country i's real GDP at time t. We combine data from the World Bank, the Penn World Table, and the Maddison Project Database to calculate real GDP growth. Growth rates are first computed within each source and then merged across different sources. Likewise, we define τ-year-ahead cumulative inflation for country i at time t as

$$\pi_{it+\tau} = \frac{p_{it+\tau} - p_{it}}{p_{it}}, \tag{A.2}$$

where p_{it} denotes country i's GDP deflator in year t. Inflation data come from the World Bank, Reinhart and Rogoff, and the IMF. We merge these datasets into a single composite series. We provide details on data merging and the construction process in the Appendix.

On the fiscal side, we track structural adjustments in government budgets by measuring the change in the cyclically adjusted primary surplus:

$$\Delta_\tau p_{it+\tau} = (ps/y)_{it+\tau} - (ps/y)_{it}, \tag{A.3}$$

where $(ps/y)_{it}$ denotes country i's cyclically adjusted primary balance to GDP ratio at time t. We obtain these data from the IMF Fiscal Monitor, and they are available from 1990 onward. This measure captures structural changes in surpluses rather than business-cycle-

induced fluctuations in revenue or spending.[12]

[12]The primary balance, by definition, is the net lending/net borrowing excluding interest expense or net interest expense. With cyclical adjustment, we strip out the impact of cyclical movements in revenue and expenditures.

Online Appendix

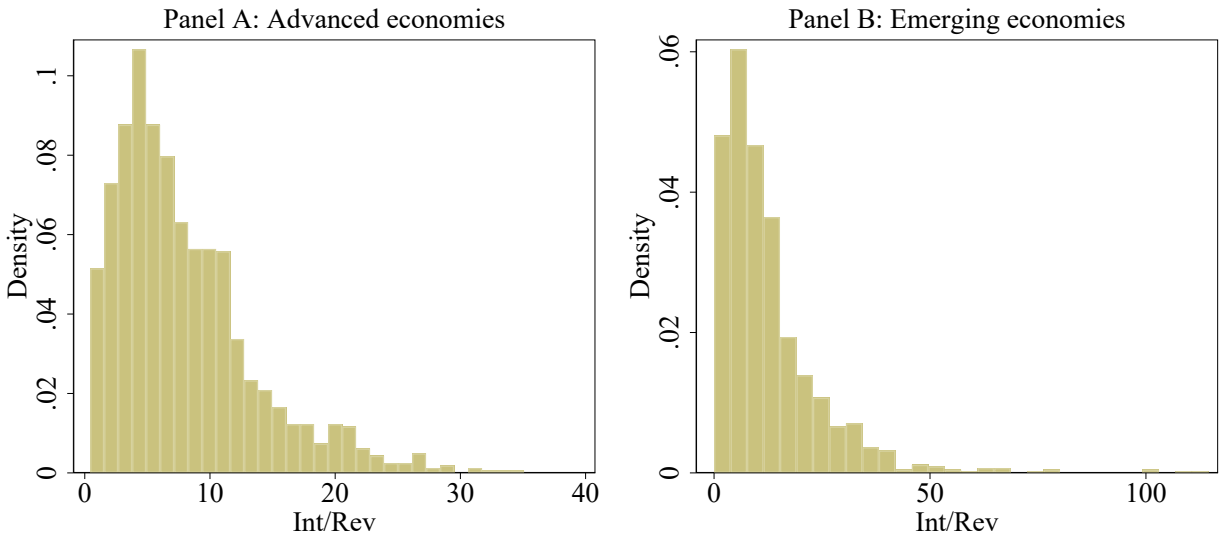


Figure B.1. Histogram of Int/Rev. Panel A shows the histogram of Int/Rev for developed economies. Panel B shows the histogram of Int/Rev for emerging economies. The sample covers the period from 1950 to 2023.

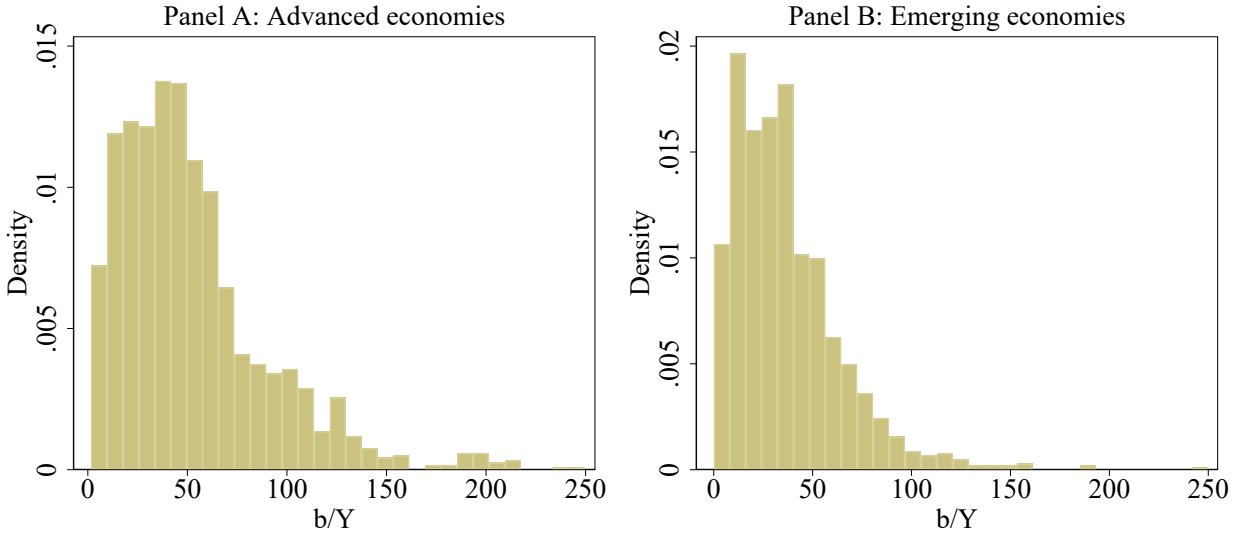


Figure B.2. Histogram of b/Y. Panel A shows the histogram of b/Y for developed economies. Panel B shows the histogram of b/Y for emerging economies. The sample covers the period from 1950 to 2023. We exclude observations for Spain in 1970 and 1971 and Venezuela in 2020, as these observations are extreme outliers with b/Y ratios exceeding 300 percent.

Table B.1
Consumption Crises

This table reports consumption crisis episodes for both advanced and emerging economies in our sample. We define consumption crises as years in which annual per capita growth falls below -5%. For each country, we report the number of consumption crises, the average size of crises (in percent), and the specific years in which the crises occurred.

Country	Number of years	Average size of contraction	Year
Panel A: Advanced Economies			
Austria	1	6.40	2020
Belgium	1	5.67	2020
Denmark	1	5.68	2022
France	1	6.30	2020
Greece	3	7.06	2010–2012
Ireland	3	6.84	1982, 2009, 2015
Italy	1	8.24	2020
New Zealand	3	6.00	1967, 1976, 1991
Norway	3	10.86	2000, 2021–2022
Portugal	1	6.34	2020
Spain	1	9.35	2020
Sweden	1	5.07	1951
United Kingdom	1	11.92	2020
Panel B: Emerging Economies			
Argentina	11	8.63	1961, 1975–1976, 1985, 1988–1989, 1995, 2001–2002, 2019–2020
Bolivia	5	7.07	1964, 1974, 1980, 1983, 2020
Brazil	5	12.95	1963, 1965, 1981, 1988, 2020
Chile	4	12.52	1974, 1982–1983, 2020
China	2	6.33	1959, 1961
Colombia	4	6.05	1956–1957, 1999, 2020
Egypt	5	6.14	1965–1966, 1974, 1987, 1993
India	3	6.59	1968, 1975, 2020
Indonesia	3	6.37	1965, 1987, 1998
Korea	1	8.69	1998
Malaysia	2	11.38	1987, 1998
Mexico	6	7.87	1982–1983, 1987, 1995, 2009, 2020
Nigeria	10	14.80	1967, 1981, 1986, 1989, 1999–2000, 2006, 2012, 2020–2021
Peru	7	11.59	1978–1979, 1983, 1988–1990, 2020
Philippines	2	9.57	1970, 2020
South Africa	2	6.68	1985, 2020
Thailand	1	9.32	1998
Turkey	4	7.08	1981, 1988, 1994, 2001
Uruguay	5	9.85	1961, 1982–1983, 2002, 2020
Venezuela	18	13.51	1974, 1979–1980, 1983–1984, 1987, 1989, 1994, 1996, 1999–2000, 2002–2003, 2010, 2016–2019

Table B.2
GDP Crisis

This table reports GDP crisis episodes for both advanced and emerging economies in our sample. We define GDP crises as years in which annual per capita growth falls below −5%. For each country, we report the number of GDP crises, the average size of crises (in percent), and the specific years in which the crises occurred.

Country	Number of years	Average size of contraction	Year
Panel A: Advanced Economies			
Austria	1	6.92	2020
Belgium	1	5.21	2020
Canada	1	6.06	2020
Denmark	1	5.49	2009
Finland	2	7.45	1991, 2009
France	1	7.91	2020
Germany	1	5.17	2009
Greece	5	7.84	1974, 2010–2012, 2020
Ireland	3	6.86	2008–2009, 2023
Italy	2	7.19	2009, 2020
Japan	1	5.69	2009
New Zealand	3	6.92	1951, 1967, 1991
Portugal	2	8.19	1975, 2020
Spain	1	11.39	2020
United Kingdom	2	7.98	2009, 2020
Panel B: Emerging Economies			
Argentina	11	7.63	1952, 1959, 1963, 1978, 1981, 1985, 1989, 2001–2002, 2009, 2020
Bolivia	6	7.70	1953, 1956–1957, 1982–1983, 2020
Brazil	3	5.86	1981, 1983, 1990
Chile	5	9.47	1973, 1975, 1982–1983, 2020
China	4	11.90	1961–1962, 1967–1968
Colombia	2	7.72	1999, 2020
India	1	6.77	2020
Indonesia	2	10.23	1958, 1998
Korea	2	5.91	1960, 1998
Malaysia	3	7.56	1951, 1998, 2020
Mexico	5	7.01	1983, 1986, 1995, 2009, 2020
Nigeria	8	10.60	1958, 1966–1967, 1975, 1978, 1981–1983
Peru	6	10.41	1978, 1983, 1988–1990, 2020
Philippines	3	10.07	1984–1985, 2020
South Africa	2	6.37	1983, 2020
Thailand	4	7.38	1954, 1956, 1998, 2020
Turkey	3	6.70	1994, 2001, 2009
Uruguay	4	9.02	1982–1983, 2002, 2020
Venezuela	12	13.64	1980, 1983, 1989, 1999, 2002–2003, 2015–2020

Table B.3
Hyperinflation

This table reports hyperinflation years for both developed and emerging economies in our sample. We define a hyperinflation year as a year in which the annual inflation rate exceeds 100 percent. For each country, we report the number of hyperinflation years, the average size of inflation (in percent), and the specific years in which the hyperinflation occurred.

Country	Number of years	Average size of inflation	Year
Argentina	17	531.41	1959, 1975-1979, 1981-1985, 1987-1991, 2023
Bolivia	9	1661.65	1953-1954, 1956-1957, 1982-1986
Brazil	14	816.43	1981-1994
Chile	5	357.94	1973-1977
Indonesia	6	159.33	1962-1965, 1967-1968
Korea	1	210.37	1951
Mexico	2	121.30	1987-1988
Nigeria	1	219.00	1981
Peru	7	1454.21	1983-1985, 1988-1991
Turkey	2	124.19	1994, 1998
Uruguay	4	128.87	1968, 1973, 1990-1991

Table B.4
Inflation Crisis

This table reports inflation crisis years for both advanced and emerging economies in our sample. Following Reinhart and Rogoff (2011), we define an inflation crisis as a year in which the annual inflation rate exceeds 20 percent. For each country, we report the number of inflation crises, the average size of inflation (in percent), and the specific years in which the crises occurred.

Country	Number of years	Average size of inflation	Year
		Panel A: Advanced economies	
Austria	1	27.49	1951
Finland	1	22.07	1974
Greece	8	21.99	1973-1974, 1979, 1981-1984, 1990
Ireland	2	20.58	1975-1976
Italy	2	20.53	1974, 1980
Japan	1	20.81	1974
New Zealand	1	21.49	1976
Norway	2	24.19	2021-2022
Portugal	8	22.73	1977-1978, 1980, 1982-1986
Spain	2	22.01	1977-1978
United Kingdom	1	25.77	1975
		Panel B: Emerging economies	
Argentina	49	209.42	1950-1951, 1957-1959, 1961-1967, 1971-1991, 2002, 2008, 2010-2023
Bolivia	18	849.58	1950-1957, 1959, 1973-1974, 1980-1986
Brazil	38	328.67	1952, 1954, 1956, 1958-1969, 1973-1995
Chile	32	89.06	1951, 1953-1959, 1963-1970, 1972-1980, 1983, 1985-1988, 1990-1991
China	1	20.62	1994
Colombia	24	25.86	1950, 1963, 1973-1977, 1979-1994, 2000
Egypt	5	24.74	1979, 1982, 2017-2018, 2023
Indonesia	20	74.97	1950-1951, 1955, 1957-1960, 1962-1965, 1967-1969, 1973-1974, 1979-1980, 1998, 2000
Korea	15	46.59	1950-1957, 1963-1964, 1974-1976, 1978, 1980
Malaysia	2	23.96	1950-1951
Mexico	17	52.32	1974, 1977, 1980-1991, 1993, 1995-1996
Nigeria	15	47.36	1970, 1974-1975, 1981, 1988-1989, 1992-1996, 2000, 2002, 2004, 2006
Peru	20	543.67	1975-1994
Philippines	2	42.92	1974, 1984
South Africa	1	23.05	1980
Thailand	1	20.33	1974
Turkey	34	56.12	1959, 1973-1975, 1977-2003, 2021-2023
Uruguay	34	61.77	1959-1960, 1964-1969, 1971-1981, 1983-1997
Venezuela	30	2865.31	1974, 1979-1980, 1984, 1987, 1989-1997, 1999-2000, 2002-2005, 2008, 2010-2011, 2013-2019

Table B.5: Predicting Inflation Crises

This table reports results from logit regressions where the dependent variable is an indicator for whether a country experiences an inflation episode in the next year, $\mathcal{I}_{it+1}^{crisis}$. We set $\mathcal{I}_{it+1}^{crisis}$ equal to 1 if inflation in the next year exceeds 20%, and 0 otherwise. The sample includes 20 developed and 20 emerging economies over the period 1950–2023. Robust t-statistics are reported in parentheses. The pseudo-R^2 is reported at the bottom. p-values test the null hypothesis that the coefficients are equal to zero.

	(1)	(2)	(3)
Int/Rev (1 lag)	0.0572		0.0829
	(10.89)		(12.16)
D/Y (1 lag)		-0.0103	-0.0247
		(-4.038)	(-6.443)
Constant	-2.787	-1.678	-2.065
	(-27.67)	(-14.48)	(-14.97)
p-value	0.0000	0.0001	0.0000
Pseudo R^2	0.0606	0.0131	0.106
Observations	2538	2538	2538

B.1. Extensions

In this section, we present extensions and robustness checks that broaden the empirical analysis and sharpen the interpretation of our main results. We first study whether debt burdens help predict inflation crises under a broader definition than hyperinflation. We also analyze whether higher interest burdens help forecast banking crises and sovereign debt crises.

B.1.1. Predicting Inflation Crisis

We next examine the robustness of our hyperinflation results. Our baseline definition classifies a hyperinflation episode as any year in which inflation exceeds 100 percent. While this captures extreme price instability, many economies experience severe economic and social disruption well before inflation reaches such levels. To account for these high-inflation environments, we follow Reinhart and Rogoff (2011) and adopt a broader definition of an inflation crisis as any year in which annual inflation exceeds 20 percent. This alternative threshold allows us to test whether our findings hold when we focus on episodes that, while less extreme than hyperinflation, still represent major macroeconomic stress.

Across 40 countries, we identify a total of 387 inflation-crisis years, the majority of which occur in emerging economies, with only 29 episodes in developed economies. Table B.4 provides a detailed summary of these inflation crises. As shown in the table, inflation crises in emerging economies tend to exhibit much higher inflation rates and longer durations

compared to those in developed economies. For instance, Argentina experienced persistently high inflation for 20 consecutive years from 1971 to 1991, and again from 2010 to 2023. Similarly, Turkey underwent a prolonged inflation episode from 1977 to 2003. These crises are highly persistent and appear to be particularly catastrophic for emerging economies. Overall, the probability of an inflation crisis in our sample is approximately 13 percent.[13]

Similarly, we find stronger predictive power of the interest burden in predicting inflation crises. Table B.5 presents the logit estimates for inflation outcomes. Across all specifications, the lagged interest burden enters positively and remains highly significant, suggesting that when governments devote a larger share of resources to interest payments, the likelihood of an inflationary event in the following period increases. For instance, in Column (1), a 1% rise in the interest burden translates into an absolute increase of roughly 0.8 percentage points in the probability of an inflation episode. When scaled by a one–standard-deviation change in interest expenses, this probability rises by about 7.5 percentage points.

These results continue to hold when we control for the size of public debt. Interestingly, the debt ratio itself enters with a negative and statistically significant coefficient. This may reflect endogenous feedback mechanisms, such as countercyclical fiscal tightening or crisis-induced debt restructuring, that lie beyond the scope of this paper. What matters for inflation risk, however, is not the amount of debt outstanding but the burden of servicing it. Inflation crises arise when rising interest costs compress fiscal space and limit a government's ability to adjust through conventional fiscal means. These findings reinforce the central conclusion that debt sustainability depends less on the level of debt than on the terms of financing and the credibility of fiscal adjustment strategies.

B.1.2. Banking and Debt Crisis

Next, we examine how debt burdens relate to episodes of banking and sovereign debt crises. We construct our crisis indicators using well-established chronologies. The banking crisis series draws on Reinhart and Rogoff (2009) and the bank-run data from Jamilov et al. (2025). The sovereign debt crisis variable follows the definition in Reinhart and Rogoff (2011), which identifies episodes of default, restructuring, or coercive maturity extensions on either domestic or external public debt.

Using these crisis measures, we find that higher debt burdens are also stronger predictors of sovereign debt crises than the debt stock alone. Higher interest payments signal tightening refinancing constraints, and this stress appears well before debt ratios reach extreme levels. In this sense, the Int/Rev ratio captures a cumulative pressure that when interest payments absorb a growing share of revenues, even a solvent government becomes more exposed to shocks, policy slippage, or deteriorating market sentiment.

Elevated interest expenses also help forecast banking crises, consistent with models in which sovereign stress weakens financial intermediaries through their holdings of government debt (Gennaioli et al., 2014). Rising debt-servicing costs can drain liquidity, erode bank

[13]We have a total of 2,951 non-missing inflation observations; thus, the probability is calculated as $387/2{,}951 = 0.13$.

Table B.6: Predicting Banking and Debt Crisis

This table reports results from logit regressions where the dependent variable is an indicator for whether a country experiences a banking crisis, B_{it}^{crisis}, or a sovereign debt crisis, D_{it}^{crisis}. The sample includes 20 developed and 20 emerging economies over the period 1950–2023. Robust t-statistics are reported in parentheses. The pseudo-R^2 is reported at the bottom. p-values test the null hypothesis that the coefficients are equal to zero.

	Banking			Debt		
	(1)	(2)	(3)	(4)	(5)	(6)
Int/Rev (lag)	0.0179		0.0176	0.0352		0.0345
	(2.352)		(2.288)	(4.571)		(4.280)
D/Y (lag)		0.000393	-0.000381		0.000444	0.000459
		(0.533)	(-0.213)		(0.552)	(0.469)
Constant	-3.711	-3.545	-3.694	-4.641	-4.145	-4.719
	(-24.47)	(-28.54)	(-20.88)	(-22.78)	(-25.05)	(-21.63)
p-value	0.0187	0.5943	0.0210	0.0000	0.5810	0.0000
Pseudo R^2	0.00494	0.0000878	0.00462	0.0301	0.000109	0.0293
Observations	2420	2522	2360	2351	2453	2291

balance sheets, and transmit fiscal stress to the financial system. These results suggest that interest expense ratios capture the mechanisms emphasized in modern crisis theory and provide a more timely early-warning indicator of fiscal and financial fragility than traditional debt-to-GDP measures.

B.2. Household Optimization Problem

The household's optimization problem yields the following first-order conditions:

$$\frac{\chi C_t}{1 - N_t} = (1 - \tau_t)\, w_t, \tag{B.1}$$

$$\frac{1}{C_t} = \beta_t (1 + i_t) \mathbb{E}_t \left[\frac{1}{C_{t+1} \pi_{t+1}} \right], \tag{B.2}$$

$$1 = \beta_t\, \mathbb{E}_t \left[\left(\frac{C_{t+1}}{C_t} \right)^{-1} \left(r^k_{t+1} + 1 - \delta_k \right) \right], \tag{B.3}$$

B.3. NKPC Derivation

Following the same setup as in Section 3.2, let W_t denote the nominal wage and R^k_t the nominal rental rate of capital. The firm minimizes nominal cost subject to producing y_{jt}:

$$\min_{n_{jt},\, k_{jt}} \; W_t n_{jt} + R^k_t k_{jt} \quad \text{s.t.} \quad y_{jt} = z_t\, k^{\alpha}_{jt}\, n^{1-\alpha}_{jt}.$$

Let λ_{jt} be the Lagrange multiplier on the production constraint (in nominal units). The first-order conditions are

$$W_t = \lambda_{jt}\, z_t (1 - \alpha)\, k^{\alpha}_{jt}\, n^{-\alpha}_{jt},$$
$$R^k_t = \lambda_{jt}\, z_t \alpha\, k^{\alpha-1}_{jt}\, n^{1-\alpha}_{jt}.$$

Dividing the two conditions yields the intratemporal cost-minimizing factor ratio,

$$\frac{R^k_t}{W_t} = \frac{\alpha}{1 - \alpha} \frac{n_{jt}}{k_{jt}}. \tag{B.4}$$

Using standard duality for Cobb–Douglas, the nominal marginal cost is the unit cost:

$$MC_t = \frac{1}{z_t} \frac{W_t^{1-\alpha}\, (R^k_t)^{\alpha}}{\alpha^{\alpha} (1 - \alpha)^{1-\alpha}}. \tag{B.5}$$

In real terms, the real marginal cost is

$$mc_t = \frac{MC_t}{P_t} = \frac{1}{z_t} \frac{w_t^{1-\alpha}\, (r^k_t)^{\alpha}}{\alpha^{\alpha} (1 - \alpha)^{1-\alpha}}. \tag{B.6}$$

Firm j solves the profit-maximization problem using the stochastic discount factor

$$Q_{t,0} = \beta^t \frac{u_{C,t} P_0}{u_{C,0} P_t}. \tag{B.7}$$

The firm chooses $\{p_{jt}\}$ (and cost-minimizing inputs $\{n_{jt}, k_{jt}\}$) to maximize

$$\max_{\{p_{jt}\}} \mathbb{E}_0 \sum_{t=0}^{\infty} Q_{t,0} \left[(p_{jt} - MC_t)\, y_{jt} - \frac{\varphi}{2} \Big(\frac{p_{jt}}{p_{jt-1}} - \bar{\pi} \Big)^2 P_t Y_t \right], \tag{B.8}$$

where MC_t is nominal marginal cost given in (B.5). Define $\pi_{jt} \equiv p_{jt}/p_{jt-1}$. The demand derivative is

$$\frac{\partial y_{jt}}{\partial p_{jt}} = -\eta \Big(\frac{p_{jt}}{P_t} \Big)^{-\eta-1} \frac{Y_t}{P_t} = -\frac{\eta}{p_{jt}} y_{jt}.$$

Taking the first-order condition with respect to p_{jt} yields

$$\begin{aligned} 0 &= Q_{t,0} \left[y_{jt} - \frac{\eta}{p_{jt}} (p_{jt} - MC_t) y_{jt} - \varphi(\pi_{jt} - \bar{\pi}) \frac{P_t Y_t}{p_{jt-1}} \right] + \mathbb{E}_t \left[Q_{t+1,0}\, \varphi(\pi_{jt+1} - \bar{\pi})\, \frac{p_{jt+1}}{p_{jt}}\, \frac{P_{t+1} Y_{t+1}}{p_{jt}} \right] \\ &= Q_{t,0} \left[y_{jt} \Big(1 - \eta + \eta \frac{MC_t}{p_{jt}} \Big) - \varphi(\pi_{jt} - \bar{\pi}) \frac{P_t Y_t}{p_{jt-1}} \right] + \mathbb{E}_t \left[Q_{t+1,0}\, \varphi(\pi_{jt+1} - \bar{\pi})\, \pi_{jt+1}\, \frac{P_{t+1} Y_{t+1}}{p_{jt}} \right]. \end{aligned}$$

In symmetric equilibrium, $p_{jt} = P_t$, $\pi_{jt} = \pi_t$, and $y_{jt} = Y_t$. Dividing by $Q_{t,0} P_t Y_t$ and using

$$\frac{Q_{t+1,0}}{Q_{t,0}} = \beta \frac{u_{C,t+1}}{u_{C,t}} \frac{P_t}{P_{t+1}} = \beta \frac{u_{C,t+1}}{u_{C,t}} \frac{1}{\pi_{t+1}},$$

we obtain the Rotemberg New Keynesian Phillips Curve:

$$mc_t = \frac{\eta - 1}{\eta} + \frac{1}{\eta} \left\{ \varphi(\pi_t - \bar{\pi})\pi_t - \mathbb{E}_t \left[\beta \frac{Y_{t+1}}{Y_t} \frac{u_{C,t+1}}{u_{C,t}} \varphi(\pi_{t+1} - \bar{\pi})\pi_{t+1} \right] \right\}, \tag{B.9}$$

where mc_t is given by (B.6).

In Markov perfect equilibrium, suppressing time subscripts and using primes to denote next-period variables, (B.9) can be written as

$$\frac{1}{z} \frac{w^{1-\alpha} (r^k)^{\alpha}}{\alpha^{\alpha} (1-\alpha)^{1-\alpha}} = \frac{\eta - 1}{\eta} + \frac{1}{\eta} \left\{ \varphi(\pi - \bar{\pi})\pi - \beta \mathbb{E} \left[\frac{Y'}{Y} \frac{u'_C}{u_C}\, \varphi(\pi' - \bar{\pi})\pi' \right] \right\}. \tag{B.10}$$

B.4. Government Optimization

Let λ denote the multiplier on the government budget constraint. The first-order condition with respect to government spending is

$$G^{-1} = \lambda. \tag{B.11}$$

The first-order condition with respect to next-period debt issuance b' is

$$\lambda \left(q + b' \frac{\partial q}{\partial b'} \right) = \beta \mathbb{E}_{z'} \left[\int_{-\infty}^{s} \frac{\lambda'}{\pi'} d\Phi(s^*) + \int_{s'}^{\infty} 0\, d\Phi(s^*) \right]. \tag{B.12}$$

Using $G^{-1} = \lambda$, define the government stochastic discount factor as

$$M = \beta\Big(\frac{G'}{G}\Big)^{-1}. \tag{B.13}$$

Then the debt Euler equation can be written as

$$q + b'\frac{\partial q}{\partial b'} = \mathbb{E}\left[\int_{-\infty}^{p'} \frac{M}{\pi'}\, d\Phi(s^*)\right], \tag{B.14}$$

where the integral averages over realizations of the default threshold s^* with CDF $\Phi(\cdot)$, and repayment occurs when $s^* \leq s$. Equivalently, this term can be expressed as $\int_{-\infty}^{s} d\Phi(s^*) = \Phi(s)$.

B.5. Shocks Calibration

TFP Shocks. We model total factor productivity as an exogenous stochastic process that follows an AR(1) process in logs,

$$\log z_t = (1-\rho_z)\log \bar{z} + \rho_z \log z_{t-1} + \varepsilon_t^z. \tag{B.15}$$

To calibrate this process, we use the total factor productivity series (rtfpna, TFP at constant national prices) from the Penn World Table as the empirical counterpart to z_t. We calibrate the model separately for advanced and emerging economies. For each country, we first estimate ρ_z and the innovation ε_t^z, and then average these estimates across countries within each group.

Discount Factor Shocks. To calibrate shocks to the household and government's effective discount factor, we use data on government spending. The calibration proceeds in two steps. First, we use the government spending rule to recover a time series for the latent spending state g_t. Second, we map this spending state into an implied time series for the government's effective discount factor, β_t, and estimate an AR(1) process for $\log \beta_t$.

Recall that the government spending rule is

$$G_t = g_t\left((1-\nu)Y_t + \nu\bar{Y}_t\right),$$

where g_t is a latent spending state and $\nu \in [0,1]$ governs the weight placed on trend output relative to contemporaneous output. Dividing both sides by Y_t gives

$$\frac{G_t}{Y_t} = g_t\left((1-\nu) + \nu\frac{\bar{Y}_t}{Y_t}\right),$$

where g_t follows an AR(1) process in logs:

$$\log g_t = (1-\rho_s)\log \bar{g} + \rho_s \log g_{t-1} + \varepsilon_t^s.$$

Taking logs, and then we can write the estimating equation as

$$\log\left(\frac{G_t}{Y_t}\right) = (1-\rho_s)\log\bar{g} + \rho_s \log g_{t-1} + \log\left((1-\nu) + \nu\frac{\bar{Y}_t}{Y_t}\right) + \varepsilon_t^s.$$

Since

$$\log g_{t-1} = \log\left(\frac{G_{t-1}}{Y_{t-1}}\right) - \log\left((1-\nu) + \nu\frac{\bar{Y}_{t-1}}{Y_{t-1}}\right),$$

we have

$$\log\left(\frac{G_t}{Y_t}\right) = \log\left((1-\nu) + \nu\frac{\bar{Y}_t}{Y_t}\right) + (1-\rho_s)\log\bar{g} + \rho_s\left[\log\left(\frac{G_{t-1}}{Y_{t-1}}\right) - \log\left((1-\nu) + \nu\frac{\bar{Y}_{t-1}}{Y_{t-1}}\right)\right] + \varepsilon_t^s.$$

Here, we obtain government spending data from the World Bank. The measure is general government final consumption expenditure, which includes government purchases of goods and services, compensation of employees, and most spending on national defense and security. Real gross domestic product is also obtained from the World Bank. We use the period from 1960 to 2023 for countries with available data.

We then allow the government's effective discount factor to vary with the recovered spending state according to[14]

$$\beta_t = \bar{\beta}\exp\left[-\phi_g\left(g_t - \bar{g}\right)\right], \qquad \phi_g > 0. \tag{B.16}$$

Equivalently,

$$\log\beta_t = \log\bar{\beta} - \phi_g\left(g_t - \bar{g}\right). \tag{B.17}$$

This mapping implies that high-spending states, represented by high values of g_t, are associated with a lower effective government discount factor.

Given the implied series for β_t, we estimate the following AR(1) process:

$$\log\beta_t = (1-\rho_b)\log\bar{\beta} + \rho_b\log\beta_{t-1} + \sigma_b\varepsilon_{b,t}, \qquad \varepsilon_{b,t} \sim \mathcal{N}(0,1). \tag{B.18}$$

The estimated autoregressive coefficient gives the persistence of government discount-factor shocks, ρ_b, while the standard deviation of the residuals gives the shock volatility, σ_b.

[14] This specification captures the idea that high-spending states occur when the government places greater weight on current expenditure needs. A higher value of g is therefore associated with a lower β_g. This reduced-form mechanism is inspired by the political-economy view that public debt may exceed the benchmark implied by a benevolent planner because incumbent policymakers do not fully internalize future fiscal costs, or because they use debt strategically to influence the choices of future governments. Persson and Svensson (1989) show how debt can be used strategically across governments with different preferences, while Alesina and Tabellini (1990) emphasize how political turnover and distributive conflict can lead to excessive deficits and debt accumulation. More broadly, Alesina and Perotti (1995) argue that institutional and political distortions can produce persistent departures from optimal fiscal policy, and Alesina and Passalacqua (2016) survey a wide range of mechanisms through which political frictions shape public spending, deficits, and debt dynamics.

Global Financial Shocks. We define r_t following the process

$$r_t - r_{t-1} = \kappa_r(\bar{r} - r_{t-1}) + \sigma_t \varepsilon_{r,t}, \tag{B.19}$$

To calibrate the global discount factor process, we use the U.S. one-year real risk-free rate as an empirical proxy for global discounting conditions. Specifically, we use the corresponding FRED series ("REAINTRATREARAT1YE") to discipline the global financial shock process.

Monetary Policy Shocks. The monetary policy rule in our model is

$$1 + i_t = (1 + \bar{i}) \left(\frac{\pi_t}{\bar{\pi}}\right)^{\psi_\pi} \left(\frac{Y_t}{\bar{Y}_t}\right)^{\psi_y} \exp(\varepsilon_{m,t}).$$

Taking logs yields

$$\log(1 + i_t) = \log(1 + \bar{i}) + \psi_\pi \log\left(\frac{\pi_t}{\bar{\pi}}\right) + \psi_y \log\left(\frac{Y_t}{\bar{Y}_t}\right) + \varepsilon_{m,t}.$$

Rearranging, the implied monetary policy shock can be recovered from the data as

$$\varepsilon_{m,t} = \log(1 + i_t) - \log(1 + \bar{i}) - \psi_\pi \log\left(\frac{\pi_t}{\bar{\pi}}\right) - \psi_y \log\left(\frac{Y_t}{\bar{Y}_t}\right).$$

Equivalently, one can estimate the reduced-form regression

$$\log(1 + i_t) = \alpha_0 + \alpha_\pi \log \pi_t + \alpha_y \log\left(\frac{Y_t}{\bar{Y}_t}\right) + \varepsilon_{m,t}, \tag{B.20}$$

where the coefficients map to the structural parameters according to

$$\alpha_0 = \log(1 + \bar{i}) - \psi_\pi \log \bar{\pi}, \qquad \alpha_\pi = \psi_\pi, \qquad \alpha_y = \psi_y. \tag{B.21}$$

We assume that the monetary policy shock follows an AR(1) process,

$$\varepsilon_{m,t} = \rho_m \varepsilon_{m,t-1} + \mu_t, \tag{B.22}$$

where ρ_m governs persistence and $\mu_t \sim \mathcal{N}(0, \sigma_m^2)$ is an i.i.d. innovation. We estimate ρ_m and σ_m using the constructed series $\{\varepsilon_{m,t}\}$. Our monetary policy rule and shocks are calibrated to the United States using data from 1980 to 2023, reflecting the structural shift in the conduct of monetary policy after 1980.