

# Time Consistent Fiscal Policy in a Debt Crisis

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## Optimal fiscal policy in macroeconomic crises with high debt

- **Stabilize debt** or borrow to **stabilize the economy**?
- **Increase tax rates** or **cut tax rates** to stimulate the economy?
- **Cut social spending** or **insure the unemployed**?
- **Reduce** provision of **public good** or **stimulate activity**?
- **Austerity** vs. **crisis management**?

Examine this in:

- 1 Sovereign debt production-economy model
- 2 Government provides intertemporal smoothing **and** intratemporal insurance
- 3 Government has "rich" set of fiscal policy instruments
- 4 Government lacks commitment to ALL instruments

**Households:** Wage and unemployment risk

- Rely on government for consumption smoothing and unemployment insurance

**Firms:** Produce output, hire workers in frictional labor market

- Technology subject to stochastic aggregate technology shocks

**International lenders:** Purchase sovereign debt

- Punish government for default

**Government:** Sets policy instruments to maximize social welfare

- Lacks commitment to ALL instruments

Continuum of households that face unemployment risk

**Expected utility:**

$$\mathcal{U}_{i,t} = \mathbb{E}_t \sum_{s=t}^{\infty} \beta^{s-t} \left[ \underbrace{p_s e_{i,s}}_{\text{job finding probability}} \underbrace{(\mathbf{u}(c_{i,s}^w, e_{i,s}, G_s) - \kappa)}_{\text{utility if employed}} + \underbrace{(1 - p_s e_{i,s})}_{\text{unemployment risk}} \underbrace{\mathbf{u}(c_{i,s}^u, e_{i,s}, G_s)}_{\text{utility if unemployed}} \right]$$

**Budget constraints:**

$$\begin{aligned} c_s^w &= (1 - \tau_s) w_s + \pi_s \\ c_s^u &= T_s + \pi_s \end{aligned}$$

**Optimal search:**

$$\begin{aligned} p(\mathbf{u}^w - \mathbf{u}^u) &= p e_i \mathbf{u}_e^w + (1 - p e_i) \mathbf{u}_e^u \implies \\ e_i &= \mathcal{E}(p, \tau, T, w, G) \end{aligned}$$

Continuum of competitive one-worker firms

- Post vacancies at cost  $a > 0$ , filled with probability  $q$

**Technology:**

$$y = \mathbf{x}(z, h), \quad h = \begin{cases} 0 & \text{if good credit history} \\ 1 & \text{if bad credit history} \end{cases}$$

$$z \in \mathcal{Z}, \text{ Markovian}$$

$$\mathbf{x}(z, 0) \geq \mathbf{x}(z, 1) \quad \forall z$$

**Free entry:**

$$\mathbf{x}(z, h) - w = \frac{a}{q}$$

Workers and firms meet in an anonymous matching market

**Matching function:**

$$n = \psi e^\phi v^{1-\phi}, \phi < 1$$
$$v = \int v_i di, e = \int e_i di$$

**Wages:** (Nash bargaining)

$$w = \mathbf{x}(z, h) - \frac{1 - \lambda}{\lambda} \frac{\mathbf{u}(c^w, e, G) - \kappa - \mathbf{u}(c^u, e, G)}{(1 - \tau) \mathbf{u}_c(c^u, e, G)}$$

Many international risk neutral lenders with deep pockets, free entry

- **Punishments for default:** Temporary exclusion from future borrowing & productivity loss

**Free entry:**

$$\mathbf{R}(B', z) = \mathbb{E} \left( \frac{1 - d'}{1 + r} \right)$$

- $d$  is the default probability,  $r$  is the risk free rate

# Government: Objective Functions

Sets  $(\tau, T, G, B', d)$  to maximize utilitarian **social welfare**:

$$\mathcal{U}_t^G = \mathbb{E}_t \sum_{s=t}^{\infty} \beta^{s-t} \left\{ \underbrace{n \left( \mathbf{u} \left( c_s^w, e, G \right) - \kappa \right)}_{\text{employed agents' utility}} + \underbrace{(1-n) \mathbf{u} \left( c^u, e, G \right)}_{\text{unemployed agents' utility}} \right\}$$

- Incentive to smooth intertemporally and provide unemployment insurance

Government sets instruments subject to

- Government budget constraint
- Economy-wide resource constraint
- Private sector behavior (implementability) - search effort, free entry, wage determination



Government cannot commit - focus on **Markov perfect equilibria**

## Definition

A Markov Perfect equilibrium is a set of policies  $\Omega(S)$ , an allocation  $Y(S, \Omega)$  and a set of future policies  $\Omega'(S)$  such that (i) the policies and the allocations solve the government's problem, (ii) the bond price is solves the lenders problem and is consistent with free entry, and (iii)  $\Omega(S) = \Omega'(S)$ ;

- Lack of commitment to other instruments turns out to be important

## 1. Samuelson condition:

$$u_G^G = nu_{c^w}^G + (1 - n) u_{c^u}^G$$

- Static wedge: Distortionary tax finance
- Crisis wedge: Cut spending when debt issuance is expensive

## 2. Redistribution:

$$u_{c^w} = u_{c^u}$$

- Static wedges: Need to incentivate search + distortionary tax
- Crisis wedge: Sacrifice redistribution?

## 3. Intertemporal smoothing:

$$u_{c^w} = \beta (1 + r) \mathbb{E} u'_{c^w}$$

- Static wedge: Need to incentivate search + distortionary tax
- Crisis wedge: Sacrifice smoothing?

**Felicity function:**

$$\mathbf{u}(c, e, G) = \frac{c^{1-\sigma_c} - 1}{1 - \sigma_c} - \vartheta \frac{e^{1+\sigma_e} - 1}{1 + \sigma_e} + \zeta \log G \quad (1)$$

Implies optimal search effort:

$$e = \left(\frac{p}{\vartheta}\right)^{1/\sigma_e} \left(\frac{(c^w)^{1-\sigma_c} - (c^u)^{1-\sigma_c}}{1 - \sigma_c} - \kappa\right)^{1/\sigma_e} \quad (2)$$

- both substitution and wealth effects

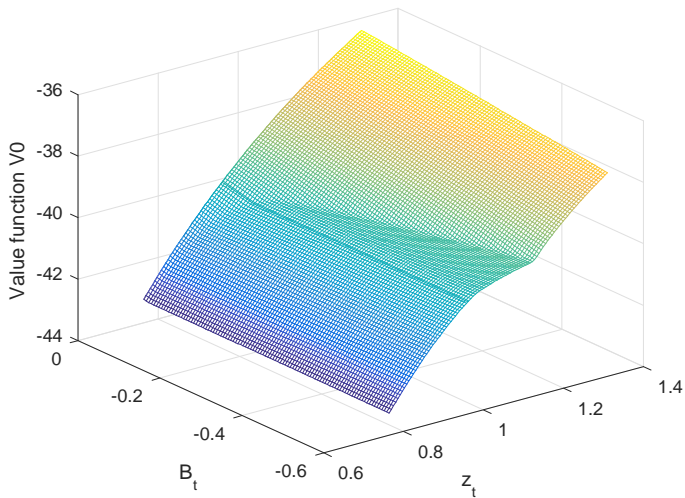
# Calibration - preselected parameters

Parameter	Description	Value
$r$	risk-free rate	1%
$\sigma_c$	Risk aversion	2
$1/\sigma_e$	Search elasticity	1/3
$\lambda$	Workers' barg. weight	0.4
$\phi$	Matching elasticity	0.4
$\rho_z$	Productivity persistence	0.93
$\sigma_z^2$	Variance of prod. shocks	0.03 <sup>2</sup>
$\alpha$	Persistence of exclusion	0.917

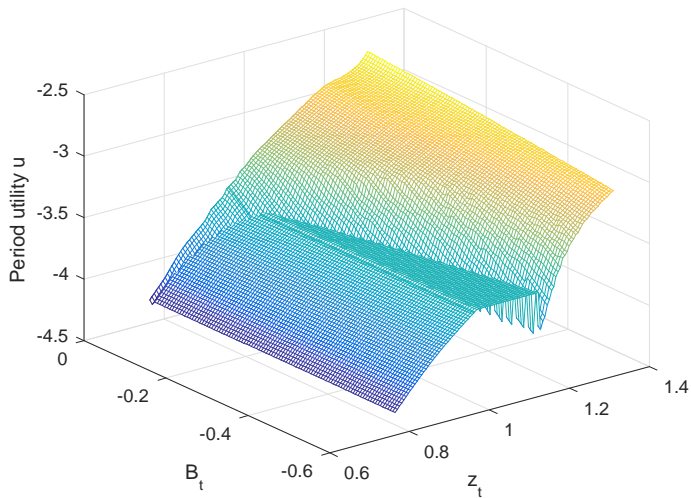
## Calibrated with indirect inference

Parameter	Target	Value	Implied model value
$\beta$ (discount factor)	Default prob. 3%	0.90	3%
$a$ (vacancy costs)	Hiring costs 4.5%	0.04	4.4%
$\vartheta$ (pref. weight)	Employment rate 89%	0.02	89%
$\kappa$ (pref. cost)	$c^u / c^w = 58\%$	1.03	58%
$\xi$ (pref. weight)	$G / c = 33\%$	0.54	32.8%
$\hat{z}$ (prod. ceiling)	Output loss in default 5%	0.97	5.0%

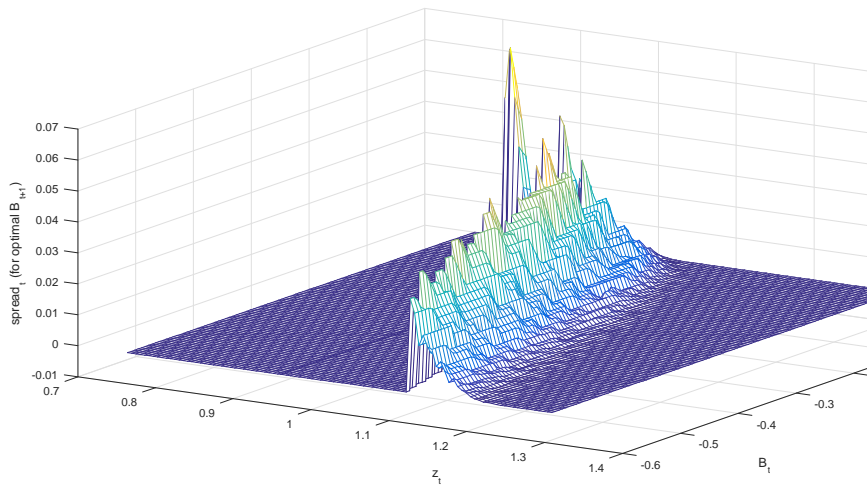
# Value function



# Period utility function



# Default Spread

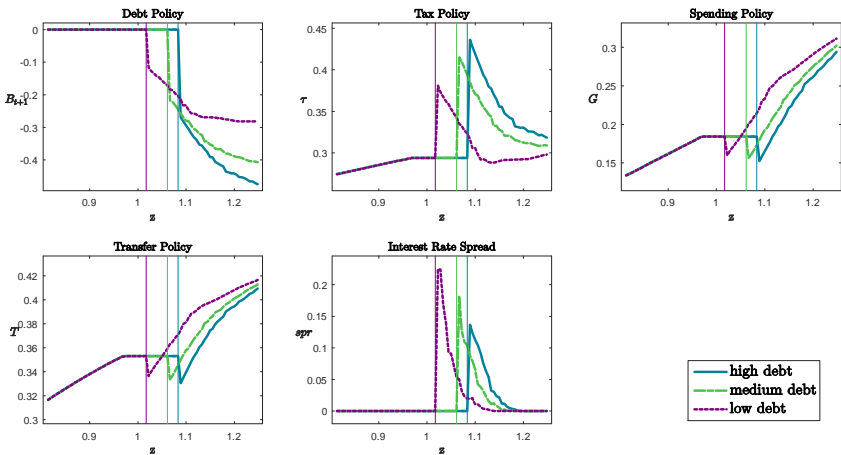




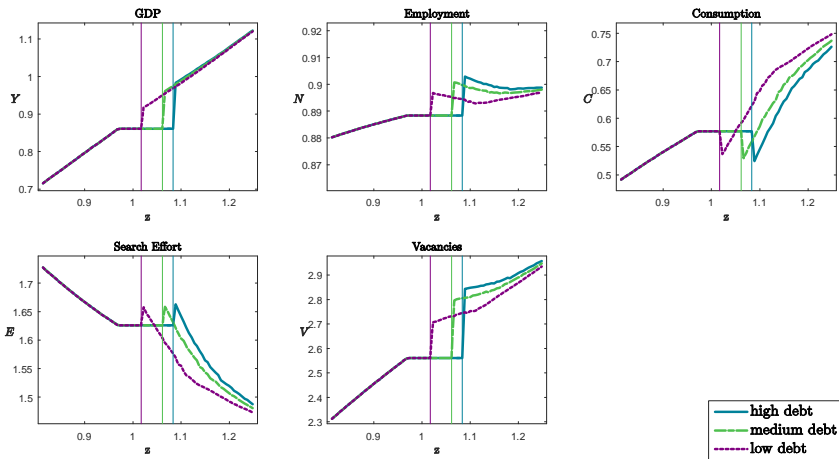
## Optimal to Implement Austerity in Crisis Zone

- Consumption of both employed and unemployed agents drop below the levels in much of the autarky zone
- Primary budget surplus
- Hike in tax rates, cuts in social transfers, cuts in government provision of public goods
- but done smartly: Promotes employment growth by providing incentive to search
- Employment growth means lower welfare payments plus higher output

# Debt Crisis, Austerity and Default



# Debt Crisis, Austerity and Default

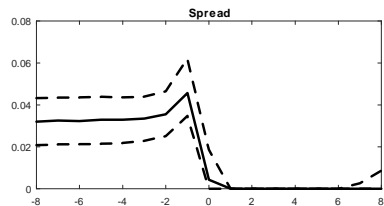
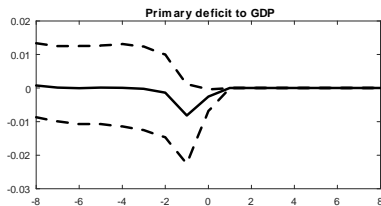
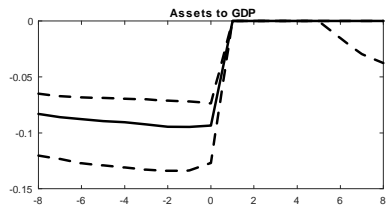
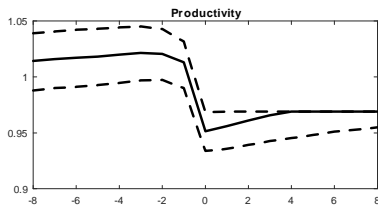


Now look at

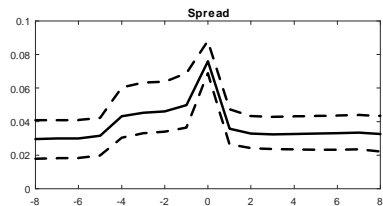
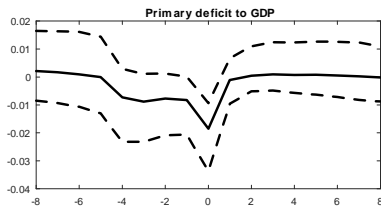
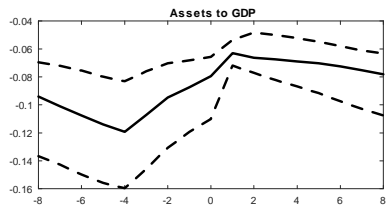
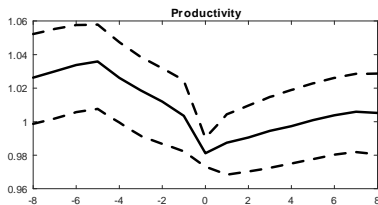
- “Typical” default - average path of the economy around a default
- “Typical” debt crisis - average path of the economy around an instance where spread goes above 5 percent for at least 4 quarters

Computed over a simulation of the economy for 1 million periods (around 26,000 defaults)

# Default Episodes



# Crisis Episodes



**Typical default episode:** Moderate growth followed by unusually low productivity

- Defaults preceded by short-lived austerity
- After the typical default - long period of low activity
- Fiscal stimulus post default

**Typical crisis episode:** Long sequence of low productivity

- Spread rising even if debt/GDP is relatively stable
- Government implements **austerity** measures
- Build up of primary surplus
- Eventually productivity recovers and a default is avoided

# Austerity: The Role of Commitment

Two sources of austerity:

- **Budgetary reasons:** To avoid default, government implements primary surplus
- **Lack of commitment:** Lenders realize government has incentive to stimulate economy post-default, force the government to cut consumption in the crisis zone

How much does lack of commitment matter?

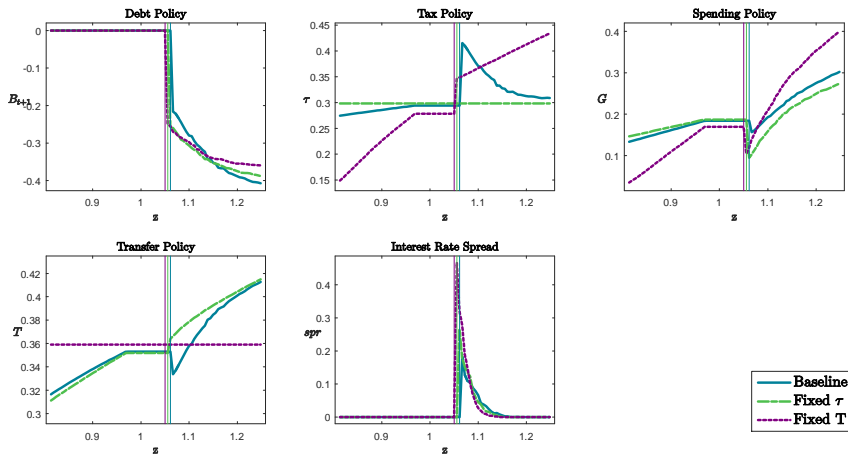
- Suppose government could commit to not changing its instruments

Commitment does not change optimality of austerity but does change its nature:

- Removes the option of a post-default stimulus
  - no tax hike during crisis if transfers can be fixed
  - no transfer cuts during crisis if taxes can be fixed



# The Role of Commitment



- 1 Trade-off between austerity and default in a sovereign debt crisis.
- 2 Lack of commitment implies that lenders demand austerity in crisis times to minimize risk of default
- 3 Other things we examine
  - Bailouts - may explain lack of austerity in the data
  - Tax evasion - create large distortions in debt crises
  - Labor market inefficiency - perhaps important to understand deterioration of labor market conditions
  - Partial default