Fear of Hiking?
Monetary Policy and Sovereign Risk

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Motivation

Two developments in the euro area

1. Public debt has reached new highs in euro area countries
2. Since 2008, ECB key interest rates are low

The joint observation of high debt and low interest rates has sparked a debate about fiscal-monetary interaction in the euro area

Narrative: the ECB is keeping rates low to shield sovereigns from rising borrowing costs to prevent a debt crisis.

This paper

How does the short-term rate set by the central bank affect sovereign borrowing and default risk in a monetary union?

Answer this question in a Eaton and Gersovitz (1981) style model of a small member of a monetary union

- Local government issues defaultable debt to investors inside the monetary union
- Sticky wages generate unemplyoment in equilibrium and imply monetary policy has real effects (Arellano et al., 2020; Bianchi and Mondragon, 2022)

Results

Main insight: The effects of a rate hike flip when debt/GDP is above a critical threshold level

- Low debt/GDP: debt levels and default risk *decline*
- High debt/GDP: debt levels and default risk *rise* (Fear of Hiking)

Results in a nutshell

- Analytical decomposition: substitution vs income effect
- Calibration to Italy: fear of hiking is relevant
- Policy implications (positive)

2. Model.

Overview

Eaton-Gersovitz style model

- Small country in a monetary union
- Households, firms, domestic government
- Nominal friction: downward wage rigidity
- Risk-neutral foreign lenders within the monetary union
- Central bank sets the short-term rate

Presentation: wage rigidity binding, relative prices fixed, no inflation

Domestic households details

Households consume bundle C_t of domestic and foreign goods

- Intertemporal elasticity of substitution $1/\sigma$
- Home bias $1-\gamma$
- No access to financial markets (hand to mouth)
- Consume labor income $W_t L_t$ minus taxes (primary surplus) T_t

$$C_t = W_t L_t - T_t$$

Domestic production

Firms

- competitive, linear technology, no profits
- downward rigid wages $W_t \geq 1$

Wage rigidity binds, domestic output is determined by

- domestic demand $(1-\gamma)C_t$
- (exogenous) foreign demand X_t

$$Y_t = (1-\gamma)C_t + X_t$$

Domestic government

Government chooses primary surplus T_t, debt B_t and default δ_t to maximize household utility.

The budget constraint is

$$\tilde{\mu} B_{t-1} = T_t + q_t (B_t - (1-\mu) B_{t-1}).$$

- B_t is the amount of long-term debt, q_t the bond price
- μ is the fraction of maturing debt, $\tilde{\mu} = \mu + \iota$ (normalization)
- Standard setup (Chatterjee and Eyigungor, 2012)

Default entails utility cost, plus the economy is excluded from financial markets for a random number of periods.

Rest of the union

Debt is purchased by risk-neutral foreign lenders. The price of debt is

$$q_t = \frac{\mathbb{E}_t(1-\delta_{t+1})(\tilde{\mu} + (1-\mu)q_{t+1})}{1+i_t},$$

where $\delta_{t+1} = 1$ default indicator.

Investors' outside option is i_t, the policy rate set by the central bank.

$\Rightarrow$ main exercise: study effect of i_t on sovereign borrowing decision and default risk

3. Threshold for debt/GDP.

Income and substitution effect

Define $\tilde{q}(B_t, s_t) = q(B_t, i, s_t)(1+i)$, then we can write government Euler equation for B_t as

$$\frac{U'(C(1+i))}{\gamma}\left(\tilde{q}(B_t, s_t) + \frac{\partial \tilde{q}(B_t, s_t)}{\partial B_t}(B_t - (1-\mu)B_{t-1})\right) + \beta(1+i)\frac{\partial}{\partial B_t}\mathbb{E}V(B_t, i_{t+1}, s_{t+1}) = 0.$$

where V is the continuation value.

Two competing effects

1. Substitution effect implies that B_t falls in i
2. Income effect implies that B_t rises in i

Threshold for debt to GDP

graphical illustration

Proposition

Consider a temporary change in i. Define the threshold $\mathcal{T}$

$$\mathcal{T}_t = \frac{\gamma}{\tilde{\mu}\sigma}\left(1 + \left(\frac{\sigma}{\gamma} - 1\right)\frac{T_t}{Y_t}\right).$$

Then $\partial B_t / \partial i > 0$ if and only if $B_t / Y_t > \mathcal{T}_t$

Effects of monetary policy flip at high levels of public debt

- Threshold shaped by three key parameters: σ, $\tilde{\mu}$ and γ
- Depends on business cycle through primary surplus/ GDP ratio T_t

$\Rightarrow$ B_t also captures future default risk

4. Quantitative analysis.

The Fear of Hiking zone

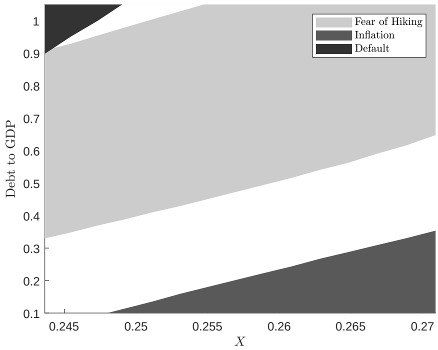
calibration table

Results from a calibration to Italy

Statistic	Value
$\mathrm{mean}(\mathcal{T})$	0.5116
$\mathrm{mean}(\mathbb{1}_{\mathcal{I}})$	0.7056
$\mathrm{corr}(\mathbb{1}_{\mathcal{I}}, Y)$	-0.6781

Indicator $\mathbb{1}_{\mathcal{I}}$ for the Fear of Hiking zone. Hence, 71% of the time in Fear of Hiking zone, more likely to visit the Fear of Hiking zone in a recession (correlation -0.68)

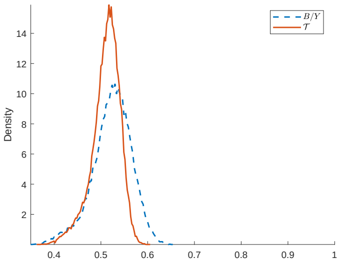
The Fear of Hiking zone

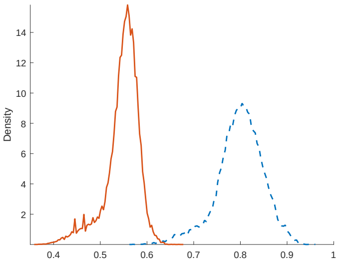


- At higher debt levels, the economy is more likely to be in the Fear of Hiking zone
- In good times, the government runs a surplus $\Rightarrow$ the Fear of Hiking zone is smaller

5. Policy implications.

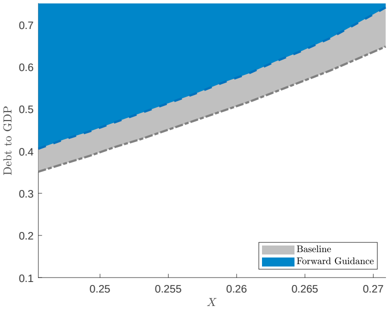
Policy implication #1: Decline in long rates





- Decline in long rates modeled as a cut in ι, from 2% to 0%
- Economy becomes more likely to be in Fear of Hiking zone
- Too low for too long and limited ammunition (Boissay et al., 2021; Mian et al., 2021)

Policy implication #2: Forward guidance



(Credible) announcements about future interest rate increases reduce the Fear of Hiking zone

- Announcements change B/Y and $\mathcal{T}$, hence $\mathbb{1}_{\mathcal{I}}$
- Needs to be traded off against direct effects of forward guidance, for instance, impact on sovereign risk

5. Conclusion.

Summary and conclusion

Monetary policy's impact on public debt flows and sovereign default risk in a currency union may be highly state dependent, depending in particular on current debt/GDP of member countries

Quantify the threshold and policy implications

Households

back

Households' utility is

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \frac{C_t^{1-\sigma}}{1-\sigma},$$

with consumption basket

$$C_t = \zeta C_{h,t}^{1-\gamma} C_{f,t}^{\gamma},$$

where $\zeta \equiv (1-\gamma)^{-(1-\gamma)} \gamma^{-\gamma}$. Here, $C_{h,t}$ are domestic and $C_{f,t}$ are imported goods. Budget constraint

$$P_{h,t} C_{h,t} + P_{f,t} C_{f,t} = W_t L_t + P_{h,t} T_t,$$

where $W_t L_t$ is income, T_t are taxes. Households have no access to financial markets.

Optimality conditions

Households supply $\bar{L} = 1$ inelastically. Due to wage rigidities described below, may supply $L_t < 1$ in equilibrium.

Optimal expenditure

$$C_{h,t} = (1-\gamma)\frac{P_t}{P_{h,t}} C_t \tag{1}$$

$$C_{f,t} = \gamma \frac{P_t}{P_{f,t}} C_t, \tag{2}$$

with cost-minimizing price index $P_t = P_{h,t}^{1-\gamma} P_{f,t}^{\gamma}$.

Definition of equilibrium

Definition (Markov-perfect equilibrium)

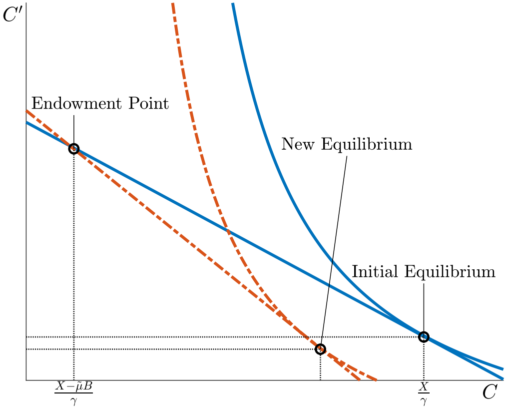
For a given law of motion governing i and s, a Markov-perfect equilibrium is a set of value functions $\{V(B,i,s), V^r(B,i,s), V^\delta(i,s)\}$, a set of policy functions $\{\delta(B,i,s), B'(B,i,s), C(B,i,s)\}$ and a pricing function $q(B',i,s)$ such that

1. Given the bond price schedule, the value and policy functions solve the above problems
2. The bond price schedule satisfies

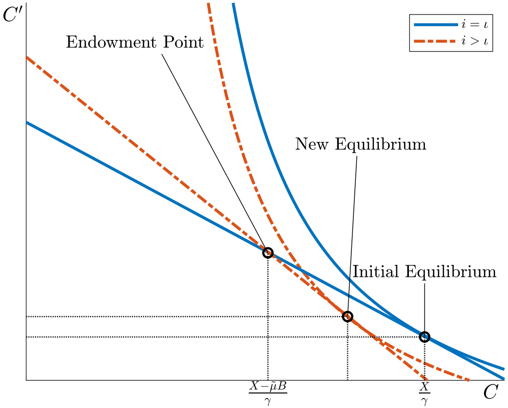
$$q(B',i,s) = \frac{\mathbb{E}(1-\delta(B',i',s'))(\tilde{\mu}+(1-\mu)q(B'',i',s'))}{1+i},$$

where $B'' = B'(B',i',s')$.

Two-period consumption model: low B



Two-period consumption model: high B back



Calibration table back

Parameter	Value	Target	Data	Model
ι	0.02	Risk free rate	-	-
σ	4	EIS	-	-
γ	0.27	Home bias	-	-
ζ	0.27	Elasticity	-	-
μ	0.14	Debt maturity	-	-
p	0.18	Exclusion period	-	-
β	0.945	$\text{mean}(B_t / Y_t)$	0.499	0.529
μ_X	0.257	$\text{mean}(1 - L_t)$	0.094	0.088
σ_X	0.022	$\text{std}(Y_t)$	0.023	0.021
ρ_X	0.65	$\text{corr}(Y_t,\ Y_{t-1})$	0.640	0.610
s_ξ	0.66	$\text{mean}(\textit{spread}_t)$	0.014	0.014
L_0	2.262	$\text{corr}(X_t - C_{f,t},\ Y_t)$	-0.170	-0.140
L_1	20	$\text{std}(\textit{spread}_t)$	0.011	0.006