A Theory of Fear of Floating

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Motivation

- Flexible exchange rate optimal according to textbook open economy model
- But empirically countries classified as "floaters" do not let exchange rate float

> *We find that countries that say they allow their exchange rate to float mostly do not—there seems to be an epidemic case of fear of floating*
>
> Calvo and Reinhart, QJE 2002

- This paper: "fear of floating" as an optimal policy outcome

Preview

Main ingredients:

- Downward nominal wage rigidity
- Households' borrowing constraint linked to real exchange rate

- **By stabilizing the nominal exchange rate:**
  - Prevent self-fulfilling financial crises
  - Avoid contractionary depreciations

Model

Model: Preferences and Technology

- Preferences

$$\sum_{t=0}^{\infty} \beta^t \left[\log(c_t) + \chi \log\left(\frac{M_{t+1}}{P_t}\right)\right]$$

where

$$c_t = \left[\phi (c_t^T)^{\frac{\gamma-1}{\gamma}} + (1-\phi)(c_t^N)^{\frac{\gamma-1}{\gamma}}\right]^{\frac{\gamma}{\gamma-1}},$$

- Hours $\bar{h}$ and tradable endowment y^T
- Law of one price for tradables (normalization, $P_t^{T^*} = 1$)
- Linear production for non-tradables in labor $y_t^N = n_t$

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- Law of one price for tradables (normalization, $P_t^{T*} = 1$)
- Linear production for non-tradables in labor $y_t^N = n_t$
- Will focus on cash-less limit for welfare analysis

Household Problem

$$\max_{\left\{b_{t+1},\tilde{b}_{t+1},M_{t+1},c_t^T,c_t^N\right\}_{t=0}^{\infty}} \sum_{t=0}^{\infty} \beta^t \left[U(c_t) + \chi \log\left(\frac{M_{t+1}}{P_t}\right)\right]$$

subject to

$$P_t^T c_t^T + P_t^N c_t^N + M_{t+1} + \tilde{b}_t + e_t b_t =$$
$$P_t^T y_t^T + W_t h_t + M_t + \frac{\tilde{b}_{t+1}}{\tilde{R}_t} + \frac{e_t b_{t+1}}{R} + T_t,$$

$$\frac{e_t b_{t+1}}{R} \leq \kappa \left(P_t^T y_t^T + W_t h_t\right).$$

- Foreign currency b, with interest rate R
- Domestic currency, $\tilde{b}$, with interest rate $\tilde{R}_t$
  - For simplicity: no need for collateral, zero net supply

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Labor Market

- Firms
  - Produce N goods $y_t^N = n_t$
  - Profit maximization $\phi_t^N = \max_{n_t}\{P_t^N n_t - W_t n_t\}$

    $\Rightarrow P_t^N = W_t$

- Downward nominal wage rigidity

$$W_t \geq W_{t-1}$$

- Rationing:
  - If market clearing wage is below W_{t-1}, employment is demand determined

Government and Competitive Equilibrium

Government budget constraint

$$T_t = M^s_{t+1} - M^s_t.$$

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Market clearing

$$c^N_t = y^N_t, \quad {}_t = n_t, \quad \tilde{b}_{t+1} = 0, \quad M^s_{t+1} = M_{t+1}$$

Competitive Equilibrium. *Given an initial condition b_0 and W_{-1}, an equilibrium is a sequence of govt. policies $\{M_{t+1}, T_t\}$, prices $\{\tilde{R}_t, e_t, W_t, P^N_t\}$, allocations $\{c^T_t, c^N_t, h_t\}$ and asset holdings $\{\tilde{b}_{t+1}, b_{t+1}\}$ such that*

1. *Households and firms' optimize* ▸ *conditions*
2. *Market clearing*
3. *Wage rigidity and rationing condition holds*

Roadmap

1. Multiplicity under flexible wages
    - Schmitt-Grohe and Uribe, 2020
2. How monetary policy affects vulnerability?
    - Low debt levels: floating regime vulnerable to self-fulfilling crisis while fixing implements good eqm.
3. In a managed peg, depreciating the exchange rate can be contractionary

Endogenous Borrowing Limit

$$\frac{b_{t+1}}{R} \leq \kappa \left(y_t^T + \frac{W_t}{e_t} h_t \right)$$

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$$W_t = P_t^N, \qquad \frac{P_t^N}{e_t} = \frac{1-\omega}{\omega} \left(\frac{c_t^T}{c_t^N} \right)^{ac1\gamma},$$

$$h_t = c_t^N, \quad c_t^T = y_t^T - b_t + \frac{b_{t+1}}{R}$$

Endogenous Borrowing Limit

$$\frac{\bar{b}(B_0, B_1)}{R} = \kappa \left[y_0^T + \frac{1-\phi}{\phi} \left(\frac{y_0^T - B_0 + B_1/R}{h_0} \right)^{\frac{1}{\gamma}} h_0 \right]$$

- Borrowing limit $\bar{b}$ is decreasing in B_0 and increasing in B_1
- Higher *aggregate* consumption appreciates RER and relaxes limit

Steady-State Equilibrium

Assume $y_t^T = y^T$ and $\beta R = 1$

- We define a steady state equilibrium as a competitive equilibrium where allocations are constant for all $t \geq 0$.
  - Denote by $\hat{B}$ the level such that $\bar{b}(\hat{B}, \hat{B}) = \hat{B}$ when $h_0 = \bar{h}$.

Lemma: If $B_0 \leq \hat{B}$, we have that:

(i) the steady state eqm. exists; and

(ii) it is optimal for the government to implement $h_t = \bar{h}$

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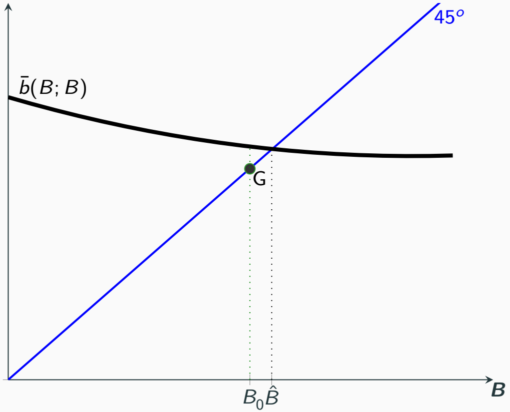
Focus on monetary policy with zero inflation $(\bar{M}, \bar{e})$:

$$\bar{e} = W_{-1} \; \frac{\phi}{1-\phi} \left(\frac{y^T - (1-\beta)B_0}{\bar{h}} \right)^{-\frac{1}{\gamma}}$$

Steady-State Equilibrium: Illustration

$$\frac{\bar{b}(B,B)}{R} = \kappa\left[y^T + \frac{1-\phi}{\phi}\left(y^T - B + \frac{B}{R}\right)^{\frac{1}{\gamma}}\left(\bar{h}\right)^{1-\frac{1}{\gamma}}\right]$$



Self-Fulfilling Crisis Equilibrium

$$\frac{\bar{b}(B_0, B_1)}{R} = \kappa \left[y^T + \frac{1-\phi}{\phi} \left(\frac{y^T - B_0 + B_1/R}{h_0} \right)^{\frac{1}{\gamma}} h_0 \right]$$

- The fact that $\frac{\partial \bar{b}(B_1, B_0)}{\partial B_1} > 1$ may open door to second eqm. with low consumption and real exchange rate
  - Schmitt-Grohe and Uribe, 2020

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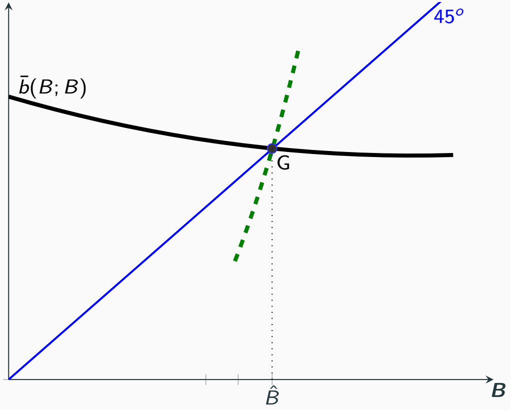
A sufficient condition for multiplicity:

$$\kappa \frac{1-\phi}{\phi} \left[\frac{y^T - (1-\beta)\hat{B}}{\bar{h}} \right]^{\frac{1}{\gamma}-1} > 1$$

Focus on $\gamma < 1$

Self-Fulfilling Crisis Equilibrium: Flexible wage

$$\frac{\bar{b}(B_0, B)}{R} = \kappa \left[y^T + \frac{1-\phi}{\phi} \left(y^T - B_0 + \frac{B}{R} \right)^{\frac{1}{\gamma}} \left(\bar{h} \right)^{1-\frac{1}{\gamma}} \right]$$



If $B_0 = \hat{B}$, constraint holds with equality at steady state eqm.

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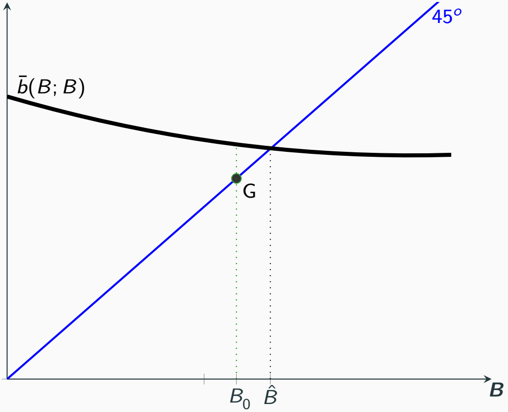

if $B_0 < \hat{B}$, steady state eqm. exists

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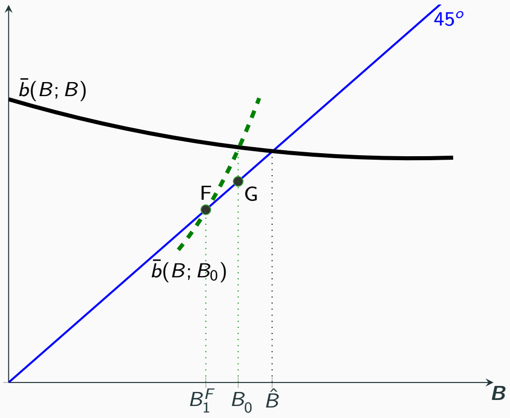

if $B_0 < \hat{B}$, another equilibrium at F

Wage Rigidity: How does monetary policy affect vulnerability?

Monetary Policy Regimes

- Flexible exchange rate
  - Fixed money supply: monetary policy sets $M_t = \bar{M}$
  - Full employment: monetary policy targets $h_t = \bar{h}$
- Fixed exchange rate
  - Monetary policy targets $e_t = \bar{e}$

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We assume regimes are perfectly credible

Flexible Exchange Rate: Fixed Money Supply

- Exchange rate determination

$$\frac{R}{1-\mu_0} = \tilde{R}_0 \frac{e_0}{e_1} \qquad \text{(Interest Parity)}$$

$$\frac{\chi W_0}{\bar{M}} = \frac{\tilde{R}_0 - 1}{\tilde{R}_0} u_N \left(y^T - B_0 + \frac{B_1}{R}, h_0 \right) \qquad \text{(Money Demand)}$$

where μ denotes Lagrange multiplier on borr. limit]

- Lemma: if a self-fulfilling crises equilibrium exists,
    - The exchange rate depreciates $\uparrow e_0$
    - There is involuntary unemployment $h_0 < \bar{h}$

$$h_0 = \left(\frac{1-\phi}{\phi} \frac{e_0}{W_{-1}} \right)^{\gamma} \left(y^T - B_0 + \frac{B_1}{R} \right)$$

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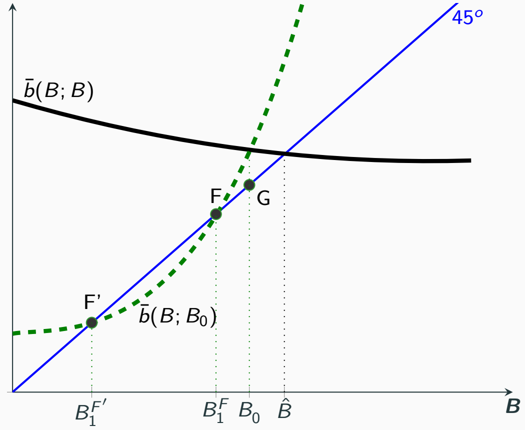
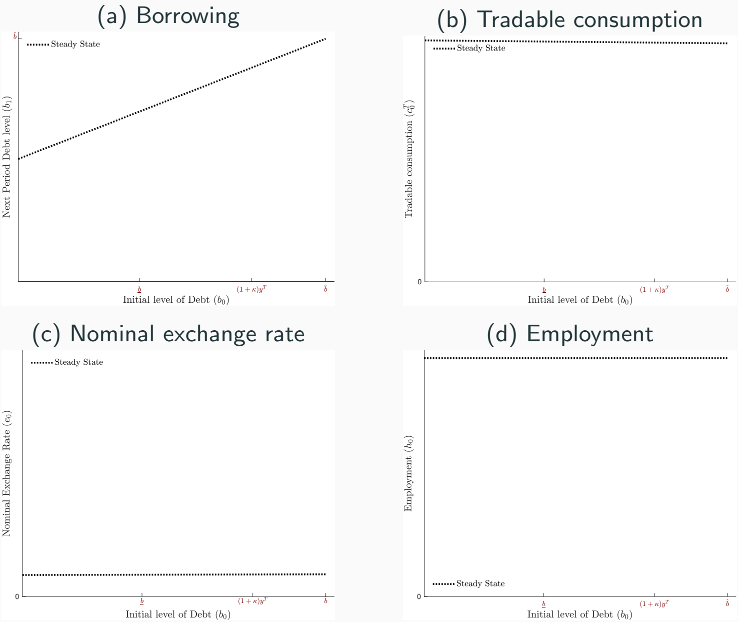
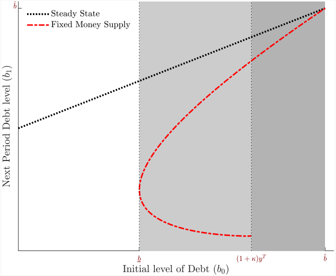


Flexible Exchange Rate: Policy Functions

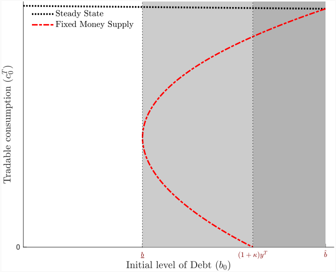


Flexible Exchange Rate: Policy Functions

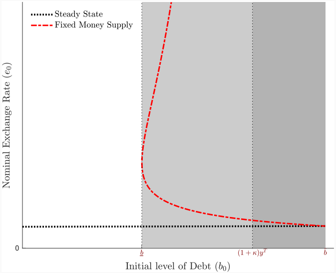
(a) Borrowing



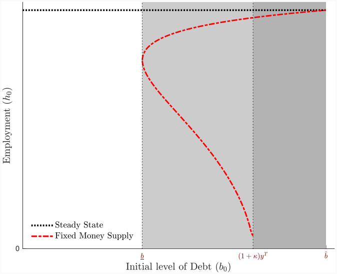
(b) Tradable consumption



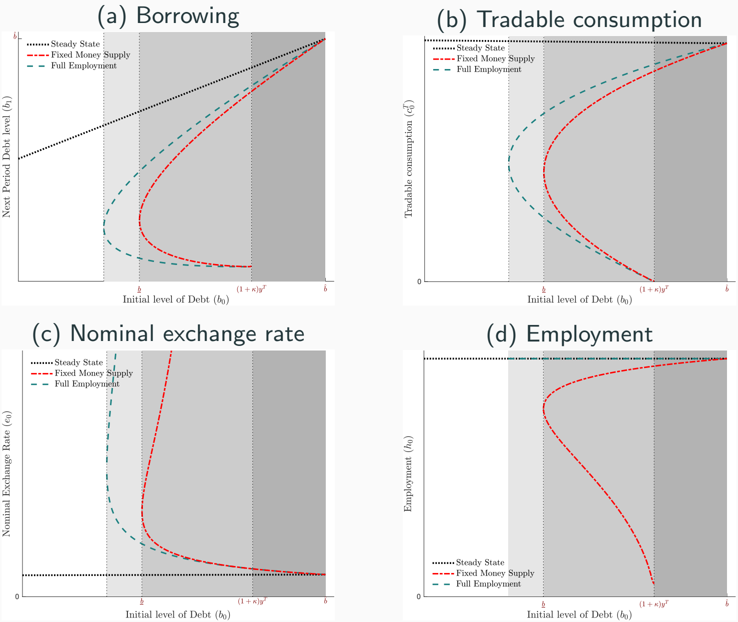
(c) Nominal exchange rate



(d) Employment



Flexible Exchange Rate: Policy Functions



Fixed Exchange Rate

$$\frac{\bar{B}(B_0, B_1)}{R} = \kappa \left[y^T + \left(\frac{1-\phi}{\phi} \right)^{\gamma} \left(\frac{W_{-1}}{\bar{e}} \right)^{1-\gamma} \left(y^T - B_0 + B_1/R \right) \right]$$

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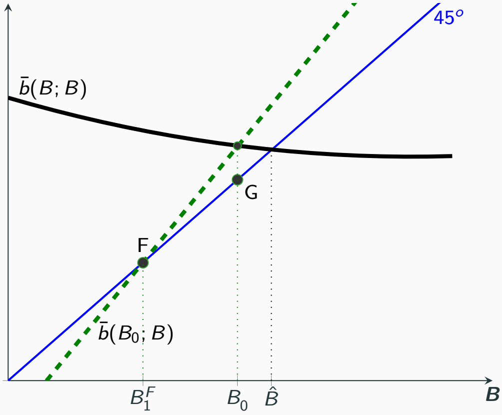


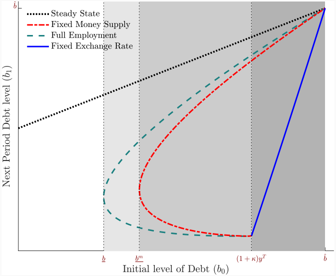
To Fix or to Float?

- Crisis region under fixed exchange rate is always contained in the crisis region under flexible exchange rate

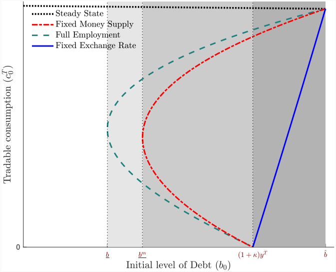
- If $b_0 < (1 + \kappa)y^T$, a fixed exchange rate welfare dominates
  - Fixing e uniquely implements good equilibrium

Fixed Exchange Rate: Policy Functions

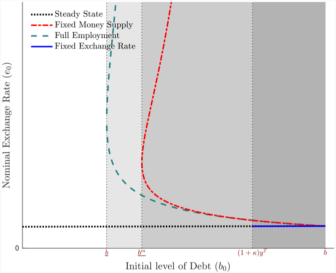
(a) Borrowing



(b) Tradable consumption



(c) Nominal exchange rate



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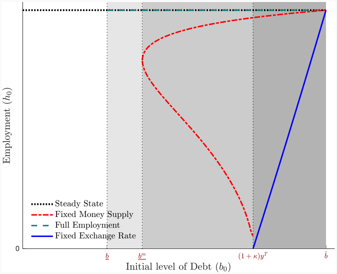
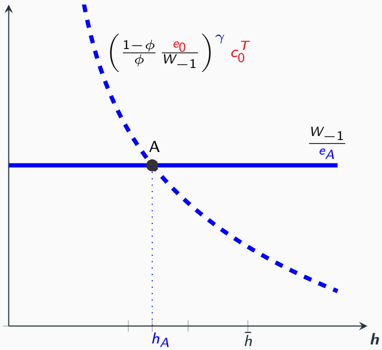


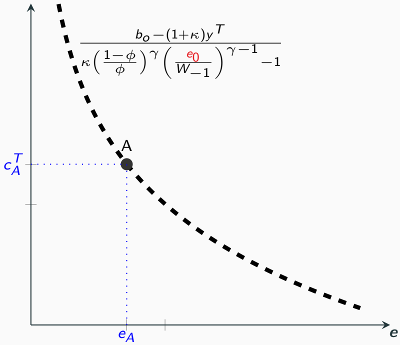
Managed pegs and contractionary depreciations

A Case of Contractionary Depreciations

(a) Output



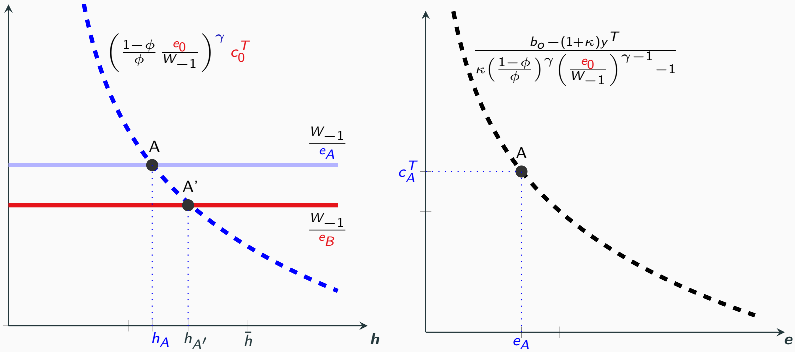
(b) Tradable consumption



A Case of Contractionary Depreciations

(a) Output

(b) Tradable consumption



- Expenditure switching:
  - Holding c_0^T constant, $\uparrow e_0$ leads to higher y^N

A Case of Contractionary Depreciations

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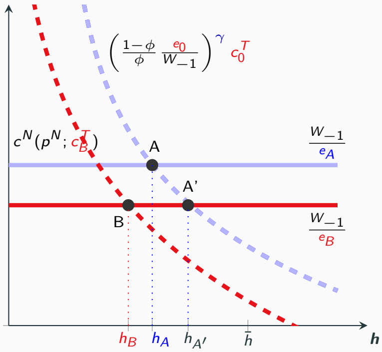

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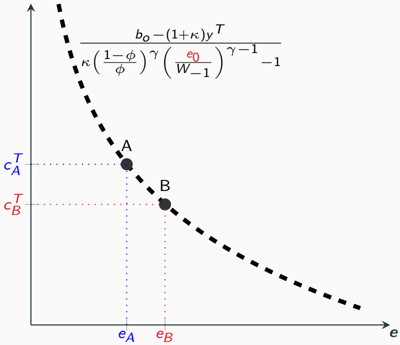

- Expenditure switching:
    - Holding c_0^T constant, $\uparrow e_0$ leads to higher y^N
- Borrowing capacity:
    - Holding y_0^N constant, $\uparrow e_0$ leads to lower b_1 and c_0^T

Other results

- Quantitative analysis with fundamental and non-fundamental shocks and optimal policies
- Welfare gains from fixing the exchange rate around 1% with self-fulfilling crises
    - If only fundamental shocks, losses of 0.4%
- Sophisticated monetary policies to implement good equilibrium

Conclusion

- Fear of floating is ubiquitous in emerging economies
- We provide a theory where fear of floating emerges endogenously
  - Fixing the exchange rate helps prevent self-fulfilling crises
  - In managing pegs, depreciating the exchange rate may be contractionary

Extras

Proposition: Flexible Exchange Rate

Proposition 1

1. *there is a nonempty region of debt levels* $b_0 \in ((1+\kappa)y^T, \hat{b})$ *for which a unique self-fulfilling crises equilibrium coexists with the steady-state equilibrium,*
2. *if* $\gamma < 1$*, there is a nonempty region of debt levels* $b_0 \in [\underline{b}^m, (1+\kappa)y^T)$ *for which two self-fulfilling crises equilibria coexist with the steady-state equilibrium, with* $\underline{b}^m > \underline{b}$*;*
3. *we have a unique equilibrium and this equilibrium is the steady state equilibrium if* $b_0 < (1+\kappa)y^T$ *and* $\gamma \geq 1$ *or if* $b_0 < \underline{b}^m$ *and* $\gamma < 1$*.*

back

Proposition: Flexible Exchange Rate

- for $b_0 \in ((1+\kappa)y^T, \hat{b})$, a unique self-fulfilling crises equilibrium coexists with the steady-state equilibrium;
- for $b_0 \in [\underline{b}^m, (1+\kappa)y^T)$, two self-fulfilling crises equilibria coexist with the steady-state equilibrium;
- for $b_0 < \underline{b}^m$ we have a unique equilibrium and this equilibrium is the steady state equilibrium.

back

Proposition: Fixed Exchange Rate

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- for $b_0 < (1+\kappa)y^T$ we have a unique equilibrium and this equilibrium is the steady state equilibrium.

back

Proposition: Contractionary Depreciations

Consider a self-fulfilling crises equilibrium and two possible values for the exchange rate $e_0, \tilde{e}_0 \in (\bar{e}, \underline{e}_0)$ such that $\tilde{e}_0 > e_0$. Then, $y^N(\tilde{e}_0) < y^N(e_0)$ (i.e., *depreciations are contractionary*) if $\gamma < 1$ and $B_0 < (1+\kappa)y^T$.

back

Household optimality ‣ back

- Money demand:

$$\frac{M_{t+1}}{P_t} = \frac{\chi}{U'(c_t)} \frac{\tilde{R}_t}{\tilde{R}_t - 1}$$

- Consumption

$$c_t^N = \left(\frac{1-\phi}{\phi} \frac{e_t}{P_t} \right)^{\gamma} c_t^T$$

- Euler for foreign bonds

$$(1-\mu_t) u_T(c_t^T, c_t^N) = \beta R E_t u_T \left(c_{t+1}^T, c_{t+1}^N \right)$$

- Interest parity:

$$R = \tilde{R}_t \left[\frac{(1-\mu_t) u_T(c_{t+1}^T, c_{t+1}^N)}{u_T(c_{t+1}^T, c_{t+1}^N)} \frac{e_t}{e_{t+1}} \right]$$