Bank of Portugal Lectures Summer 2006

Time Inconsistency and

Free-Riding in a Monetary Union

Based on work by Chari and Kehoe

Motivation

- Design of monetary unions
  - monetary policies set centrally
  - other policies set independently

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    - fiscal policies
    - labor market policies
    - bank regulation

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- Examples of monetary unions
  - Argentina
  - United States
  - European Monetary Union

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  - United States: successful
  - European Monetary Union: we'll see

Why are some successful and others not?

- Unsuccessful: unresolved time inconsistency problems in monetary policy

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  - generates free riding problem in nonmonetary policies

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  - generates free riding problem in nonmonetary policies
  - nonmonetary policies
    - inefficiently lax
    - induce monetary authority to generate high inflation

How to solve these problems

- Directly solve time inconsistency problem in monetary policy

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  - commitment via
    - central bank independence

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- Easy to say, hard to do

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Our free rider problem differs from standard one

- Standard free rider problem
  - agents directly linked
  - actions of each enter payoffs of others

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  - no time inconsistency problem means no free-rider problem

Fiscal Policy in a Monetary Union

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- Monetary policy: Inflation rate from period 0 to 1

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- Objective

$$U(c_{i0}) + \beta U(c_{i1})$$

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  - debt contract (b_i, x_i) has implicit nominal rate $R_i = x_i/b_i$
  - output ω in period 0 sufficiently small relative to $y(1)$ so country wants to borrow to smooth consumption

Monetary authority and foreign lenders

- Monetary authority: chooses π
  - objective: $1/I \sum_{i=1}^{I} [U(c_{i0}) + \beta U(c_{i1})]$

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- Foreign lenders
  - if accept debt contract (b_i, x_i), profit is

$$-b_i + \beta x_i / \pi$$

Optimistic interpretation of Maastricht Treaty

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- Optimists: Focus on 1. and 2.
  - sets up independent conservative central banker
  - equivalent to commitment

Monetary Union with Commitment

- Timing
  - Monetary authority commits to inflation rate π
  - Fiscal authorities then independently choose b_i

Monetary Union with Commitment

- Government i: takes π as given

$$\max_{b_i, x_i} U(\omega + b_i) + \beta U(y(\pi) - x_i/\pi)$$

s.t.

$$-b_i + \beta x_i/\pi \geq 0$$

yields debt contracting rules $(b_i(\pi), x_i(\pi))$

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- Noncooperative equilibrium with commitment $(\pi, b_i(\pi), x_i(\pi))$

Cooperative benchmark

- Fiscal policy set to maximize sum of welfare of I countries

$$\max_{(b_i,x_i)_{i=1}^I} 1/I \sum_{i=1}^I [U(\omega + b_i) + \beta U(y(\pi) - x_i/\pi)]$$

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Since π is set first, b_i's don't influence π

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Proposition With commitment by the monetary authority, the noncooperative and cooperative equilibria coincide

- Intuition: No strategic interaction between countries

- Result consistent with the academics' view

  - no free-rider problem

  - fiscal constraints can only be harmful

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- Pessimists: Focus on 3.
  - ex post ECB can choose whatever it wants
  - equivalent to no commitment

Monetary Union without Commitment

- Timing
  - Fiscal authorities independently choose b_i
  - Monetary authority then chooses π

Monetary Union without Commitment

- Monetary authority: takes $\bar{b} = (b_1, ..., b_I), \bar{x} = (x_1, ..., x_I)$ as given

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- Noncooperative equilibrium without commitment is a policy rule $\pi(\cdot)$ and debt contracts $(\bar{b}, \bar{x})$ that solve these problems

Cooperative benchmark

- Fiscal policy set to maximize sum of welfare

Proposition Welfare in a symmetric noncooperative equilibrium is lower than in a symmetric cooperative equilibrium

Proof of Proposition

- Noncooperative allocations feasible under cooperation
- Suffices to show allocations differ

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  Use as envelope condition in fiscal problem

Fiscal Problem

- Substitute out x_i using $b_i = \beta x_i / \pi(\bar{x})$

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F.O.C. Noncooperative

$$[U'(c_0) - U'(c_1)] + \beta U'(c_1) y_\pi \frac{\partial \pi(\bar{x})}{\partial x_i} \frac{\partial x_i}{\partial b_i} + \text{envelope terms} = 0$$

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F.O.C. Cooperative Benchmark

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- Differ by fiscal externality from *induced inflation*

A free-rider problem from fiscal externality

- Free-rider problem
  - Higher debt by i induces monetary authority to inflate more
  - Fiscal authority ignores cost of induced inflation on others
  - Excessive deficits and inflation in noncooperative equilibrium

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A free-rider problem from fiscal externality

- Free-rider problem
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  - Excessive deficits and inflation in noncooperative equilibrium
- Can debt constraints help?
  - Background: Maastricht Treaty
  - Theory

Fiscal rules from Maastricht Treaty and Stability Pact

- To join
  - debt/GNP $< 60\%$
  - deficit/GNP $< 3\%$
- To stay
  - excessive deficit rule
  - penalties for excessive deficits when no recession

Can debt constraints help?

- Let $b_c =$ cooperative level of debt
- Add debt constraints $b_i \leq b_c$ to fiscal authority's problem in noncooperative equilibrium

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Proposition With these debt constraints, the noncooperative allocations coincide with cooperative allocations

Proof Show at the cooperative allocations that noncooperative government has incentive to increase b_i

Proof of Proposition

At the cooperative allocation

$$[U'(c_0) - U'(c_1)] + \beta U'(c_1) y_\pi \frac{\partial \pi(\bar{x})}{\partial x_i} \frac{\partial x_i}{\partial b_i} = -(I-1)\beta U'(c_1) y_\pi \frac{\partial \pi(\bar{x})}{\partial x_i} \frac{\partial x_i}{\partial b_i}$$

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- Right hand side is positive since $\partial \pi / \partial x_i > 0$
- So is the left hand side which is the term in noncooperative f.o.c.
- Thus, at cooperative allocations
  - noncooperative fiscal authority wants to increase b_i
  - $b_i \leq b_c$ binds

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- Does free-rider problem disappear as number of countries grows?
  - no, it gets worse
  - free-rider vs. monopoly problem

Large I: Monopoly better, free-rider worse

- Monopoly: tariff on exports of wheat
  - 2 producing countries: lots of market power $\Rightarrow$ high tariffs
  - I producing countries: little market power $\Rightarrow$ low tariffs

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- Free-rider: Second-hand smoke
  - Benefits: to smoker of inhaling
  - Costs: to everyone else smoky clothes
    - 2 smokers: $1/2$ of bad effects on me
    - I smokers: $1/I$ of bad effects on me

Why is U.S. different from EMU?

- U.S. has solved time inconsistency problem, Italy has not
- U.S. institutional structure differs from that of Europe

U.S. institutional structure differs from Europe's

- Historical reasons
  - 1789: Explicit federal system with gold standard
  - Later: States posed balanced budget requirements for internal political economy reasons
  - 1913: When Fed set up, balanced budget rules in place

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  - 1913: When Fed set up, balanced budget rules in place
- Our model is not U.S.
  - U.S. Federal government very strong
    - Variety of implicit threats for fiscal misbehavior
    - Variety of nonmonetary bailouts

U.S. institutional structure differs from Europe's

- Modify model to be analogous to U.S.
  - Central fiscal authority can make intercountry transfers
  - Use rewards/punishments to encourage good fiscal policy

Free-riding with other policies

- Labor market policy
- Banking supervision

Labor market policy

- Member governments
  - costly effort to reduce natural rate
- Monetary authority
  - partially inflate away unemployment
- Yields free-rider problem
  - member governments choose too rigid labor markets
- Policy implication
  - impose constraints that require minimal flexibility in labor markets

Banking supervision

- Member governments
  - costly effort to regulate banks
- Monetary authority
  - bailout banks at cost of inflation
- Yields free-rider problem
  - member governments have lax supervision
- Policy implication
  - minimal standards on bank regulation

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  - Depositors: fully insured
  - Banks: limited liability
  - Monetary authority: bails out insolvent banks

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- Governments
  - limit risk-taking with costly supervision
- Time Inconsistency Problem
  - expected bailout encourages lax supervision

Banking supervision in a monetary union

- Aggregate state: $s \in [H, L]$ boom or recession
  - probabilities μ_H, μ_L

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- Aggregate state: $s \in [H, L]$ boom or recession
  - probabilities μ_H, μ_L
- Projects $z \in [0, 1/2]$
  - R if succeed, 0 if fail
  - Probability of success

$$p_H(z) = 1/2 + z$$

$$p_L(z) = 1/2 - z$$

  - Higher z is a mean preserving spread

Governments and banks

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$$q_H \max\{p_H(z)R - r\,,\,0\} + q_L \max\{p_L(z)R - r\,,\,0\}$$

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- Under our assumptions banks invest in riskiest allowable project

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  - Monetary authority liquidates bank and prints money to cover shortfall

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  - If bank receipts fall short of obligations
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- Consumers: $\sum \mu_s U(y_{si}, \pi_s)$

  where $y_{si} = p_s(z_i)R - e(x_i)$

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- Monetary authority
  - If bank receipts fall short of obligations
  - Monetary authority liquidates bank and prints money to cover shortfall
- Consumers: $\sum \mu_s U(y_{si}, \pi_s)$

  where $y_{si} = p_s(z_i)R - e(x_i)$
  - consumers dislike inflation
  - costly supervision uses real resources

Results

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  - regulation too lax
  - banks take on excessively risky projects
  - fail too often
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  - regulation too lax
  - banks take on excessively risky projects
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- Policy implication
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Conclusion

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$$+$$

- Time inconsistency problem

$\Rightarrow$ Free-rider problems in independently set policies

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Cure

- Fiscal constraints
- Minimal rules on labor market flexibility
- Minimal standards on bank regulation