ECON 712A: Handout 5 [1]

Instructor: Dean Corbae
TAs: Duong Dang and Alex von Hafften

Content Review

Ricardian Equivalence

- The government can raise government expenditures today by either

  (1) increasing taxes today ($\Delta g_t = \Delta T_t$) or

  (2) borrowing today and increasing taxes in the future ($\Delta g_t = q_t \Delta B_{t+1}$).

  Either way of financing government expenditure is feasible and consistent with government consolidated budget constraint. The government can also finance an increase in expenditure by any feasible linear combination of (1) and (2).

- Explain why "the timing of taxes does not matter".
- What assumptions underpin Ricardian Equivalence?
- How Ricardian Equivalence can hold in OLG models?

Government Commitment Problem

- Set up from section 3.4 of lecture notes:

  - Households invest x in productive technology with return $(1-\tau)R$

  - Households save m in pillow technology with return 1.

  - Because returns are linear and exogenous, households put their entire endowment in pillow technology if $1 \geq (1-\tau)R$.

  - Note that we may have both corner and internal solutions depending on parameters. [Don't blindly take FOCs, especially with linear returns.]

- What does "Big X, small x" mean?
- What does the consistency requirement mean?
- Which agent (i.e. government or households) acts first in a Ramsay equilibrium (i.e. equilibrium with commitment)?
- Which agent (government or households) acts first in a Nash equilibrium (i.e. equilibrium without commitment)?
- Why does the government overtax investment in the equilibrium without no commitment ("dynamic inconsistency")?
- What is a Laffer curve? What is the optimal choice of distortionary tax and how does it relate to a Laffer curve?

[1] Based on handout by Katya Kazakova.

ECON 712 Macroeconomics I
Fall 2020, University of Wisconsin-Madison
Instructor: Dean Corbae

Midterm Exam

Instructions: You have N hours to complete this out-of-class (during Covid-19) exam. You may only submit your answers provided you abide by the following rules. The exam is open notes. Your answers on this exam must be only your own work. Copying someone else's answers, letting someone copy mine, or discussing these questions with anyone (in or out of the class, online or offline) during the exam counts as cheating, and the penalty for cheating is a 0 on the exam which cannot be dropped.

In this midterm, we consider the possibility of government commitment problems. We will consider several different assumptions about the commitment technology. The main body of the paper considers only 2 period environments and then briefly consider what would happen in a more general finite period problem.

Environment

- There are two periods $t = 1$ and $t = 2$
- Population: There is a unit measure of households and a big government.
- Technology:
  - Each household is endowed with $w < 1$ units of a consumption good in period $t = 1$ and 1 unit of time in period $t = 2$.
  - There is a productive storage technology which transforms k units of the endowment at $t = 1$ into Rk units of the good in period $t = 2$ where $R > 1$.
  - Households can divide their 1 unit of time in period $t = 2$ to work n or leisure $1 - n$. If they work n units of time at $t = 2$, they produce n units of the consumption good (i.e. their production function is $y = n$).
- Preferences: A household's utility function is given by $U(c_1, c_2, n) = \ln(c_1 + c_2) + \ln(1 - n)$ where $c_t \geq 0$ denotes consumption in period $t = 1$ or 2. Note that $t = 1$ and $t = 2$ consumption goods are perfect substitutes (i.e. it doesn't matter when a household consumes) and that consumption in any period cannot be negative.

- There is an exogenous amount of government expenditure g in $t = 2$ which does not enter the household utility function (i.e. g is taken as given from outside the model). Assume that $g > Rw$ so that even if all endowment is put into the productive technology, it does not produce enough goods to cover government expenditure.
- Additional Parametric Assumptions:
  - A1: $(1 + g - Rw)/2 \in (0, 1)$

Question 1 - Planner's problem

1. (7.5 points) State the planner's problem if she weights all households equally (don't forget there is a resource constraint for each period).
2. (12.5 points) What is the planner's allocation?

Case 2 - Decentralized Equilibrium with commitment (Ramsey)

Now consider a competitive equilibrium where the government taxes labor earnings at proportional rate $\tau \in [0, 1 - w]$ (i.e. if the household works n hours, the government receives τn in revenue) and taxes storage returns at proportional rate $\delta \in [0, 1]$ (i.e. if the household stores k units of its $t = 1$ endowment, the government receives δRk in revenue). Assume that the government chooses τ and δ before the household chooses its storage decision k in period $t = 1$ and labor supply decision n in period $t = 2$.

3. (2.5 Points) State the government budget constraint.
4. (7.5 Points) For a given τ and δ, state the household problem.
5. (15 Points) Solve the household problem (assuming that if the household is indifferent between whether to store or not, it stores).
6. (5 Points) Taking the decision rules $n^r(\tau, \delta)$ and $k^r(\tau, \delta)$ in question 5 as given, state the government's problem.
7. (15 Points) Provide one equation in one unknown which characterizes a solution to the the government's problem (you needn't provide a closed form solution). Explain your logic. Hint: Think about what the planner would do.

Case 3 - Decentralized Equilibrium without commitment

Consider the same competitive equilibrium as in Case 2 but where the government chooses taxes (τ, δ) after households make their storage choice but before they make their labor supply choice.

8. (15 Points) Given k and (τ, δ), what is the household's decision rule $n^n(\tau, \delta, k)$ for labor supply at $t = 2$?

9. (10 Points) Given k and household decision rule $n^n(\tau, \delta, k)$, what is the optimal choice of (τ, δ) by the government? Again, provide one equation in one unknown which characterizes a solution to the the government's problem (you needn't provide a closed form solution). Explain your logic.

10. (5 Points) Given government decision rules $(\tau^n(k), \delta^n(k))$, what is the household's decision rule for capital at $t = 1$?

11. (5 Points) Suppose this 2 period problem is repeated a finite number of times. Can the Ramsey equilibrium be implemented without commitment?