EABCN Training School: Monetary-Fiscal Policy Interactions

Lecture 9. Sovereign Default Risk Premia & Fiscal Policy

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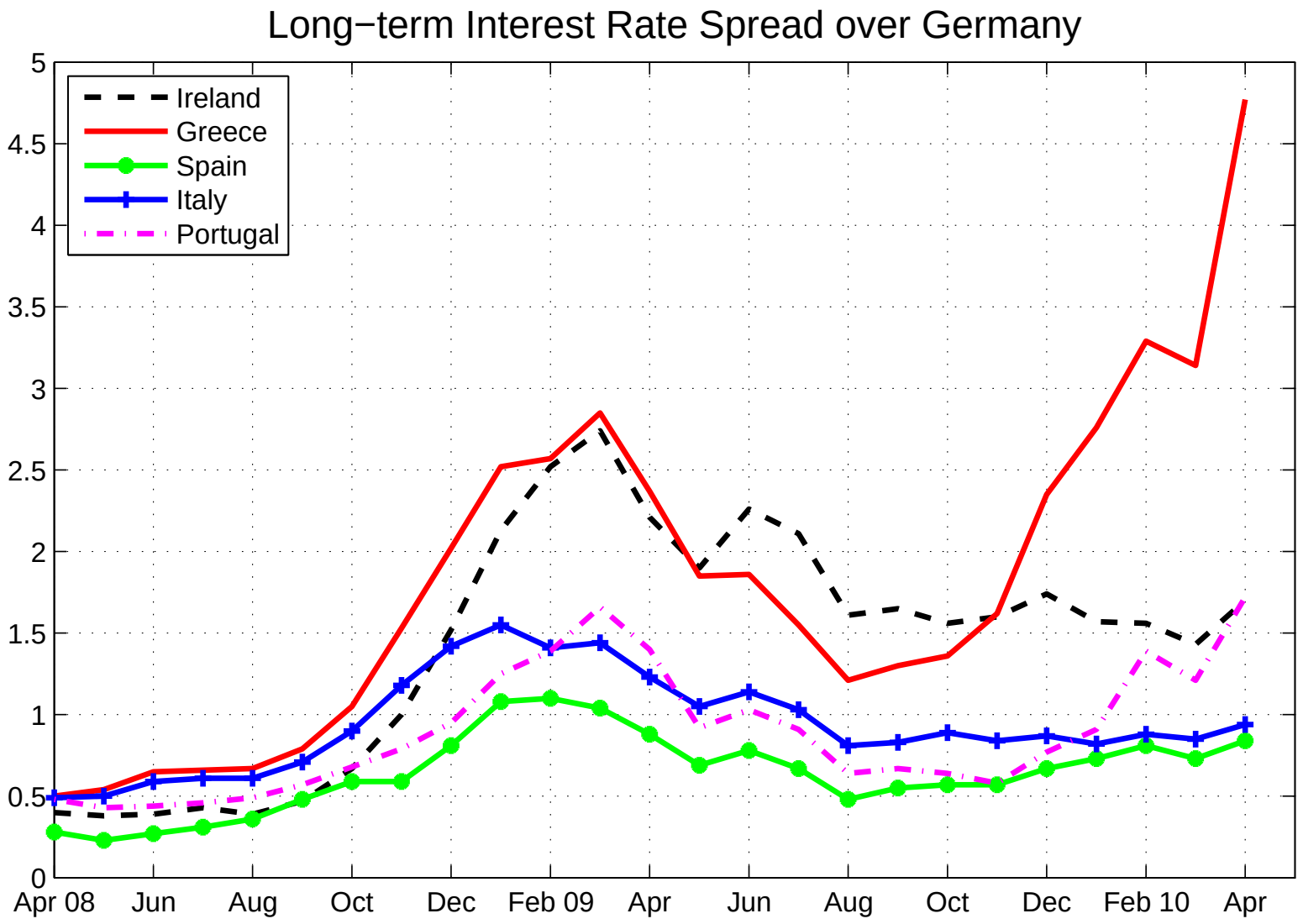
THE QUESTIONS

- Draws on Bi (2009), “Sovereign Default Risk Premia, Fiscal Limits and Fiscal Policy,” and Bi & Leeper (2010), “Sovereign Debt Risk Premia and Fiscal Policy in Sweden”
- How do sovereign default risk premia interact with fiscal policy?
- How do institutional changes to fiscal behavior affect sovereign debt risk premia?

The Findings

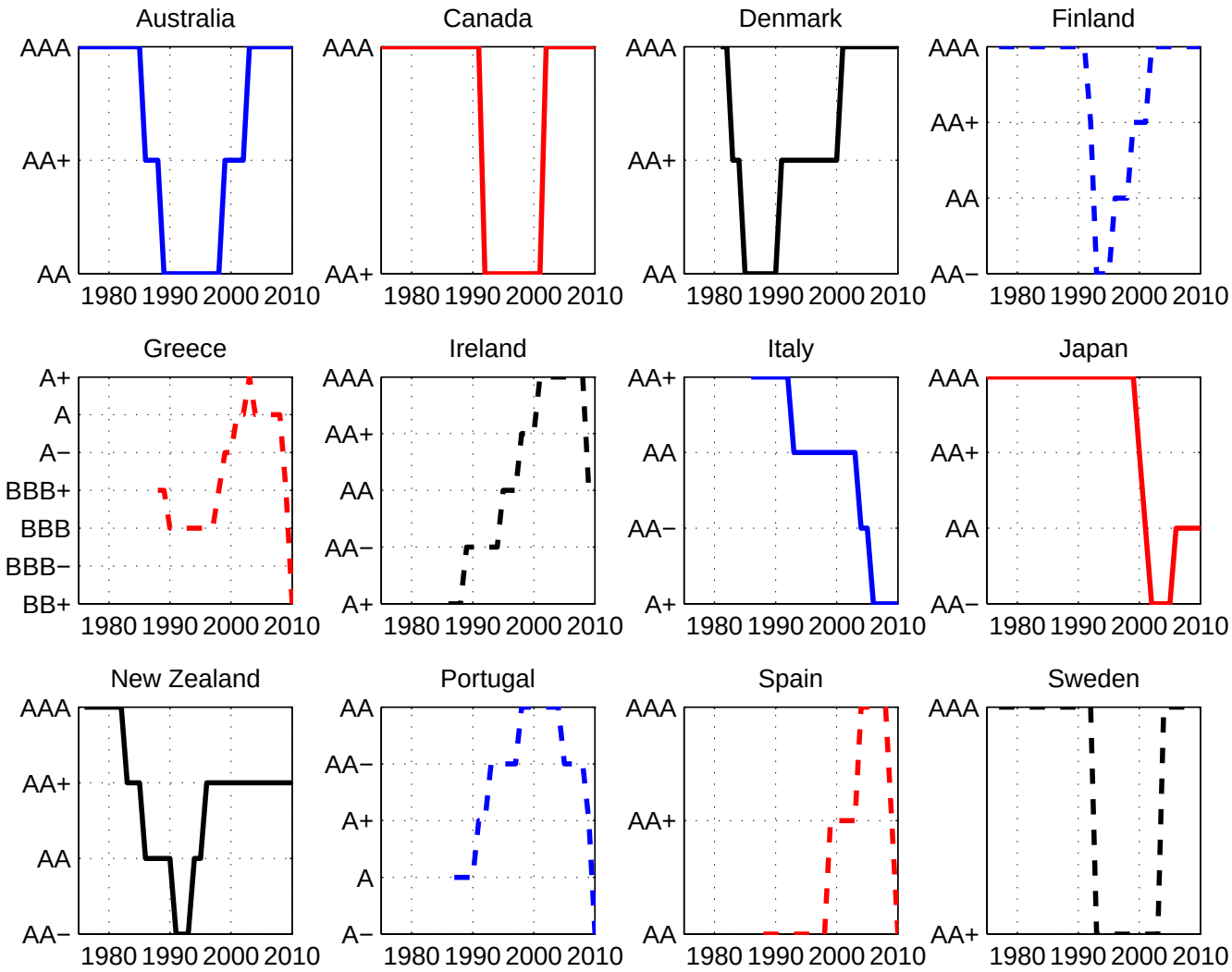
- Fiscal limits are country specific:
  - depend on government size, degree of countercyclical fiscal policy, political risk, and shock processes
- Risk premia are nonlinear in level of government debt
- Long-term bonds can provide early warning
- Fiscal reforms can significantly shift distribution of fiscal limits

Recent Sovereign Risk Premia

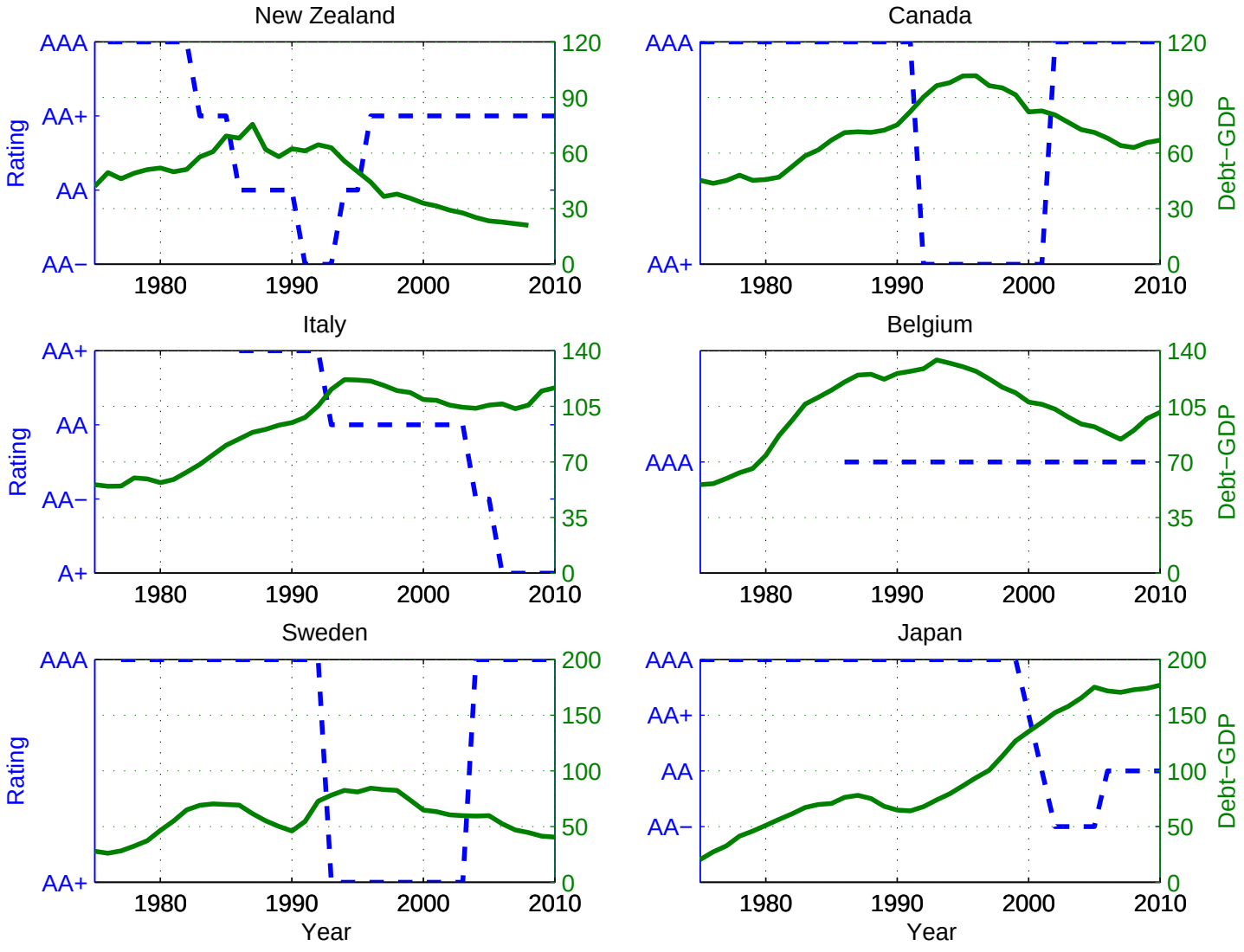


Historical Sovereign Ratings

- OECD sovereign bonds are not always risk-free



Evidence 1: Sovereign Downgrades



Evidence 2: Empirical Relations

Risk premium responds to government indebtedness nonlinearly:

- Bayoumi, Goldstein and Woglom (1995): U.S. municipal bond;
- Alesina, De Broeck, Prati and Tabellini (1992); Ardagna, Caselli and Lane (2007): OECD data
- Bernoth, von Hagen and Schuknecht (2006), Haugh, Ollivaud and Turner (2009): Euro data

A Model

Exogenous technology and government spending:

$$\begin{aligned} \ln \frac{A_t}{A} &= \rho^u \ln \frac{A_{t-1}}{A} + \varepsilon_t^A \qquad \varepsilon_t^A \sim \mathcal{N}(0, \sigma_A^2) \\ \ln \frac{g_t}{g} &= \rho^e \ln \frac{g_{t-1}}{g} + \varepsilon_t^g \qquad \varepsilon_t^g \sim \mathcal{N}(0, \sigma_g^2) \end{aligned}$$

Household problem:

$$\max \qquad E_0 \sum_{t=0}^{\infty} \beta^t u\left(c_t, L_t\right)$$

$$s.t. \qquad A_t(1-\tau_t)(1-L_t) + z_t - c_t = b_t q_t - \underbrace{(1-\Delta_t) b_{t-1}}_{b_t^d}$$

FOC:

$$\begin{aligned} \frac{u_L(t)}{u_c(t)} &= A_t\left(1-\tau_t\right) \\ q_t &= \beta E_t\left[(1-\Delta_{t+1}) \frac{u_c(t+1)}{u_c(t)}\right] \end{aligned}$$

A Model

Government budget:

$$\tau_t A_t(1-L_t) + b_t q_t = g_t + z_t + \underbrace{(1-\Delta_t)b_{t-1}}_{b_t^d}$$

- Unenforceable bond contract:

$$\Delta_t = \begin{cases} 0 & \text{if } b_{t-1} < b_t^* \text{ with } b_t^* \sim \mathcal{N}(b^*, \sigma_b^2) \\ \delta & \text{if } b_{t-1} \geq b_t^* \end{cases}$$

- Debt-stabilizing tax rule:

$$\tau_t - \tau = \gamma\left(b_t^d - b\right)$$

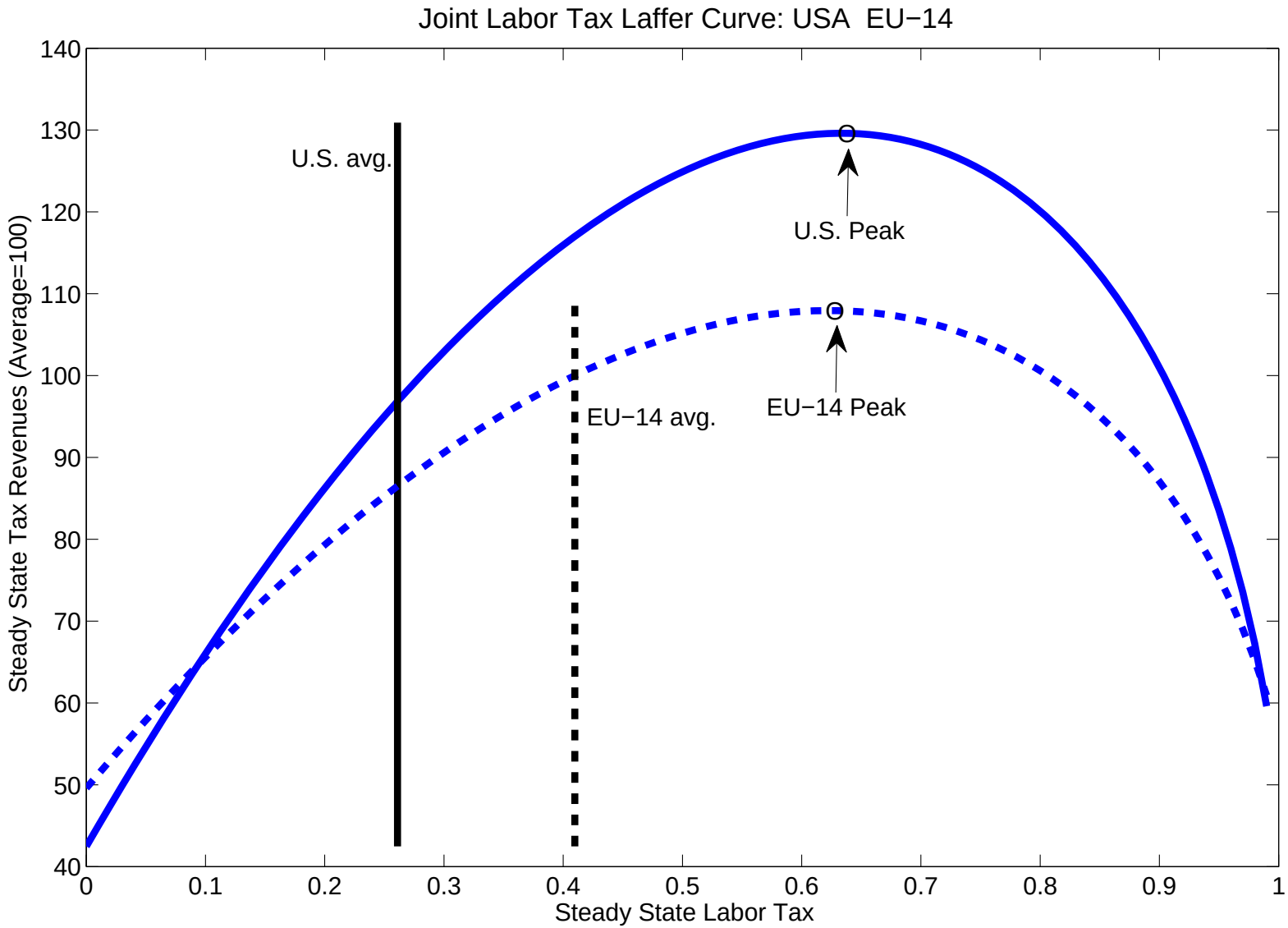
- Countercyclical lump-sum transfers:

$$\ln \frac{z_t}{z} = -\zeta^z \ln \frac{A_t}{A}$$

Two Key Elements in the Analysis

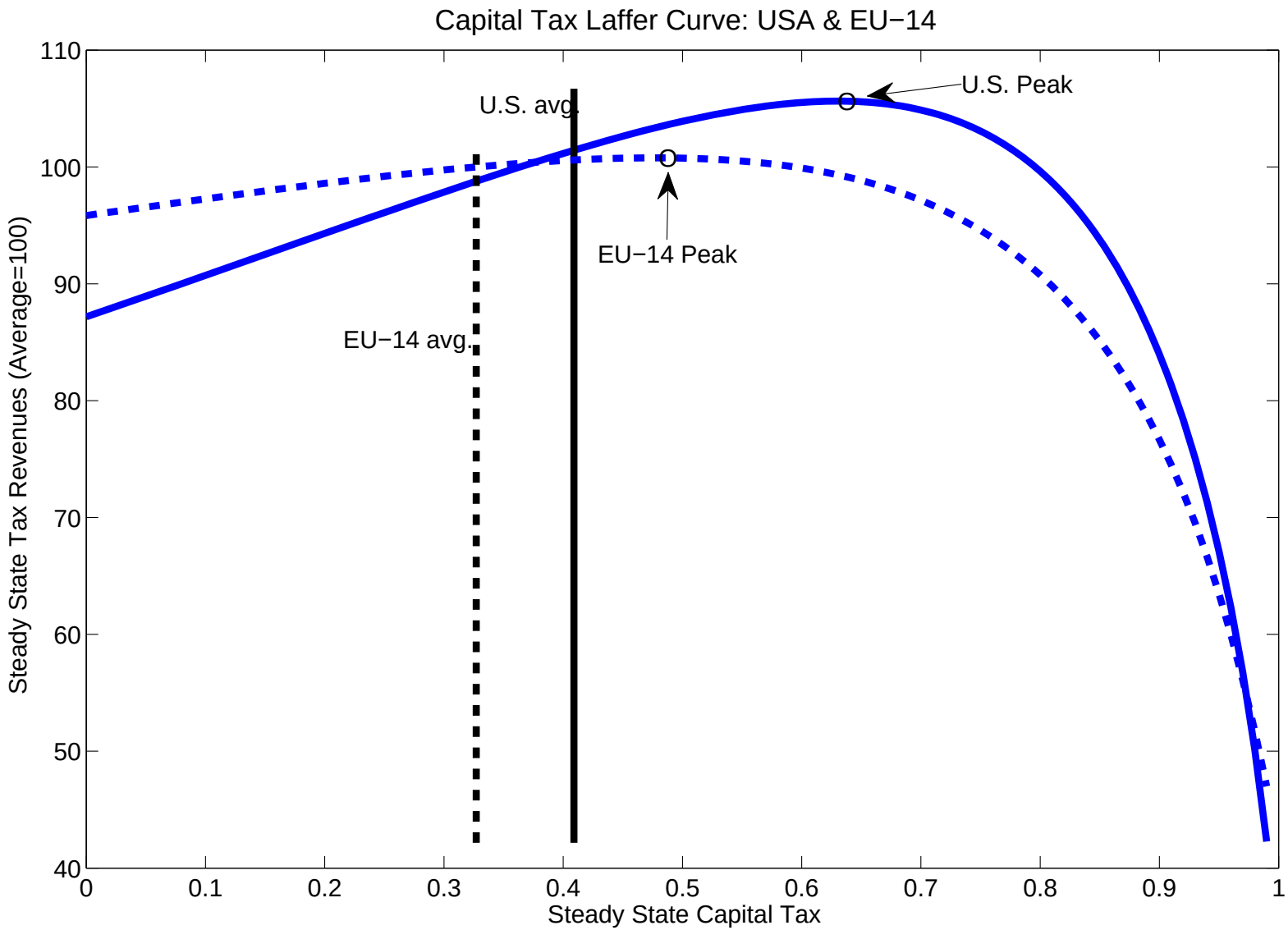
- Distribution of fiscal limits
- Nonlinear simulation under sequences of bad shocks

Steady State Labor Laffer Curves



Source: Trabandt & Uhlig

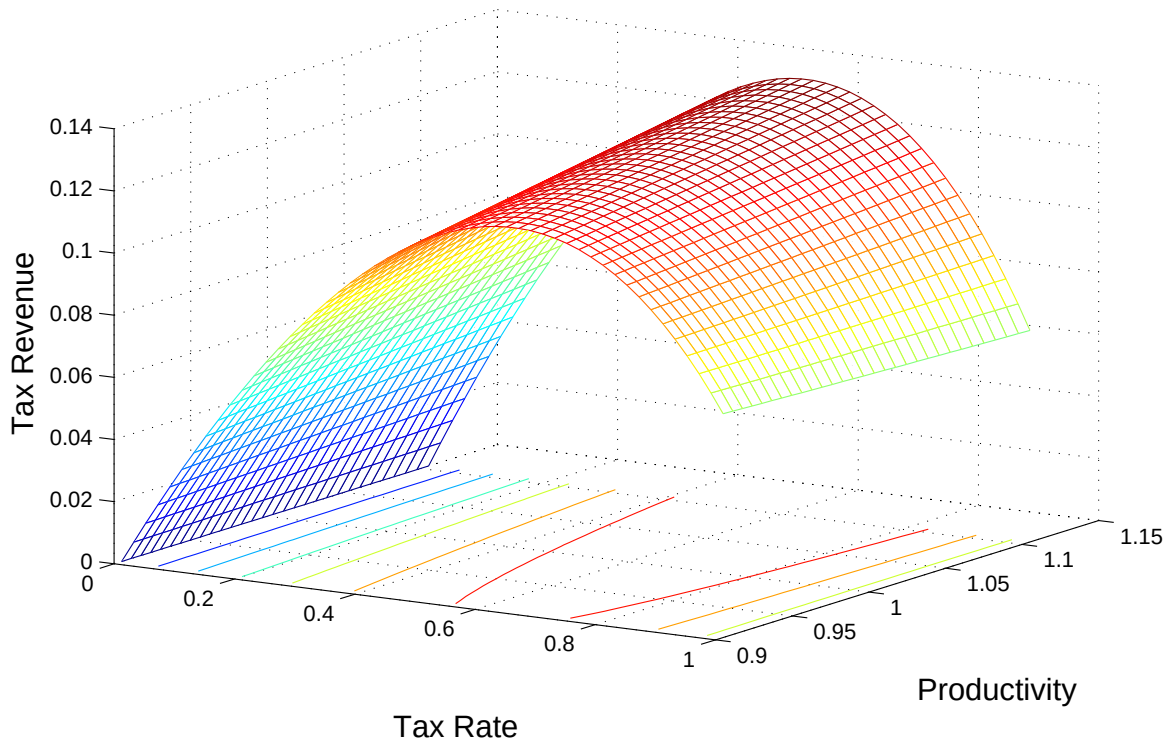
Steady State Capital Laffer Curves



Source: Trabandt & Uhlig

Dynamic Laffer Curve

$$
\begin{aligned}
T_t &= \tau_t A_t (1 - L_t) \\
\Rightarrow T^{max}(A, g) &= \mathcal{T}(\tau^{max}(A, g); A, g)
\end{aligned}
$$



FISCAL LIMIT

Fiscal limit: maximum sustainable level of government debt

$$\mathcal{B}^* = E_0 \sum_{t=0}^{\infty} \underbrace{\frac{u_c^{max}(t)}{u_c^{max}(0)}}_{\text{discount rate}} \underbrace{\theta_t}_{\text{political risk}} \underbrace{(T_t^{max} - g_t - z_t)}_{\text{future max fiscal surplus}}$$

The distribution depends on:

- Government size: g/y and z/y
- Countercyclical lump-sum transfers: ζ^z
- Political risk: $0 < \theta_t \leq 1$ (ICRG index)
  Standard & Poor's (2008): "*stability*, *predictability*, and *transparency* of a country's political institutions are important considerations. . . "
- Shock processes

MCMC simulation:

- Simulate N paths to approximate $\mathcal{N}(b^*, \sigma_b^2)$.

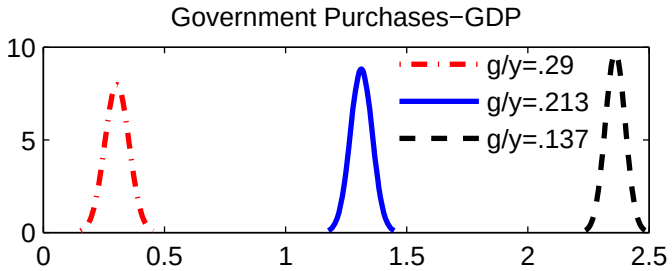
FISCAL LIMIT: GENERAL COMPARISON

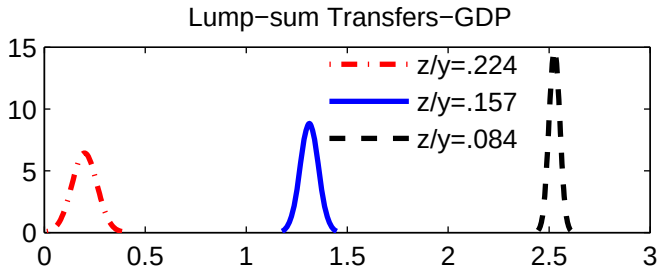
- Benchmark case: average across developed countries (1971-2007)

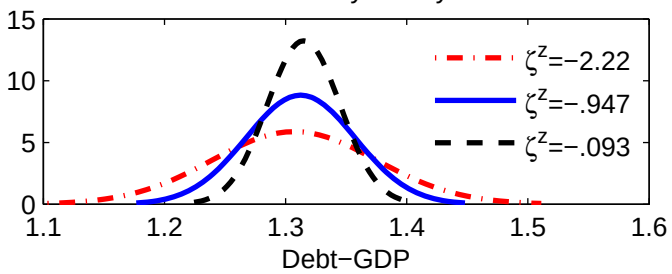
τ^L	g/y	z/y	ζ^z	θ	ρ^A	σ^A	ρ^g	σ^g
0.362	0.213	0.157	-0.947	0.83	0.553	0.02	0.553	0.02

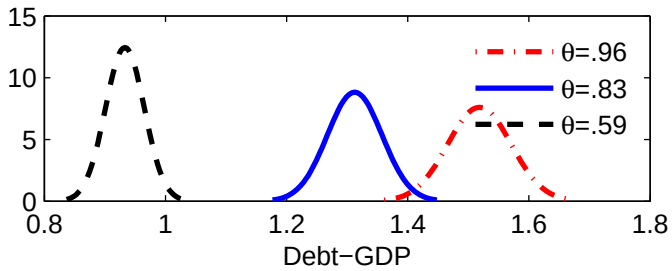
- Comparison: change one parameter each time
  - In the following figure:
    - red is Sweden ($g/y = .29$, etc)
    - black is Switzerland ($g/y = .137$, etc)
    - blue is averaged across developed countries ($g/y = .213$, etc)

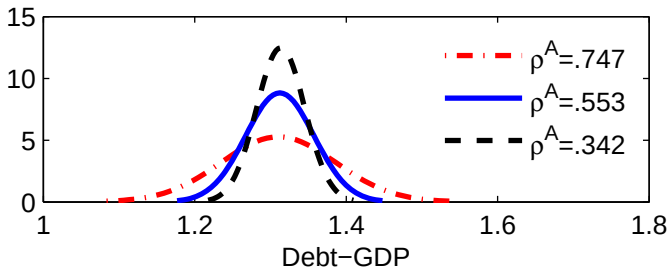
FISCAL LIMIT: SIMULATION

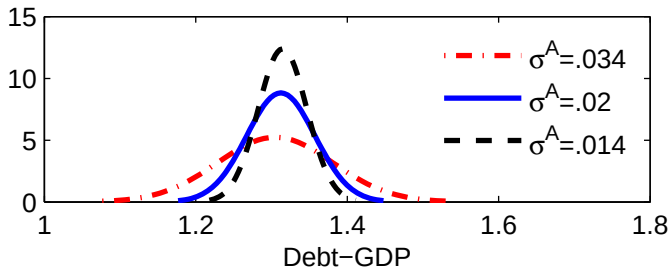


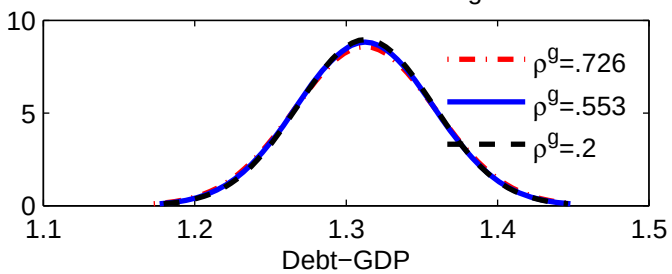


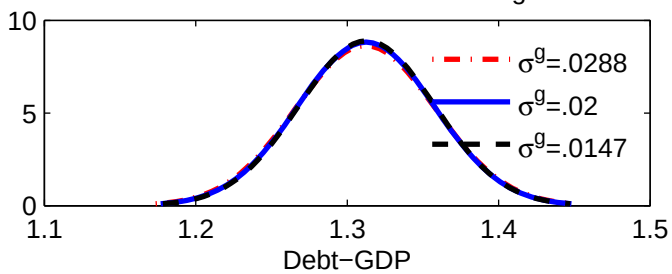




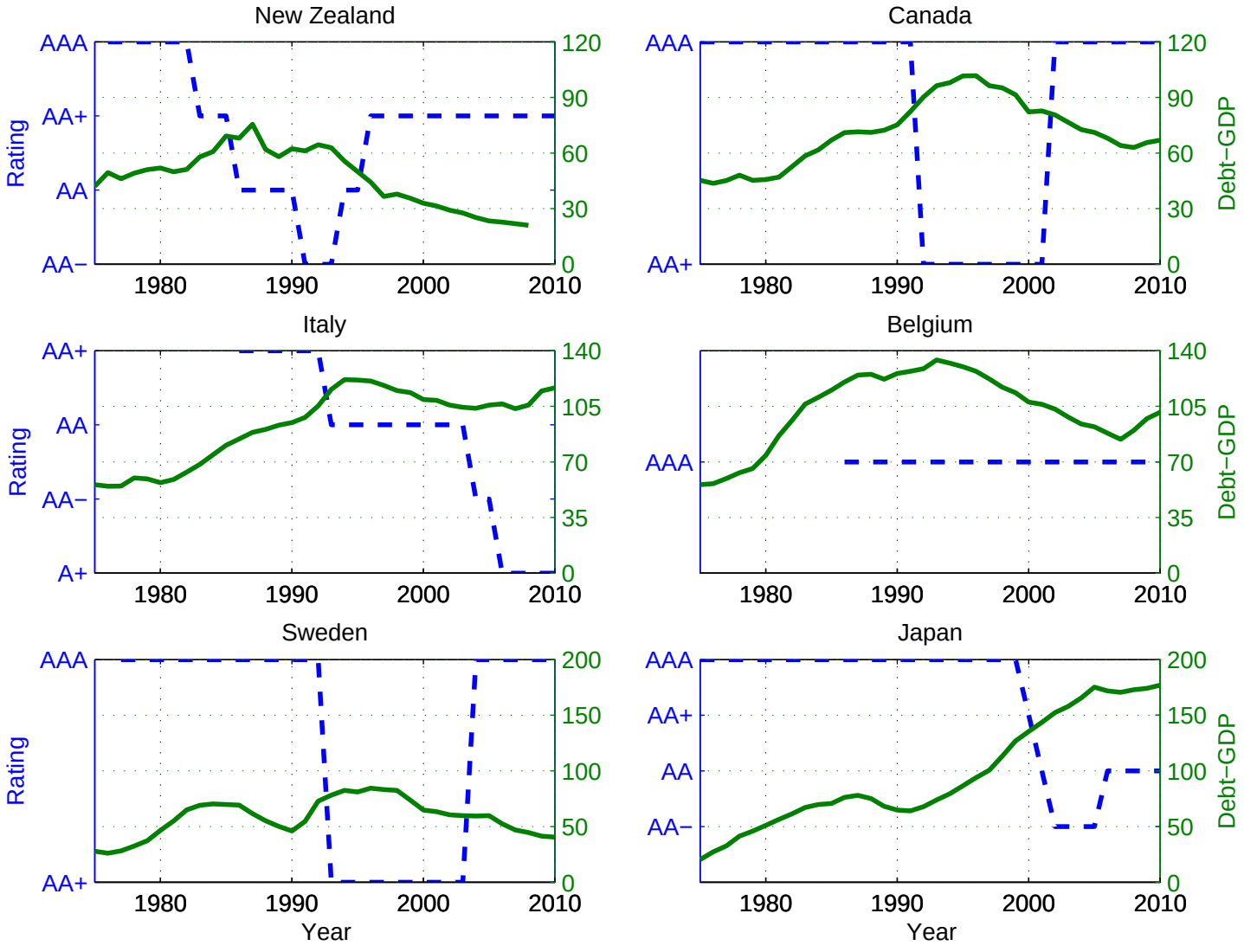








Fiscal limit: Data



FISCAL LIMIT: COUNTRY COMPARISON

Canada vs. New Zealand: shock process

τ^L	g/y	z/y	ζ^z	θ	ρ^A	σ^A
0.32	0.21	0.13	-1.25	0.85	0.6	0.02/0.04

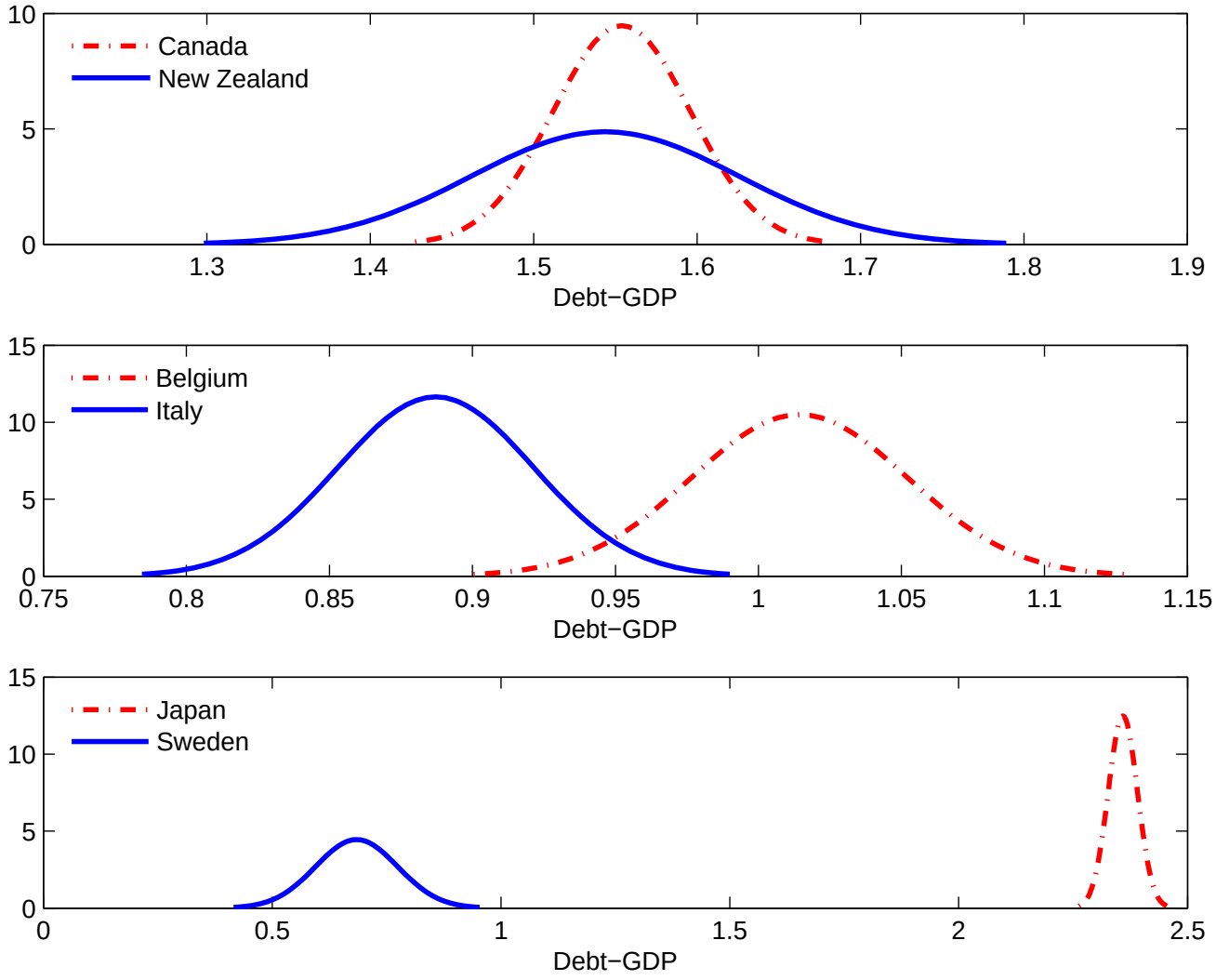
Belgium vs. Italy: political risk

τ^L	g/y	z/y	ζ^z	θ	ρ^A	σ^A
0.4	0.225	0.18	-0.63	0.8/0.7	0.68	0.025

Japan vs. Sweden: government size and countercyclical transfers

τ^L	g/y	z/y	ζ^z	θ	ρ^A	σ^A
0.32	0.162/0.29	0.1/0.195	-1.15/-2.22	0.86	0.6	0.018

Fiscal limit: Country comparison (simulation)



NONLINEAR SOLUTION

Monotone mapping method (Coleman (1991), Davig (2004)):

$$q_t = \beta E_t \Big((1 - \Delta_{t+1}) \frac{u_c(t+1)}{u_c(t)} \Big) \tag{1}$$

$$\frac{b_t^d + g_t + z(\psi_t) - \tau(\psi_t) A_t \Big(1 - L(\psi_t) \Big)}{f^b(\psi_t)}$$

$$= \beta E_t \left\{ \Big(1 - \Delta(f^b(\psi_t), b_{t+1}^*) \Big) \frac{u_c(f^b(\psi_t), A_{t+1}, g_{t+1}, b_{t+1}^*)}{u_c(\psi_t)} \right\} \tag{2}$$

- Grid points of 3-dimension state space, $\psi_t = (b_t^d, g_t, A_t)$, using Tauchen (1991)
- Initial guess of the decision rule $f_0^b(.)$ ($b_t = f_0^b(\psi_t)$)
- Update the decision rule $f_i^b(.)$ by iterating over equation (2) until it converges $(\epsilon = 1e - 8)$

  Numerical integration: Newton-Cotes formulas.

CALIBRATION

- Default scheme: A higher uncertainty of fiscal limits implies higher δ

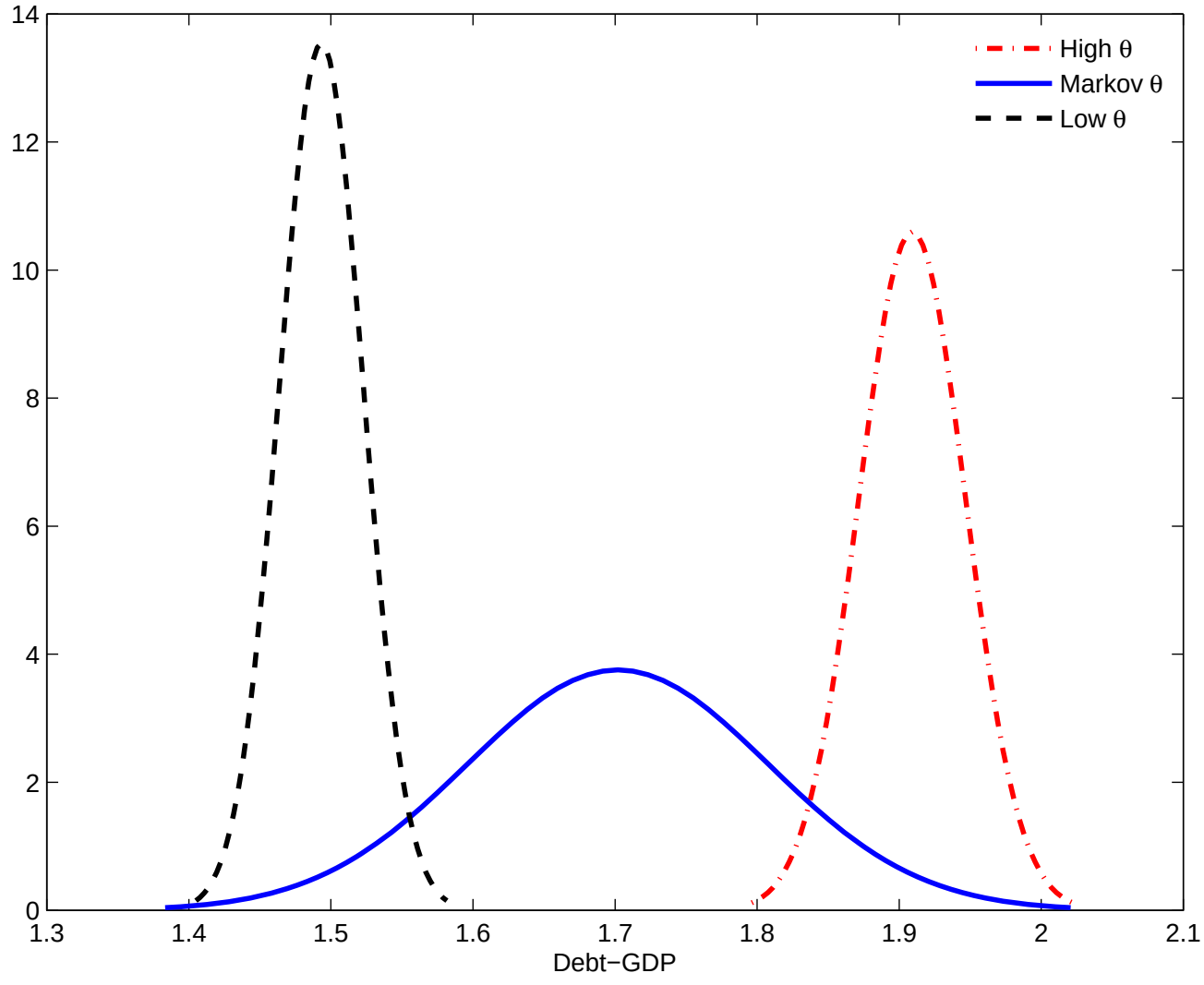
$$\Delta_t = \begin{cases} 0 & \text{if } b_{t-1} < b_t^* \\ \delta \equiv \frac{2\sigma_b}{b^*} & \text{if } b_{t-1} \geq b_t^* \end{cases} \qquad (b_t^* \sim \mathcal{N}(b^*, \sigma_b^2))$$

- Calibrate to Greece (1971 - 2007):

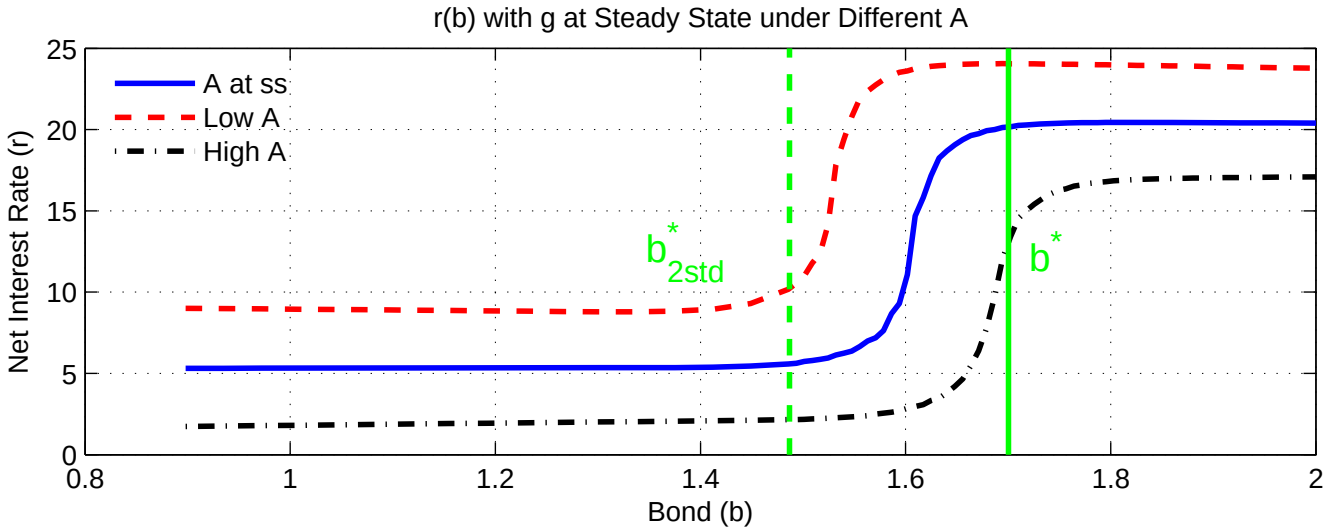
τ^L	γ	z/y	ζ^z	g/y	ρ^g	σ^g
0.32	0.42	0.134	-0.45	0.167	0.426	0.0294
θ_H	θ_L	p	β	L	ρ^A	σ^A
0.78	0.61	$1/13$	0.95	0.75	0.45	0.0328

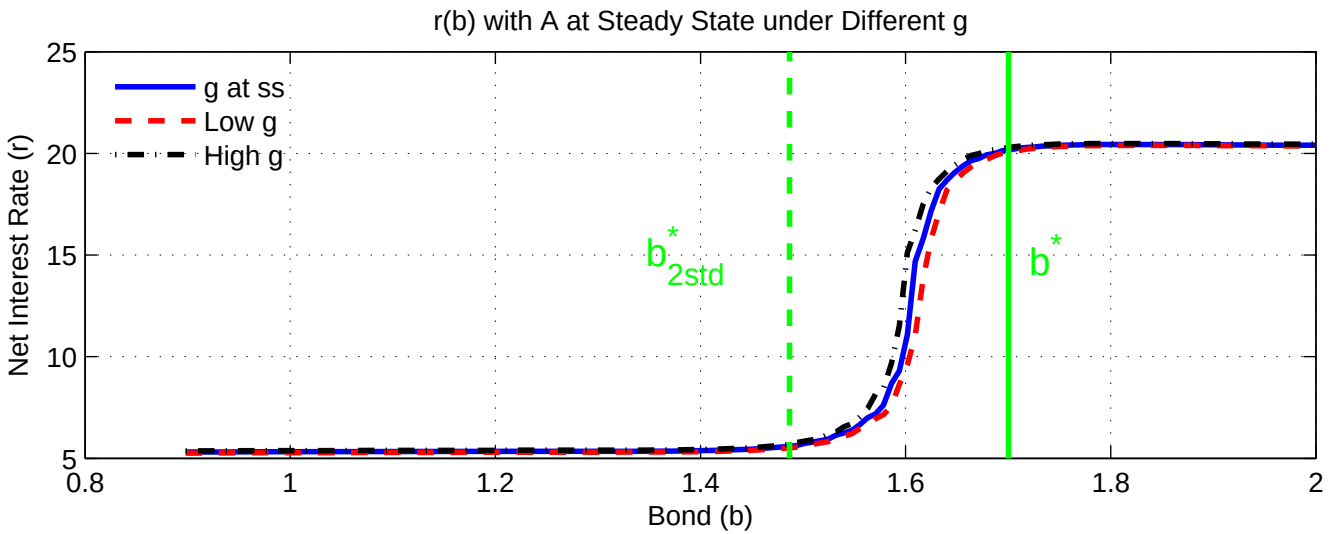
  - Markov switching θ_t: $\theta_t \in \{\theta_H, \theta_L\}$ with $p_{LL} = p_{HH} = p$

Fiscal Limit: Greece



DECISION RULE: $R(b^d, A, g)$



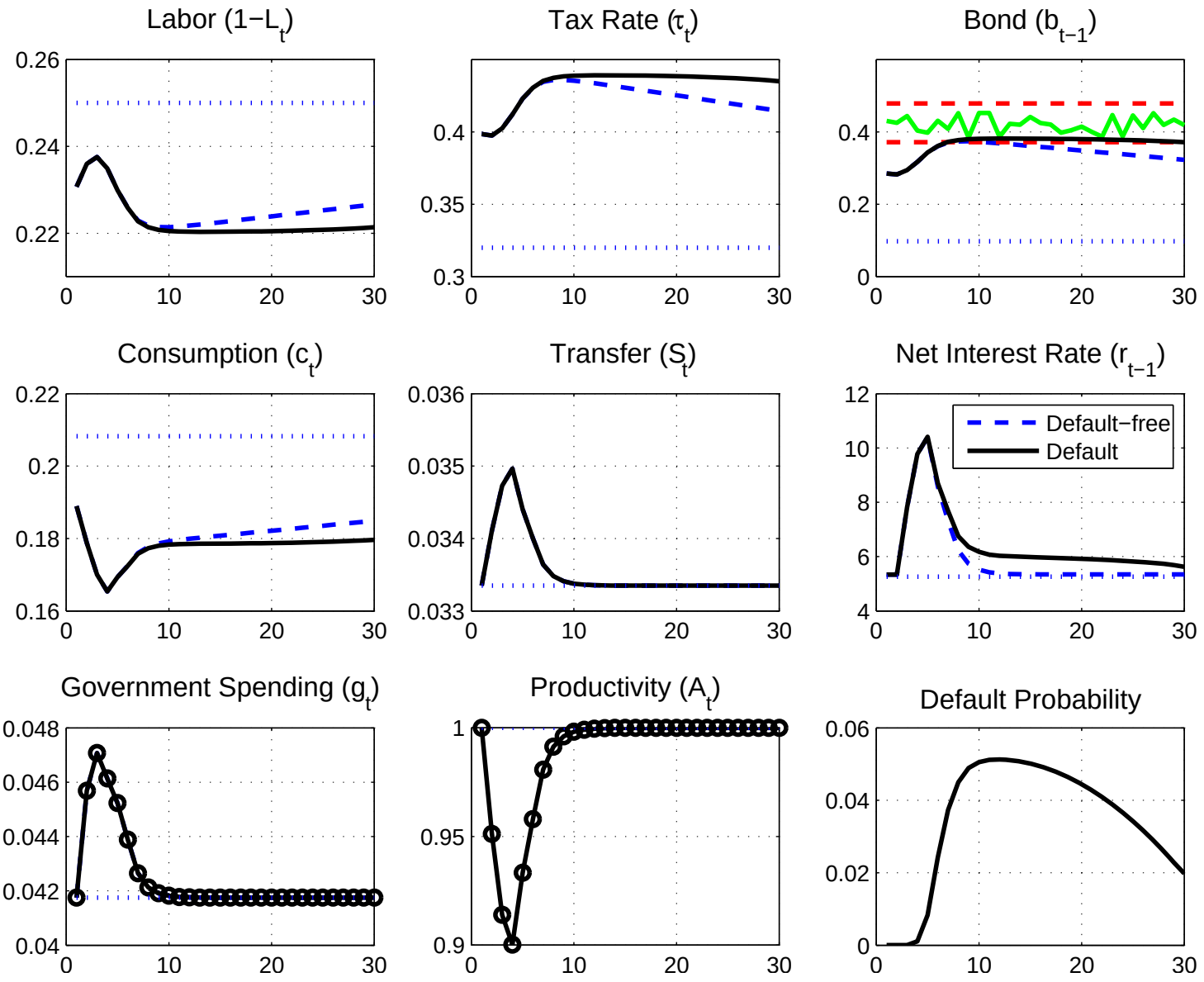


SIMULATION: A SEVERE RECESSION

- Given the paths of A_t and g_t.
- At each period, the effective fiscal limit (b_t^*, green line) is drawn from the approximated distribution.
- The paths of $c_t, L_t, \tau_t, b_t, r_t$ are determined by equilibrium conditions.

	t=1	t=2	t=3	t=4	t=5	t= 6
A_t	-4.88%	-8.61%	-9.97%	-6.67%	-4.21%	-1.92%
g_t/y_t	20.35%	21.68%	21.81%	21.08%	20.29%	19.52%

Nonlinear Simulation



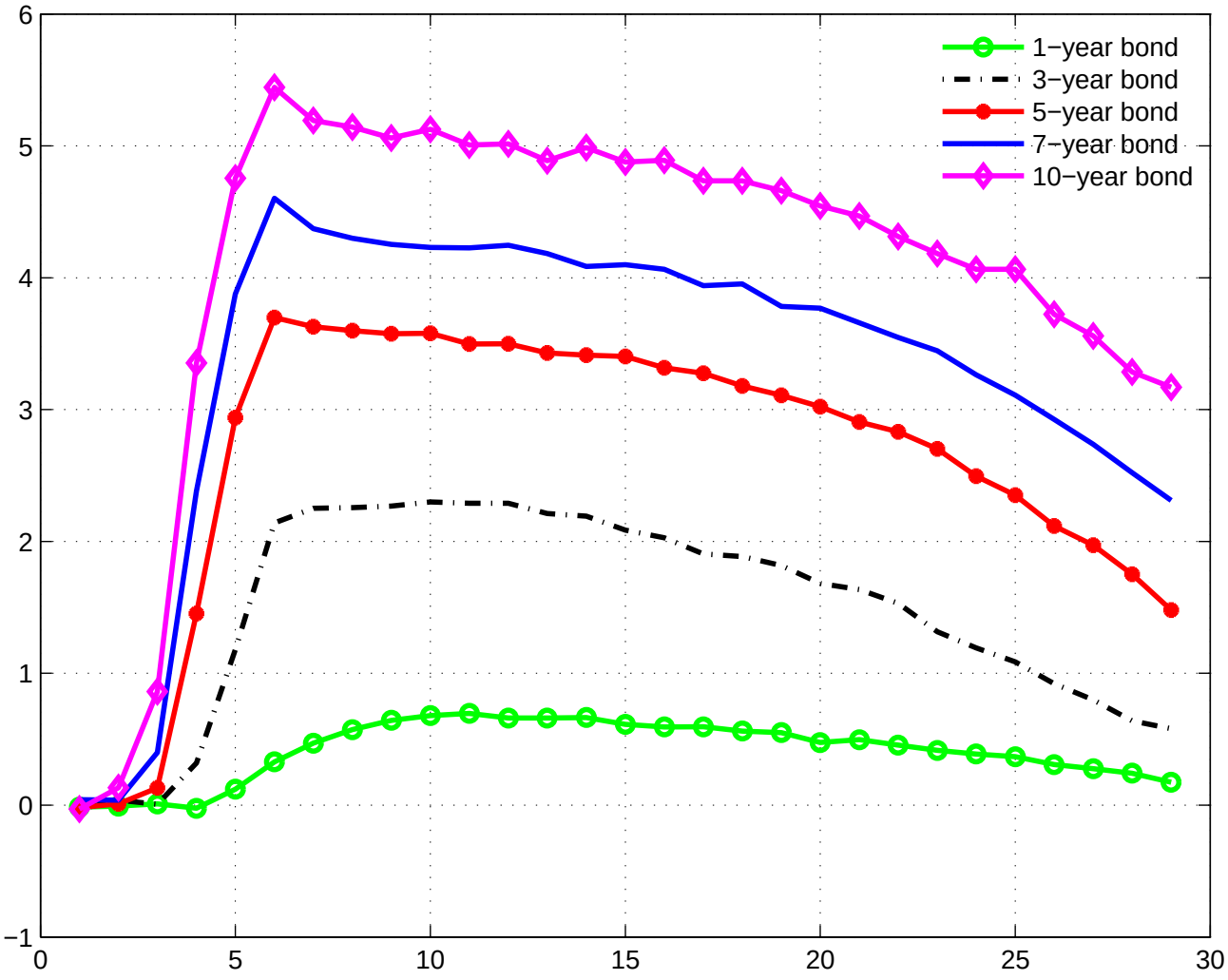
LONG-TERM BONDS

- Price of long-term bond with maturity n:

$$
\begin{aligned}
Q_t^n &= \beta^n E_t \left((1 - \Delta_{t+n}) \frac{u_c(t+n)}{u_c(t)} \right) \\
r_t^{n\Delta} &= \frac{1}{Q_t^n} - \frac{1}{Q_t^{nf}}
\end{aligned}
$$

- Solution: finite-element method

Simulation: Long-term Bonds

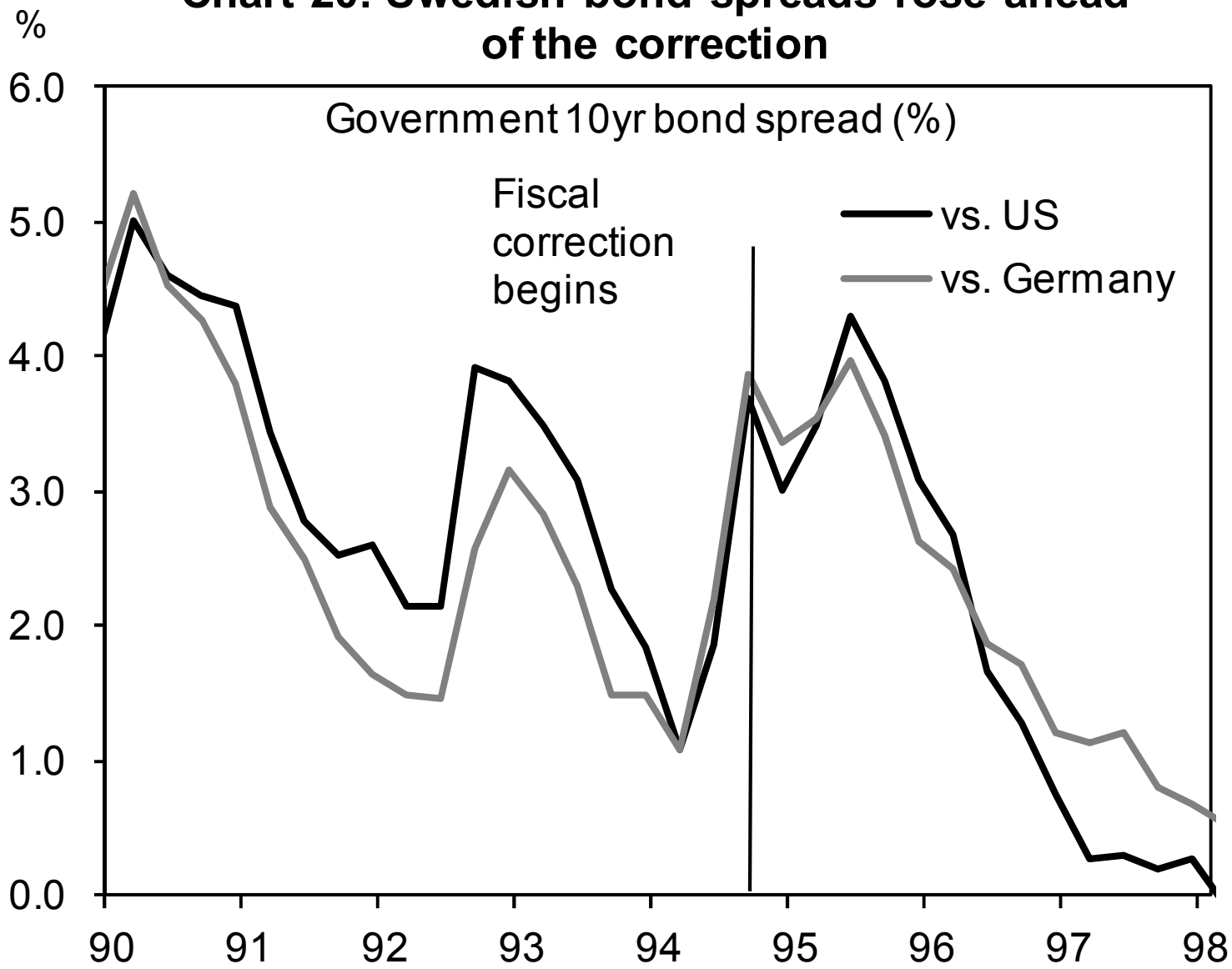


A Little Swedish History

- In 1990s, had a banking & a fiscal crisis
- In fits and starts, fiscal reforms were implemented
- Today Standard & Poor's comments:
  - "The established fiscal rules have served Sweden well. . . "
  - ". . . the Kingdom [has] substantial fiscal buffers to support its creditworthiness in the current adverse economic environment."

SWEDISH INTEREST RATE PREMIA

Chart 20: Swedish bond spreads rose ahead of the correction

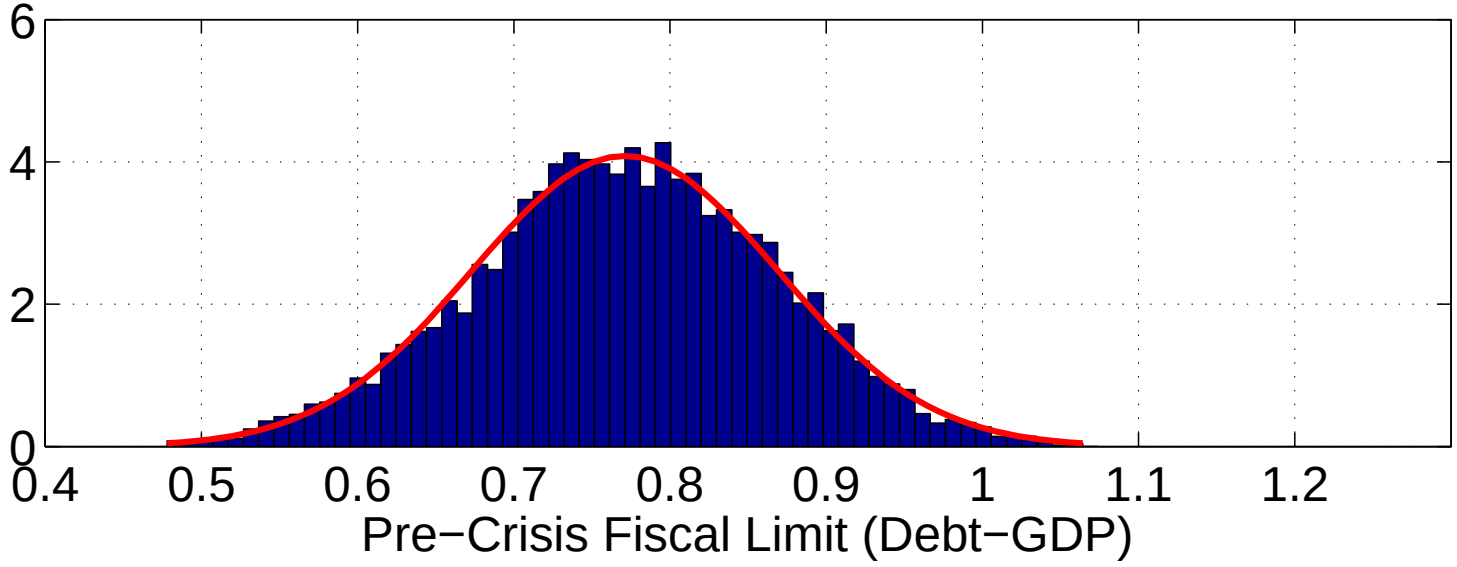


Source: OECD, GS Global ECS Research

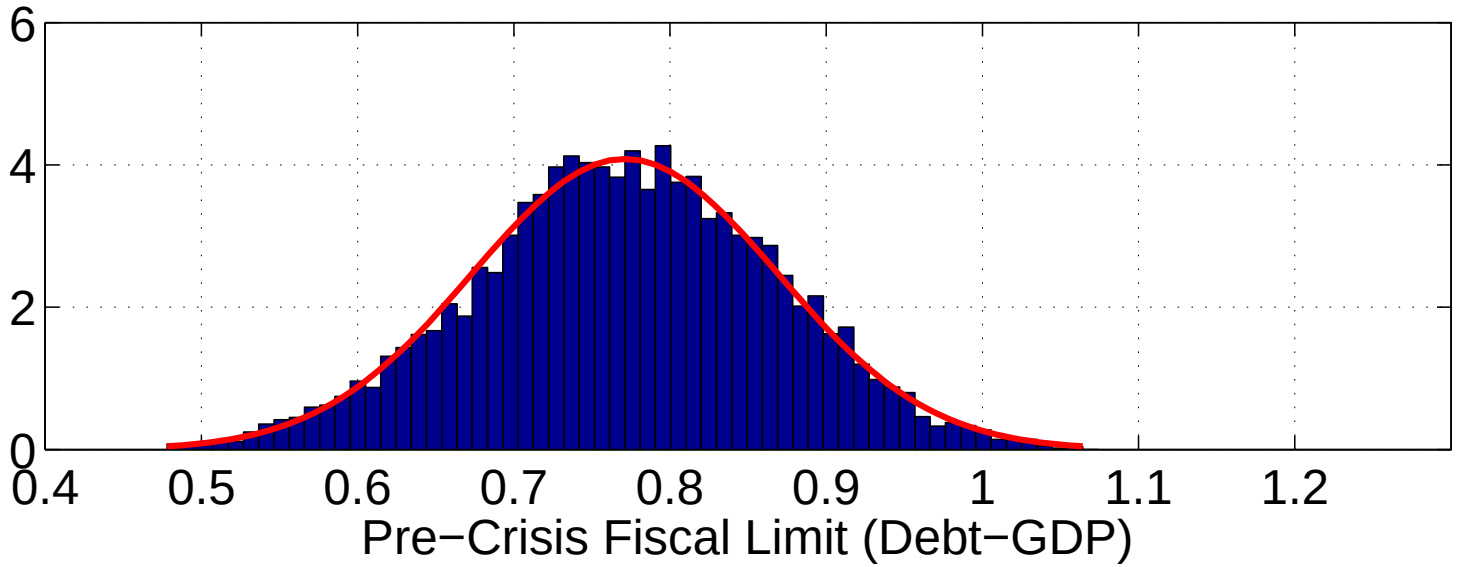
Swedish Fiscal Reforms

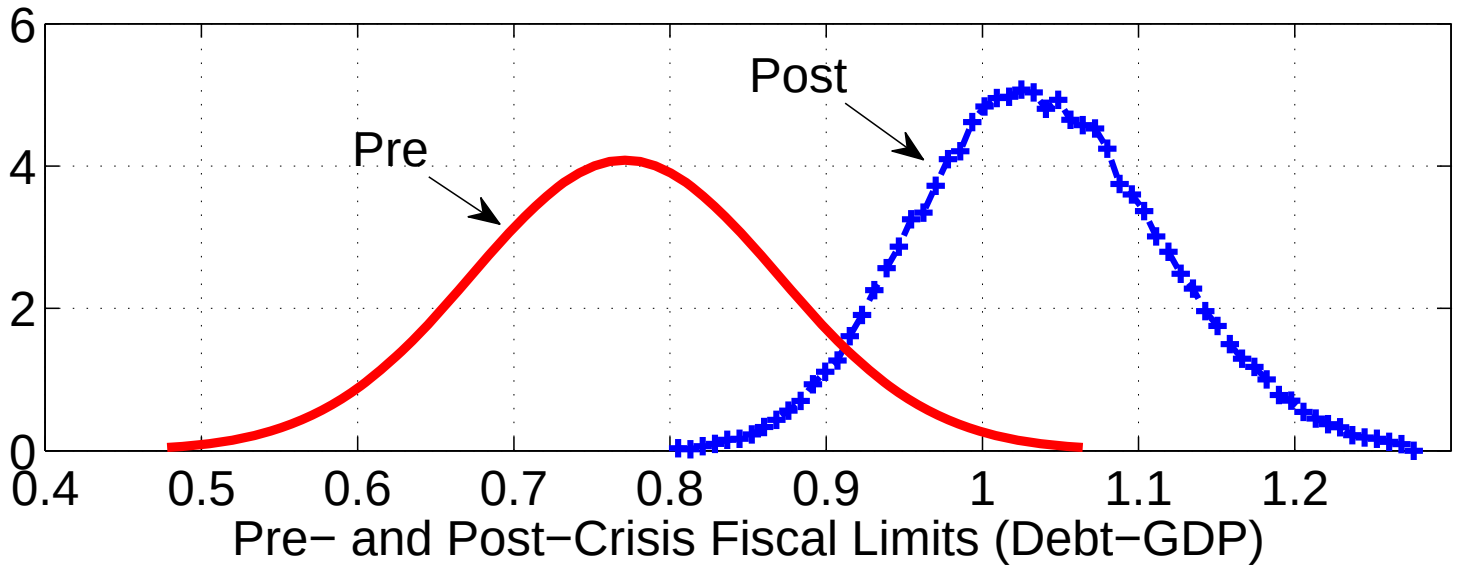
- "Consolidation Programme" of 1994
- Sought to stabilize debt
- Resulted in
  - reducing transfers and revenues as share of GDP
  - shifted government spending from counter- to pro-cyclical
  - reduced the counter-cyclicality of transfers
  - adopted an operational expenditure ceiling
  - aim to hit a medium-term surplus target
- Designed to achieve two goals:
  1. make the Fiscal Limit occur at higher levels of debt
  2. reduce current debt: move it farther from the Fiscal Limit

Swedish Fiscal Limit Pre-Crisis



Swedish Fiscal Limit Post-Crisis





Fiscal Limits and Fiscal Stimulus

- Wide range of fiscal responses to current recession
  1. Massive stimulus: China, United States
  2. Moderate additional stimulus: France, Sweden
  3. Contraction/consolidation: Iceland, Ireland
  4. Planned contraction: Greece, Portugal, Spain
- Differences explained by tension between stimulus and solvency
- Fear of the Fiscal Limit: now many countries planning substantial consolidation *despite the weak recovery*

Wrap-Up

Dynamic Laffer Curve (macroeconomic fundamentals):

- Fiscal limits are country specific
    - Depend on the government size, degree of countercyclical fiscal policy, political uncertainty and shock processes
- Sovereign risk premia arise nonlinearly with respect to the level of government debt
- Long-term bonds provide early warnings