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
Households

Continuum of households that face unemployment risk

Expected utility:

\[
U_{i,t} = \mathbb{E}_t \sum_{s=t}^{\infty} \beta^{s-t} \left[ p_s e_{i,s} \left( u \left( c_{i,s}^w, e_{i,s}, G_s \right) - \kappa \right) \right. \\
+ \left. \left( 1 - p_s e_{i,s} \right) u \left( c_{i,s}^u, e_{i,s}, G_s \right) \right]
\]

job finding probability

utility if employed

unemployment risk

utility if unemployed

Budget constraints:

\[
c_s^w = (1 - \tau_s) w_s + \pi_s \\
c_s^u = T_s + \pi_s
\]

Optimal search:

\[
p \left( u^w - u^u \right) = p e_i u_e^w + (1 - p e_i) u_e^u \approx \epsilon \left( p, \tau, T, w, G \right)
\]

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Austerity or Stimulus?

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Continuum of competitive one-worker firms

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

**Technology:**

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

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

$$x(z, 0) \geq x(z, 1) \ \forall z$$

**Free entry:**

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

Workers and firms meet in an anonymous matching market

Matching function:

\[ n = ψ e^\phi v^{1-\phi}, \phi < 1 \]
\[ v = \int v_i di, \quad e = \int e_i di \]

Wages: (Nash bargaining)

\[ w = x(z, h) - \frac{1 - \lambda u(c^w, e, G) - \kappa - u(c^u, e, G)}{\lambda (1 - \tau) u_c(c^u, e, G)} \]
Lenders

Many international risk neutral lenders with deep pockets, free entry

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

**Free entry**:

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

- \(d\) is the default probability, \(r\) is the risk free rate
Government: Objective Functions

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

\[
U_t^G = \mathbb{E}_t \sum_{s=t}^{\infty} \beta^{s-t} \left\{ n \left( u \left( c_s^w, e, G \right) - \kappa \right) \right. \\
+ \left. (1 - n) u \left( c_u, e, G \right) \right\}
\]

- 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
Equilibrium

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:**

\[ u^G_G = nu^G_{cw} + (1 - n) u^G_{cu} \]

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

2. **Redistribution:**

\[ u^w_c = u^u_c \]

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

3. **Intertemporal smoothing:**

\[ u^w_c = \beta (1 + r) \mathbb{E} u'_{cw} \]

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

\[ u(c, e, G) = \frac{c^{1-\sigma_c} - 1}{1 - \sigma_c} - \vartheta \frac{e^{1+\sigma_e} - 1}{1 + \sigma_e} + \xi \log G \]  

(1)

Implies optimal search effort:

\[ e = \left( \frac{p}{\vartheta} \right)^{1/\sigma_e} \left( \frac{(c_w)^{1-\sigma_c} - (c_u)^{1-\sigma_c}}{1 - \sigma_c} - \kappa \right)^{1/\sigma_e} \]  

(2)

- both substitution and wealth effects
Calibration - preselected parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$r$</td>
<td>risk-free rate</td>
<td>1%</td>
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<tr>
<td>$\sigma_c$</td>
<td>Risk aversion</td>
<td>2</td>
</tr>
<tr>
<td>$1/\sigma_e$</td>
<td>Search elasticity</td>
<td>1/3</td>
</tr>
<tr>
<td>$\lambda$</td>
<td>Workers’ barg. weight</td>
<td>0.4</td>
</tr>
<tr>
<td>$\phi$</td>
<td>Matching elasticity</td>
<td>0.4</td>
</tr>
<tr>
<td>$\rho_z$</td>
<td>Productivity persistence</td>
<td>0.93</td>
</tr>
<tr>
<td>$\sigma_z^2$</td>
<td>Variance of prod. shocks</td>
<td>0.03$^2$</td>
</tr>
<tr>
<td>$\alpha$</td>
<td>Persistence of exclusion</td>
<td>0.917</td>
</tr>
</tbody>
</table>
Calibrated with indirect inference

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

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Period utility function

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Default Spread

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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

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Dynamics: Default vs. Crisis

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

Productivity

Assets to GDP

Primary deficit to GDP

Spread
Crisis Episodes

Productivity

Assets to GDP

Primary deficit to GDP

Spread

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Default vs. 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

Debt Policy

Tax Policy

Spending Policy

Transfer Policy

Interest Rate Spread

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Austerity or Stimulus?

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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