Problem set 1

This problem set is due on September 26 at 6pm. Drop your assignment into the drop-box located in front of my office door (Purnell 413). No late homework will be accepted.

I. One-Period Model

1) Define a Competitive equilibrium (hereafter CE) formally with a basic economic environment we used in lectures.

2) Imagine that the economy is hit by a negative shock, which affects the total factor productivity. What are the equilibrium effects of this? (Determine how \( c, n, Y, w \) change in CE.)

3) Suppose that the substitution effect dominates the income effect when the market price changes. Further suppose that the government increases the spending and use it for the improvement on infrastructure in the economy (i.e., building bridges and constructing roads, etc.). What are the equilibrium effects of this?

4) Suppose that the government imposes a lump-sum tax on the representative consumer’s labor income, whose amount is \( T \). Further suppose that the governemnt increases the labor income tax amount. What are the effects of an increase in \( T \) on consumer’s consumption \( (c) \) and leisure \( (l) \)? Explain why.

5) Suppose that the government replaces a lump-sum tax system with a proportinal labor income tax system. That is, the government imposes a proportional tax on the representative consumer’s labor income, whose tax rate is \( t \). Further suppose that the government increases the proportional income tax rate. What are the effects of an increase in \( t \) on \( c \) and \( l \)? Explain why.

6) Show that the consumer is better off with a lump-sum tax rather than a proportinal tax on labor income given that either tax yields the same revenue for the government. Use a diagram to show this. (hint: the consumption bundle the consumer chooses under the proportional tax system must be just affordable given the lump-sum tax system.)

II. Search and Unemployment

A. One-sided model

1) The job finding rate for the first few months in 2016 hovered around 25 percent. The layoffs and discharges rate was around 1.2 percent and the quit rate was around 2 percent. What is the long-run unemployment rate?
2) Suppose that the initial unemployment rate is 4.7 percent. Compute the transition unemployment rates sequentially until period 30 and plot them. Do you see that the unemployment rate converges to the long-run unemployment rate you calculated in (1)?

3) Suppose that there is an increase in the total factor productivity (TFP). In the One-sided model, determine the effects of this on the reservation wage and the steady-state unemployment rate.

4) Consider an unemployed individual who is searching for a job under the following circumstances: each period he/she draws an wage offer $w$ from the distribution $F(w)$ whose density function is $f(w)$. The worker has the option of rejecting the offer in which he/she receives unemployment benefits, $b$; alternatively, he/she accepts the offer at wage $w$. Write down the value functions for employment and unemployment. Derive the reservation wage property.

5) We now consider a modification of the job search (One-sided) model in which the worker faces probability $\alpha$ of being fired, where $0 < \alpha < 1$. Write down the value functions for employment and unemployment. Derive the reservation wage property.

6) Suppose that in the efficiency wage model, it becomes more difficult for the firm to distinguish high-ability workers from low-ability workers in the labor market. What effect does this have on $e(w)$ and the efficiency wage?