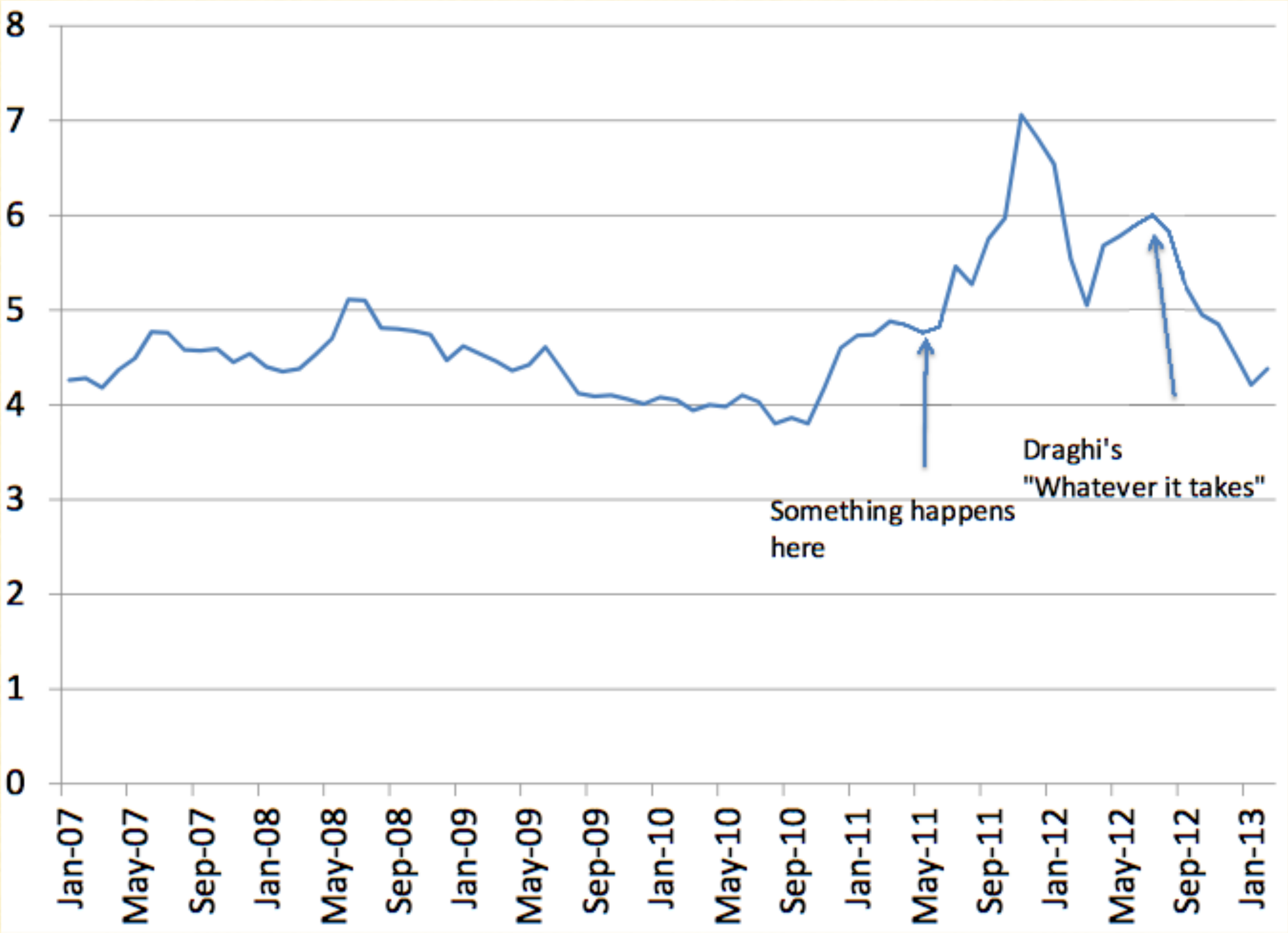
# SLOW MOVING DEBT CRISES

Guido Lorenzoni and Ivan Werning

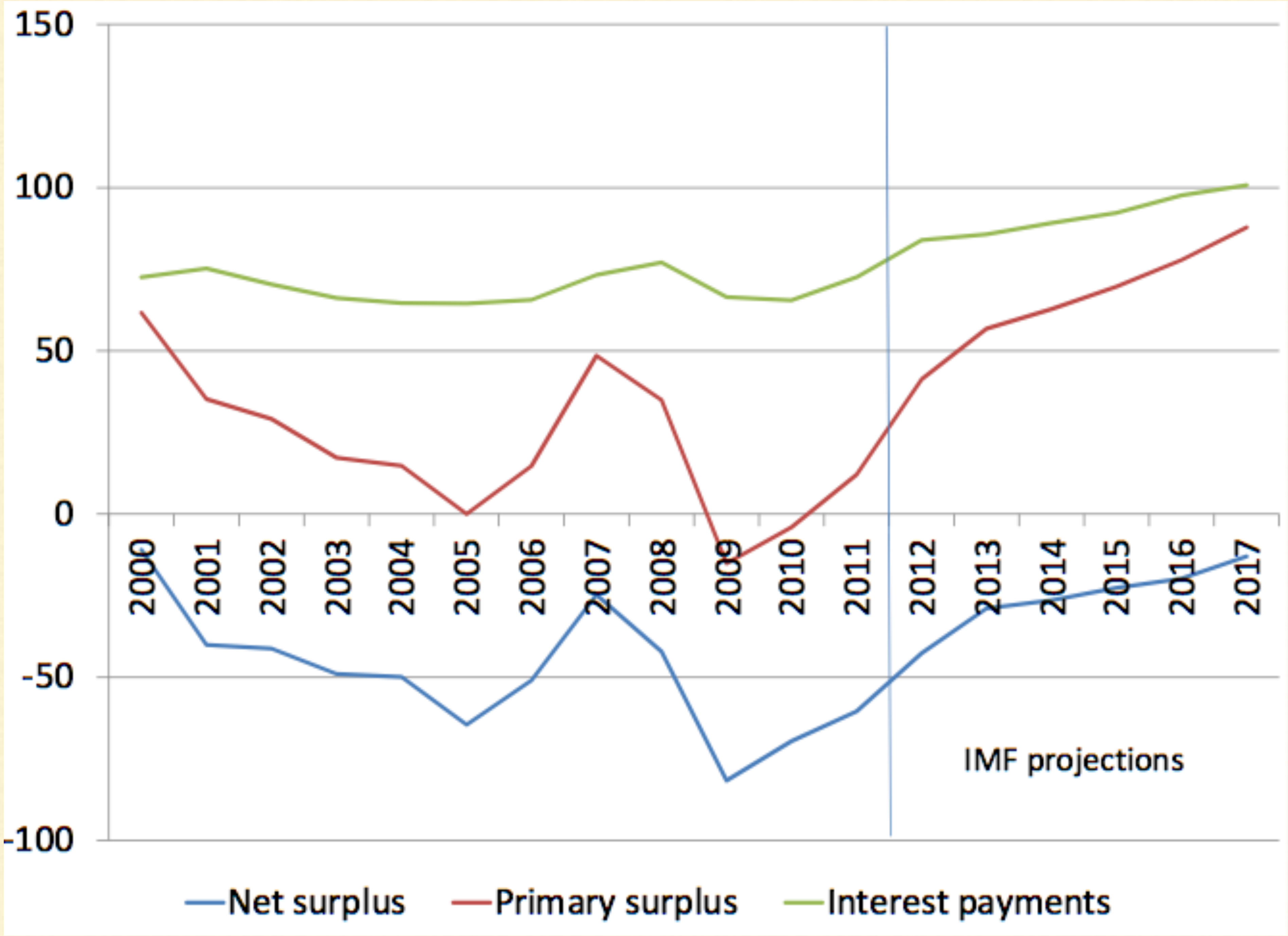
# SLOW MOVING CRISES

- Sovereign crises without immediate liquidity concern
  - unexpected sharp increase in spreads
  - treasury auctions keep going ok
  - gradual, but faster accumulation of debt despite efforts at fiscal adjustment
  - investors worry about medium-run debt dynamics
- Recent example: Italy

# ITALY: 10YR BOND YIELDS



# ITALY: GOVERNMENT BUDGET



# THIS PAPER

- Dynamic model of multiple equilibria with a fiscal rule
- Characterize maximum debt and crisis region
- What properties of fiscal rule help prevents crises?
- Also: timing/commitment issues and multiplicity

# CONNECTIONS

- Role of expectations: Calvo (1988)
- Liquidity crises: Cole-Kehoe (1998, 2000), Giavazzi-Pagano (1989), Alesina-Prati-Tabellini (1992), Chang-Velasco (1999)
- Related: Navarro, Nicolini, Teles (2014)
- Monetary/fiscal issues: Corsetti-Dedola (2014)

# OUTLINE

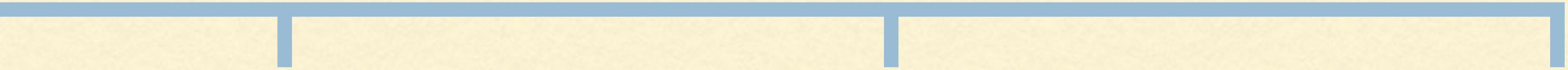
- Recursive derivation of debt capacity with short-term debt
- Applications: stationary model
- Microfoundations

# SHORT-TERM DEBT

- Time $t = 1, ..., T$
- Fiscal rule $F(s_t | s_{t-1}, b_t)$
- Zero recovery after default
- Budget constraint

$$q_t b_{t+1} + s_t = b_t$$

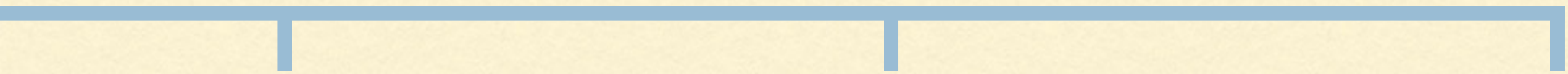
# SOLVING BACKWARDS



# SOLVING BACKWARDS

repay if

$s_T \geq b_T$



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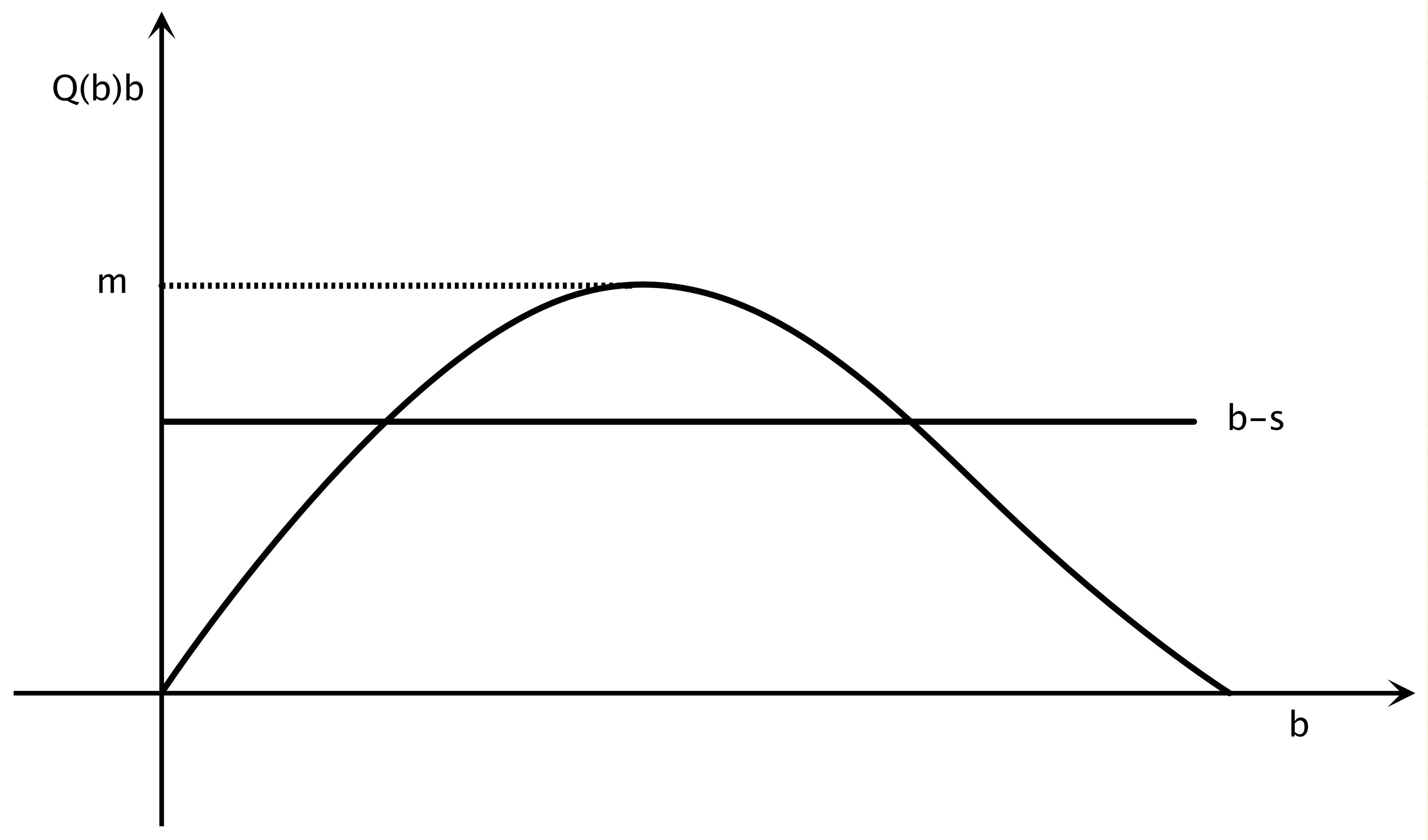
# SOLVING BACKWARDS

- Result: Maximal debt and price schedules uniquely defined
- Multiple equilibria?
  - Yes
  - $Q_t(b_{t+1}, s_t)b_{t+1}$ not monotone
  - Laffer curve

# LAFFER CURVE



# A STATIONARY EXAMPLE

- Continuous time
- With Poisson probability $\lambda$ uncertainty is realized
- At that point surplus *S* drawn from CDF *F(S)*
- If default, recover fraction of surplus
- Price at the Poisson event is

$$\Psi(b) = 1 - F(b) + \phi \frac{1}{b} \int_{\underline{S}}^{b} S dF(s)$$

# ODE

- Fiscal rule, increasing, *bounded above*

$$s = h(b)$$

- Budget constraint

$$q(\dot{b} + \delta b) + s = \kappa b$$

- Pricing condition

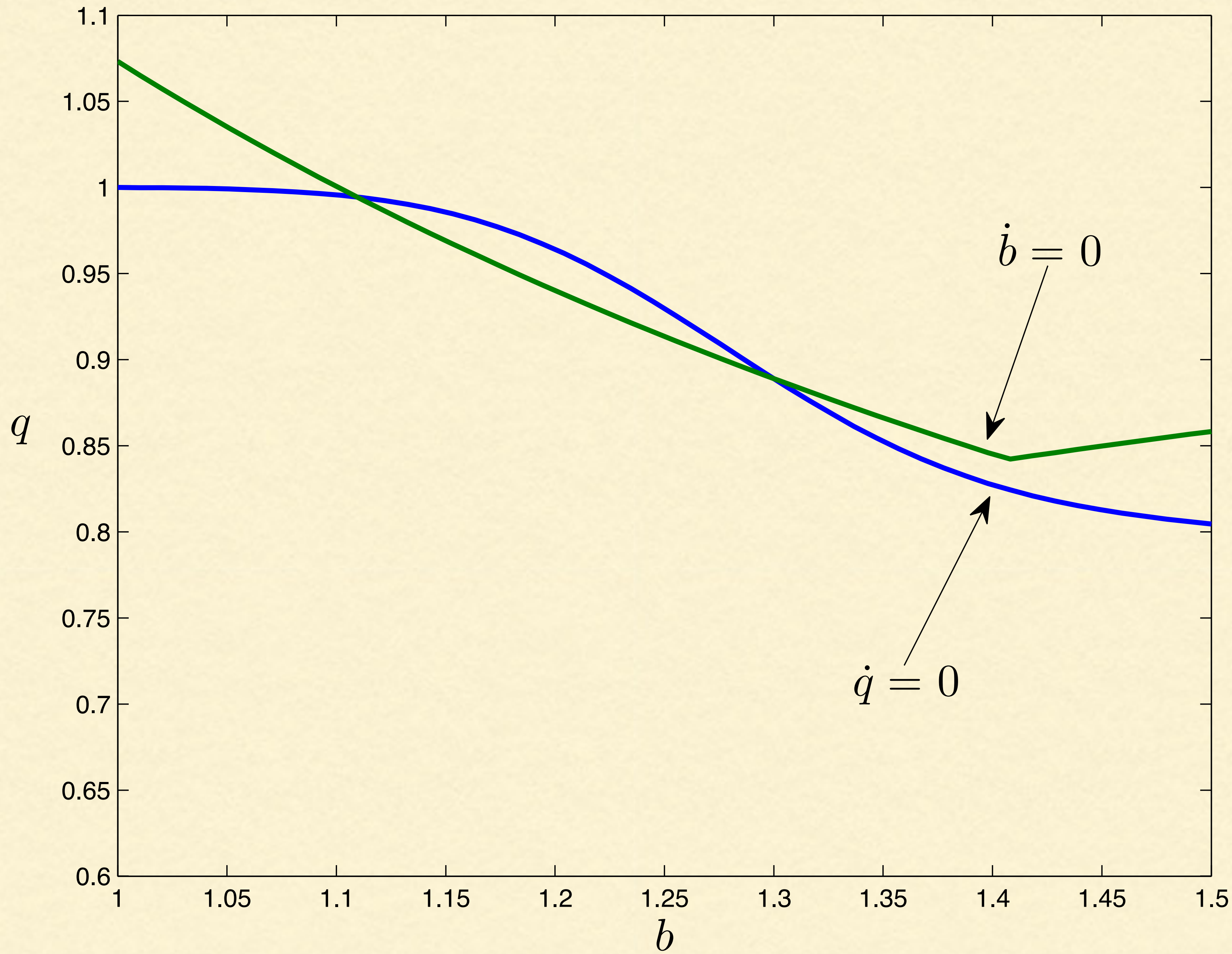
$$rq = \kappa - \delta q + \lambda(\Psi(b) - q) + \dot{q}$$

- ODEs in *b,q*

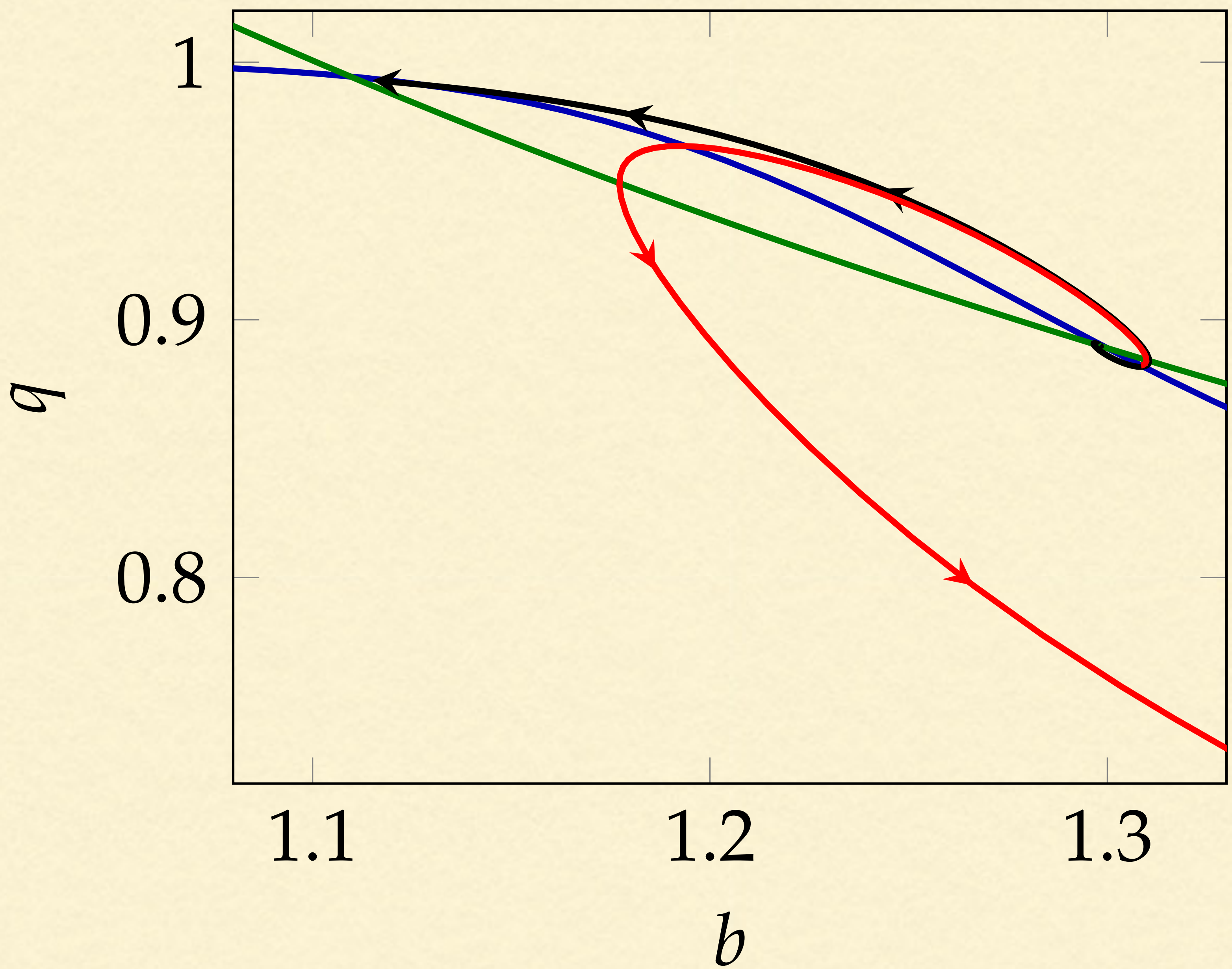
# TERMINAL CONDITIONS

- An equilibrium satisfies the ODE and a terminal condition:
  - Possibility 1: $b$ and $q$ converge to a steady state
  - Possibility 2:
$$b \to \infty, q \to 0$$
- Possibility 2 leads to default in finite time and constant debt value for $b$ large enough

# MULTIPLE STEADY STATES



# MULTIPLE EQUILIBRIA



# STABILITY

- With no default risk ODE boils down to

$$\dot{b} = rb - h(b)$$

- Stability condition (Leeper, 1991)

$$h'(b) > r$$

- Increase surplus faster than debt service

# STABILITY

- Steady state saddle path stable if

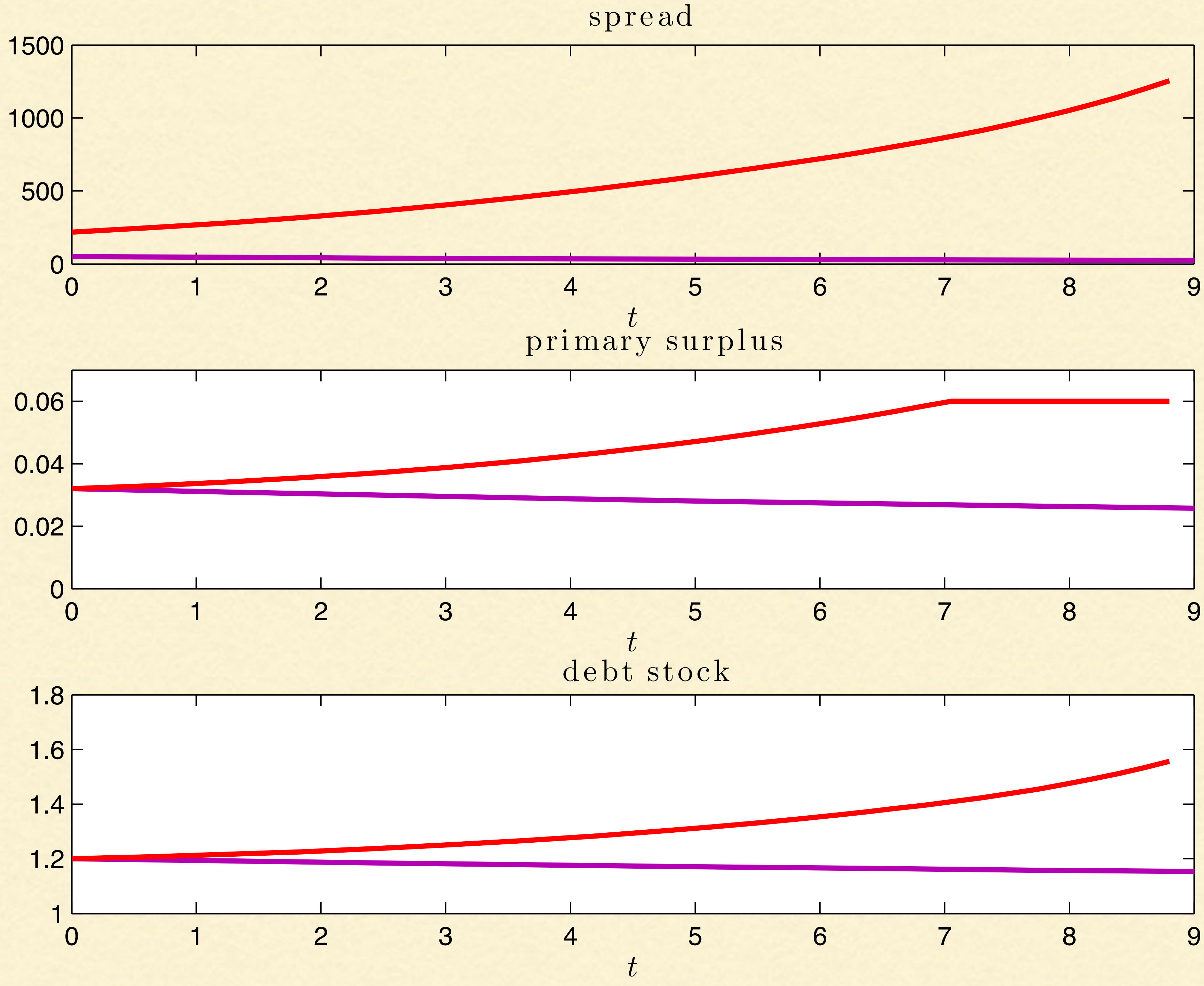
$$h'(b) > \kappa - \delta q - \frac{\delta\lambda}{r+\delta+\lambda}\Psi'(b)b$$

- This is stronger than

$$h'(b) > r$$

- **Result**: If *h* function bounded and there is a stable s.s., there must also be another s.s. with higher debt

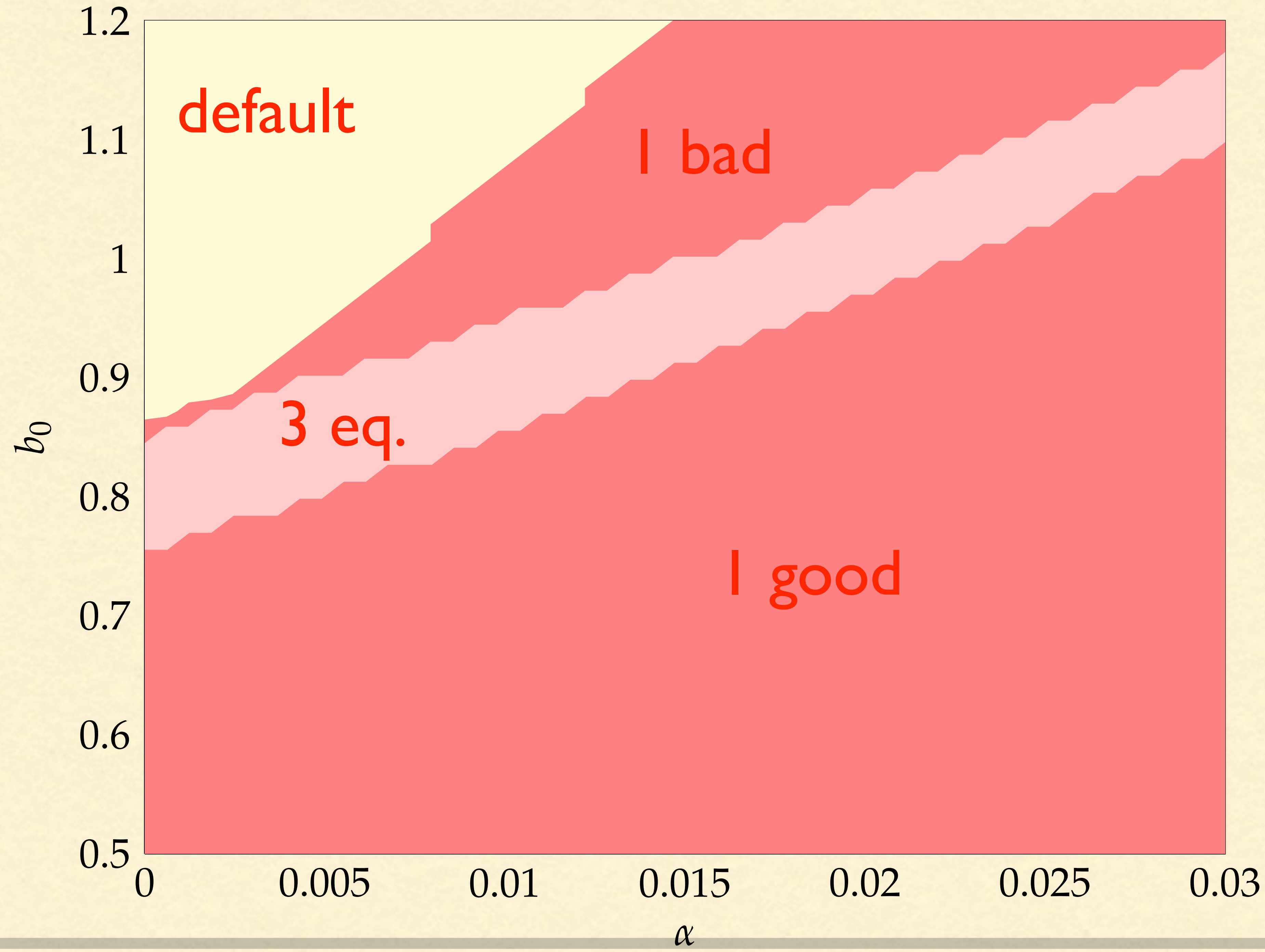
# A SLOW MOVING CRISIS



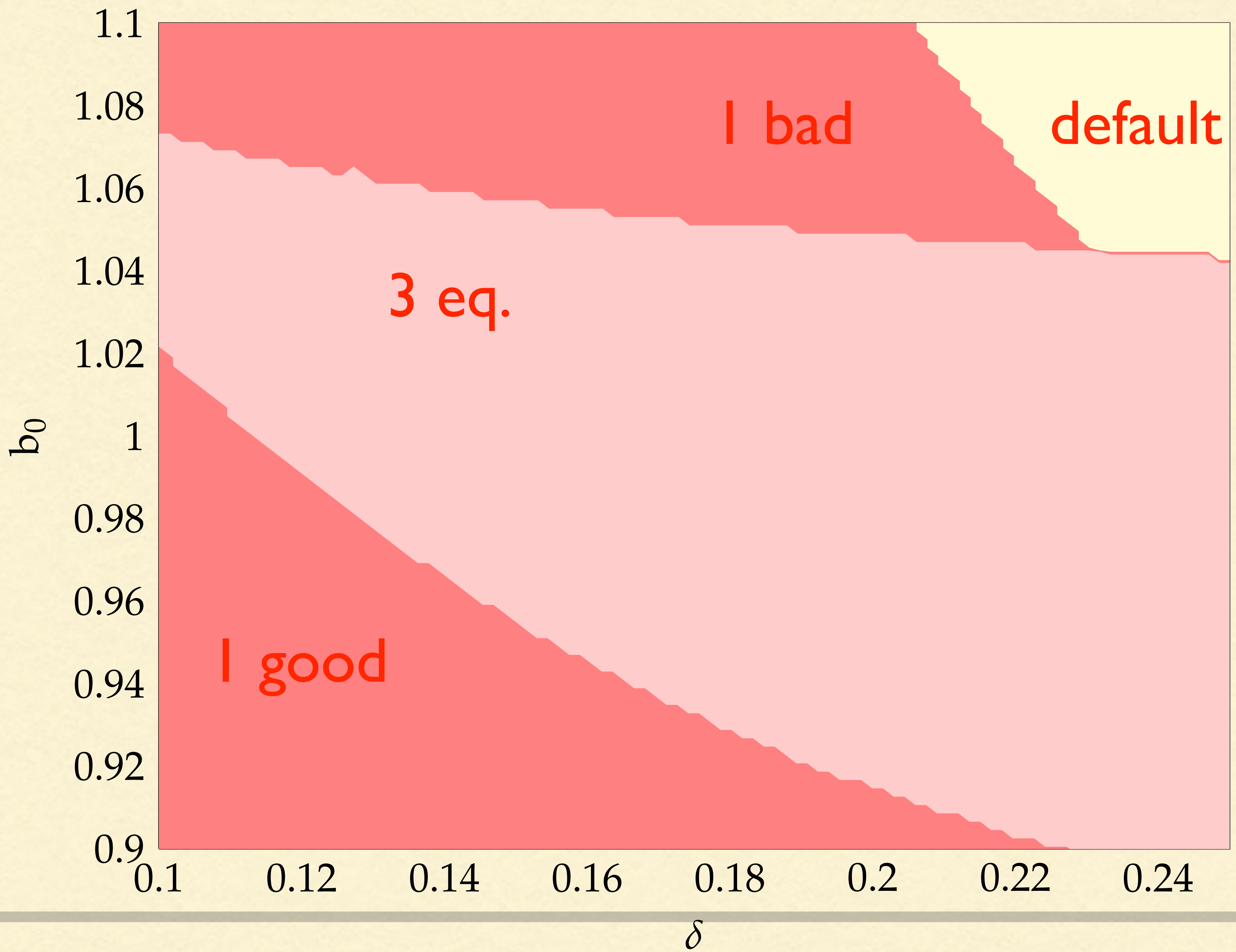
# SUMMING UP

- Conditions for "sustainability" are tighter than under risk-free debt
- Even if sustainability condition satisfied, basin of attraction is not necessarily safe
- Equilibrium is eventually unique

# REGIONS: RULE



# REGIONS: MATURITY



# MICROFOUNDATIONS

- Goal
  - write down a “game”
  - government chooses debt...
  - ... but cannot commit to not go back
  - solve it and show “Calvo outcome”

# MODEL

- Three periods
- Bonds only pay in 3
- Objective of borrower is $U(c_0, c_1, c_2)$
- Issue bonds at t=0 and t=1: $c_0 = q_0 b_0 \quad c_1 = q_1(b_1 - b_0)$
- Repayment at t=2 depends on bonds issued and shock

# MULTIPLICITY AT T=1

- Best response

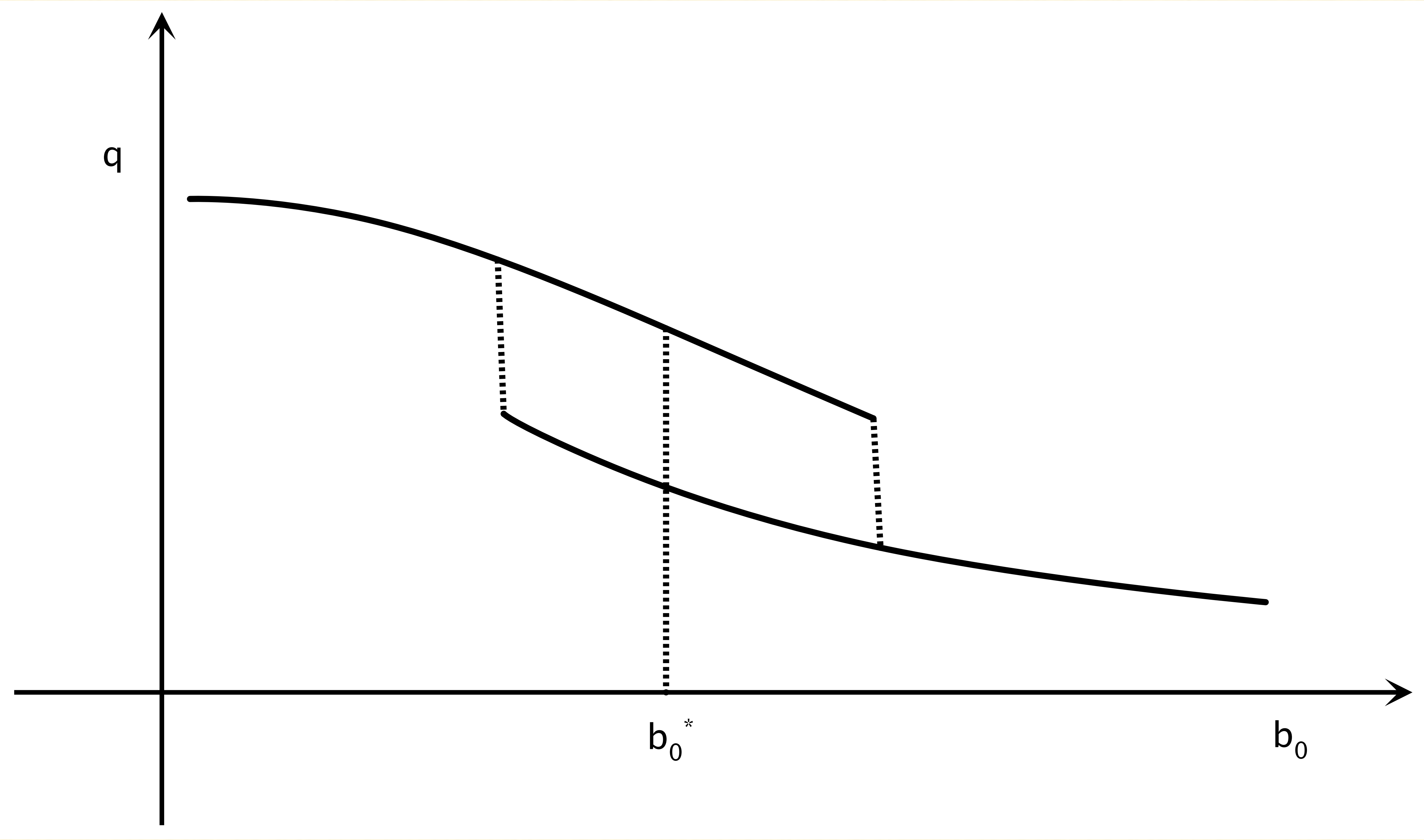
$$B_1(b_0, q_0)$$

- Rational expectations

$$q_0 = 1 - F(B_1(b_0, q_0))$$

- Multiplicity possible if preferences non-separable: low resources raised in 0 increase incentive to borrow at 1

# DO WE GET THERE?



# FINAL REMARKS

- Slow Moving Crises
    - dynamic Calvo
    - different from liquidity crisis a la Cole-Kehoe
- Tipping points and tipping regions
- Local/global properties of fiscal rule