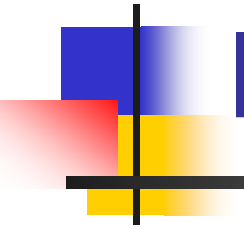


Econ 208

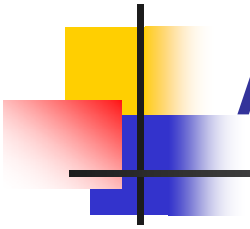
Marek Kapicka

Lecture 10

Ramsey Optimal Taxation

Where are we?

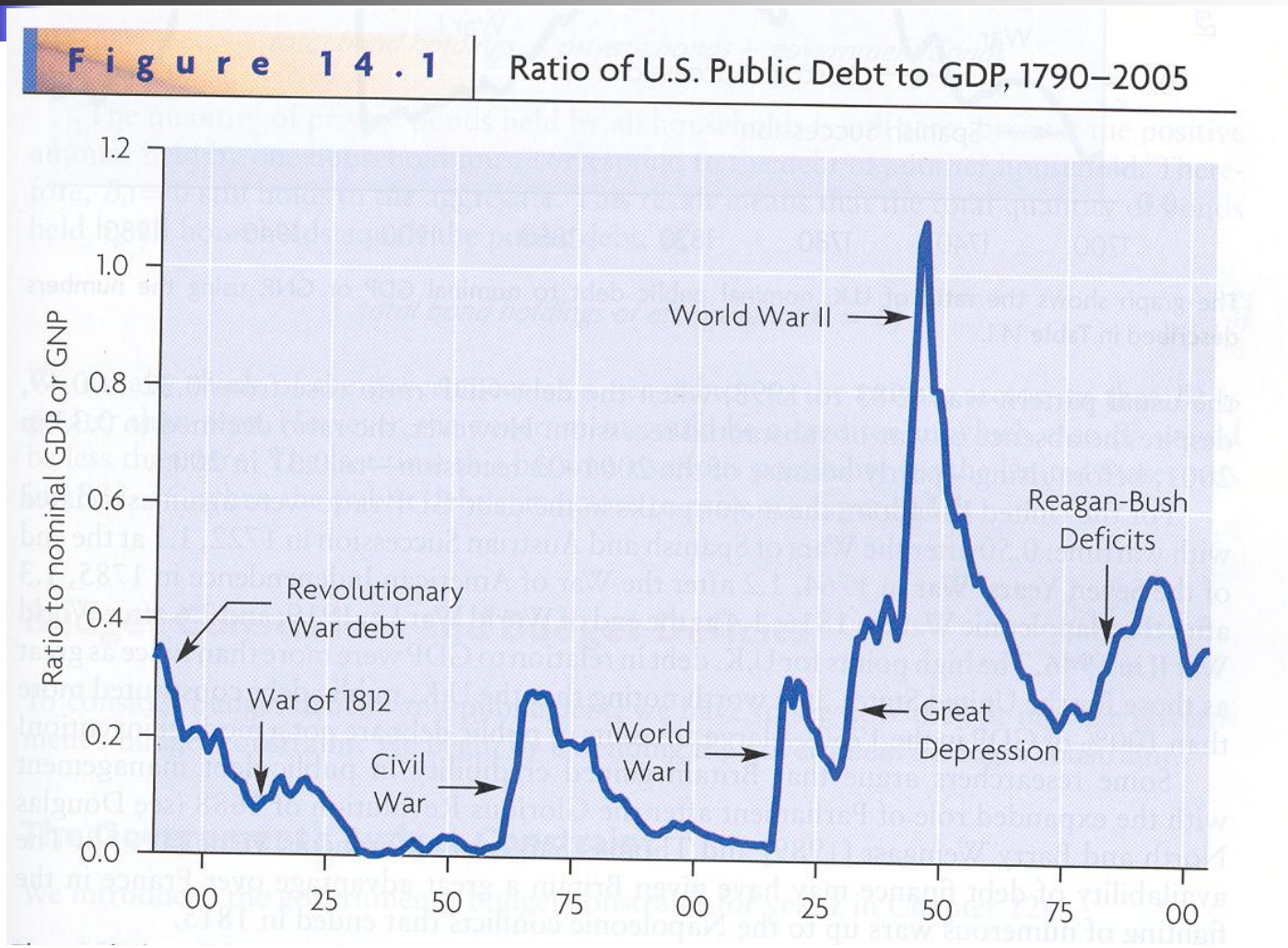
- Introduction: A model with no Government
- The Effects of Government Spending
- Government Taxation and Government Debt
  - Labor Taxation
  - Capital Taxation
  - Government Debt
- Fiscal and Monetary Policy
- Optimal Monetary Policy
- Financial Intermediation
- Current Account Determination
- Fiscal Deficits and Current Account



Announcements

- PS3 on the web today
- Read 14.3-14.4 for today

US Government Debt



Ramsey Approach to Taxation

- Choose optimal (welfare maximizing) sequences of taxes (and debt) given that only distortionary tax instruments are available.
  - Tax instruments are given
  - Lump sum taxation not allowed

Ramsey Taxation
Main Results

- Uniform Commodity Taxation
  - Under certain conditions, tax rates should be equated across goods
    - Distortions will be spread evenly
- Applies to dynamic economies:
  - Tax smoothing

Ramsey Taxation

- We will analyze a problem of a government that
  - Face a given sequence of expenditures $\{G_t\}_{t\geq 0}$
  - Choose a sequence of consumption (sales) taxes $\{\tau_t\}_{t\geq 0}$
- Similar logic applies to labor taxation

Ramsey Taxation
Household Problem

- Maximize lifetime utility

$$\max_{\{C_t\}} \sum_{t=0}^{\infty} \beta^t \ln(C_t)$$

- Subject to PVBC

$$\sum_{t=0}^{\infty} \left(\frac{1}{1+r}\right)^t (1+\tau_t) C_t = \sum_{t=0}^{\infty} \left(\frac{1}{1+r}\right)^t Y_t$$

Ramsey Taxation
Household Problem

- The Lagrangean

$$\max_{\{C_t\}} \sum_{t=0}^{\infty} \beta^t \ln(C_t) + \lambda[\sum_{t=0}^{\infty} (\frac{1}{1+r})^t Y_t - \sum_{t=0}^{\infty} (\frac{1}{1+r})^t (1+\tau_t) C_t]$$

- Assume that $\beta = 1/(1+r)$:

$$C_t(1+\tau_t) = \frac{1}{\lambda} = W$$

  - where $W = \frac{r}{1+r} \sum_{t=0}^{\infty} (\frac{1}{1+r})^t Y_t$

Ramsey Taxation
Household Problem

- Indirect Utility:

$$V(\{\tau_t\}_{t\geq 0}, W) = \sum_{t=0}^{\infty} \beta^t \ln(C_t^*)$$

$$= \sum_{t=0}^{\infty} \beta^t \ln\left(\frac{W}{1+\tau_t}\right)$$

$$= -\sum_{t=0}^{\infty} \beta^t \ln(1+\tau_t) + \frac{\ln W}{1-\beta}$$

Ramsey Taxation
Government's Problem

- PV Budget Constraint

$$\sum_{t=0}^{\infty}\left(\frac{1}{1+r}\right)^{t}G_t=\sum_{t=0}^{\infty}\left(\frac{1}{1+r}\right)^{t}\tau_t C_t^{*}$$

$$=\sum_{t=0}^{\infty}\left(\frac{1}{1+r}\right)^{t}\frac{\tau_t}{1+\tau_t}W$$

- Define $G=\sum_{t=0}^{\infty}\left(\frac{1}{1+r}\right)^{t}G_t$

Ramsey Taxation
Government's Problem

- Ramsey Problem: Choose a sequence of tax rates to maximize agent's utility, subject to the government's budget constraint

$$\max_{\{\tau_t\}_{t\geq 0}} -\sum_{t=0}^{\infty} \beta^t \ln \tau_t + \frac{\ln W}{1-\beta} + \mu[\sum_{t=0}^{\infty} (\frac{1}{1+r})^t \frac{\tau_t}{1+\tau_t} - \frac{G}{W}]$$

- First Order Condition:

$$\tau_t = \mu - 1$$

Ramsey Taxation
Government's Problem

- Solution to the Ramsey Problem: taxes are constant over time, regardless of the time path of government expenditures
- Solving for the optimal tax rate:

$$\frac{\tau^*}{1+\tau^*} = \frac{r}{1+r}\frac{G}{W}$$

$$\tau^* = \frac{\frac{r}{1+r}G}{W - \frac{r}{1+r}G}$$

Ramsey Taxation
Implications for Government Debt

- Example:

$$G_t = 1, t = 0, \quad G_t = 0, t > 0$$

$$Y_t = 1, t \geq 0$$

- Hence $W = G = 1$
- The optimal tax rate

$$\tau^* = r$$

Ramsey Taxation
Implications for Government Debt

- Tax collection each period: $r / (1+r)$
- Core Deficit

$$G_0 - T_0 = \frac{1}{1+r}$$

$$G_t - T_t = -\frac{r}{1+r}, t > 0$$

- Government Debt:

$$B_t^g = \frac{1}{1+r}, t \geq 0$$

Ramsey Taxation
WWII vs. Korean War

- WWII financed differently than Korean War

	% OF EXPENDITURES FINANCED BY	
	Direct Taxes	**Debt and seignorage**
World War II	41%	59%
Korean War	100%	0%

- Marginal Taxes

	% TAX RATES BEFORE/DURING THE WAR	
	Labor	**Capital**
World War II	9/18	44/60
Korean War	16/20	52/63

Ramsey Taxation
WWII vs. Korean War

- What if WWII were financed like Korean War (taxes only)?
  - Labor taxes would be 64% rather than 18%
  - Capital taxes would be 100% rather than 60%
  - Welfare costs are 3% of consumption

Ramsey Taxation
WWII vs. Korean War

- What if Korean War was financed like WWII (both taxes and debt)?
  - Labor taxes would be 23% rather than 20%
  - Capital taxes would be 50% rather than 62%
  - Welfare gains are 0.4% of consumption