Problem Set 3

Larry Jones

due November 30

1 TDCE with sequence of markets

Consider economy with distortionary taxes discussed in class.

a). Define TDCE in sequential form. Prove that sequential and Arrow-Debrue definitions are equivalent. Do not forget TVC.

b). Use sequential definition of the equilibrium. Suppose government issues debt and collects lump sum taxes each period. Show that Ricardian equivalence holds in such economy. That is, change in the pattern of taxes of representative consumer such that net present value of her tax liabilities stays constant (under initial interest rates) will have no effect on the equilibrium.

2 Ricardian equivalence in dynasty models

Consider the dynasty model as in problem 2d in the previous problem set. Each period government issues debt and collects lump sum taxes. Show that Ricardian equivalence holds.

3 Firms and distortionary taxes

Consider an economy with distortionary taxes as discussed in class. Modify it such that firms rather than consumers pay distortionary taxes. Show that it is equivalent to the original problem.
Consider the following problem:

\[
\begin{align*}
\max_{t=0} & \quad \beta^t \ln(c_t) + \ln(1 - n_t) \\
\text{s.t.} & \quad c_t + k_{t+1} \leq A n_t + (1 - \delta) k_t
\end{align*}
\]

\(k_0\) is given.

a). Describe the dynamic behavior of the solution.

b). Introduce labor income taxes, capital income taxes, and consumption taxes. Write the consumer’s budget constraint. How does the steady state depend on the capital income tax, the labor income tax, the consumption tax (i.e. do the comparative statics exercise)?

## 5 Optimal taxation of intermediate goods

Consider two sector static economy. Firms in the final goods sector have technology \( y \leq f(x, l_1) \) where \( x \) is intermediate good and \( l_1 \) is labor input. Firms in intermediate goods sector have technology \( x \leq h(l_2) \).

Government consumes \( g \) which it finances with taxes on labor income \( \tau_n \), consumption \( \tau_c \) and intermediate good \( \eta \).

Representative consumer maximizes utility function \( U(c, l) \).

Feasibility conditions \( c + g = y, \ l_1 + l_2 = l \).

a). Define competitive equilibrium for this economy.

b). Set up Ramsey problem.

c). Use Ramsey problem to show that allocation is efficient when

\[
\frac{f_x}{f_i} = \frac{1}{h_i}
\]

where \( f_i \) is partial with respect to \( i \).

d). What is the corresponding condition in the competitive equilibrium?

e). Show that setting \( \eta = 0 \) is an efficient tax policy.