ECON 6130-2

Macroeconomics I, Part 2
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MW 8:40-9:55AM, 202 Uris Hall

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Focus of Part 1

- DSGE, or RBC
- Single agent, infinite life
- Rational Expectations

Focus of Part 2

- OG, or OLG
- Heterogeneous agents
- Finite lives, overlapping
- Demography
- Coordination of rational beliefs
- Money
- Finance

- In Part 2, we will continue to focus on rational expectations,
- but with expectations not necessarily coordinated on the solution to a planning problem

Money

- Outside Money
- Inside Money

Outside Money: Taxes denominated in money, say dollars

- The static case: see Balasko-Shell article in the McKenzie volume, or simply click on the URL in the reading list
- commodities: $i = 1, ..., l$
- agents: $h = 1, ..., n$
- consumption: $x_h^i > 0$
- endowment: $\omega_h^i > 0$
- commodity price: $p^i > 0$ with $p^1 = 1$
  commodity price of money: $p^m \geq 0$
- lump-sum tax: τ_h

Equilibrium

- $x_h = (x_h^1, ..., x_h^i, ...x_h^l) \in \mathbb{R}^l_{++}$
- $\omega_h = (\omega_h^1, ..., \omega_h^i, ...\omega_h^l) \in \mathbb{R}^l_{++}$
- $p = (p^1, ..., p^i, ..., p^l) \in \mathbb{R}^l_{++}$
- $p^m \in \mathbb{R}_+$
- $\tau = (\tau_1, ..., \tau_h, ..., \tau_n) \in \mathbb{R}^n$

Consumer Problem (CP):

$$\max_{x_h > 0} u_h(x_h)$$

s.t.

$$p \cdot x_h = p \cdot \omega_h - p^m \tau_h$$

Competitive Equilibrium

- $(p, p^m) \in \mathbb{R}^l_{++} X \mathbb{R}_+$ is said to be an *competitive equilibrium* if
- $\sum_{h=1}^{n} x_h = \sum_{h=1}^{n} \omega_h$, where
- x_h solves CP
  for $h = 1, ..., n$

The tax vector τ:

- is said to be *bonafide*, if given $\tau \in \mathbb{R}^n$ there is some equilibrium (p, p^m) with $p^m > 0$
- is said to be *balanced* if we have

$$\sum_{h=1}^{n} \tau_h = 0$$

Money Taxation:

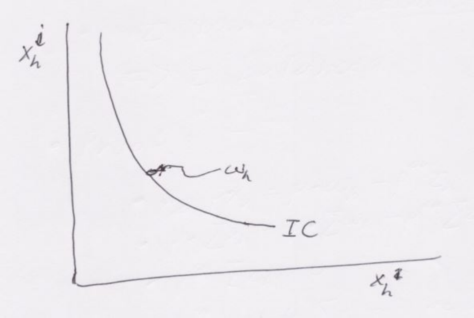
- If τ is not balanced, then τ is not bonafide
- Hence
  τ bonafide $\rightarrow$ τ balanced
- Proof

$$p \cdot x_h = p \cdot \omega_h - p^m \tau_h$$
$$p \cdot \sum x_h = p \cdot \sum \omega_h - p^m \sum \tau_h$$
$$p^m \sum \tau_h = 0$$

$$p^m = 0 \text{ or } \sum \tau_h = 0 \text{ or both}$$

Balanced $\rightarrow$ Bonafide

- True, but not so simple
- sketch of proof



- Define

$$\begin{aligned}\tilde{\omega}_h &= (\tilde{\omega}_h^1, \tilde{\omega}_h^i)\\ &= (\omega_h^1 - p^m \tau_h, \omega_h^i)\\ &= \text{tax-adjusted endowment}\end{aligned}$$

The set of equilibrium money prices: $\mathbb{P}^m$

For $l = 1$, $\mathbb{P}^m$ is an interval if τ is bonafide.
Otherwise, $\mathbb{P}^m = \{0\}$

worked examples

- 1. $n = 5,\ l = 1$

$$\omega = (150, 80, 75, 25, 10)$$

$$\tau = (40, 15, 10, -10, -30)$$

$$\sum \tau_h = 25 \neq 0$$

$$\tau \text{ not balanced, } \mathbb{P}^m = \{0\}$$

- 2. same ω

$$\tau = (45, 15, 0, -10, -50)$$

$$\sum \tau_h = 0, \quad \tau \text{ balanced}$$

Mr.h's problem is

$$\max u_h(x_h) \quad \text{s.t.}$$

$$x_h + P^m \tau_h = \omega_h$$

$\mathbb{P}^m$ is the set of all P^m such that $x_h > 0$ for $h = 1, ..., n$:

$$P^m < \min_h [\frac{\omega_h}{\max(0, \tau_h)}]$$

For Mr.1

$$150 - 45P^m > 0, \quad P^m < \frac{150}{45} = 3\frac{1}{3}$$

For Mr.2

$$80 - 15P^m > 0, \quad P^m < \frac{80}{15} = 5.33 > 3\frac{1}{3}$$

Hence

$$\mathbb{P}^m = [0, \bar{P}^m) = [0, 3\frac{1}{3})$$

No calculations are needed for $h = 3, 4, 5$. Why?

Two Monies

- Bi metalism
- Pounds Sterling and Guineas
- Thalers and Pieces of 8
- Etc!

R\$ and B\$, $l = 1$, $n = 3$
$\tau^R = (2, 1, 0), \quad \tau^B = (5, 3, -12)$
$\max u_h(x_h)$
s.t.
$x_h + P^R \tau_h^R + P^B \tau_h^B = \omega_h$

$$\sum x_h + P^R \sum \tau_h^R + P^B \sum \tau_h^B = \sum \omega_h$$

$$P^R \sum \tau_h^R + P^B \sum \tau_h^B = 0$$

$$e_{RB} = \frac{P^R}{P^B} = -\frac{\sum \tau_h^B}{\sum \tau_h^R} = -\frac{-4}{3} = \frac{4}{3}$$