EC9C6 Macro Topics: Assignment 1 Labour Markets

Instructions: The due date is 6 December 2019. Turn in on Tabula in pdf format. You should include any do files (or other script files) you used. If you used Stata do not include the do file that comes with the IPUMS download.

1.) **The Model:** So far we have seem wage posting models that assume an exogenous job arrival rate, as well as matching models that assume wages are determined by Nash Bargaining. Consider a wage posting model with a matching function. Workers receive a flow value of leisure b. Vacancies incur a flow cost of k and firms post take-it-or-leave-it wage offers. The total number of matches is determined by a matching function $M(u,v) = Au^{\alpha}v^{1-\alpha}$ and existing matches exogenously break up at rate δ. Works and firms maximize expected income over an infinite horizon, discounting the future at rate r.

   a. Write down the value functions for the work and the firm.

   b. Characterize the model equilibrium. This will involve three equations as in the DMP model: (1) an equation that characterizes the wage, (2) a Beveridge curve, and (3) a job creation curve.

   c. Now lets interpret b as unemployment compensation that is fully financed by a tax on the employed. That is, suppose employed workers pay a tax τ (a fixed amount, not a percent of their wages) to finance the unemployment benefits. Characterize the new equilibrium. (You should have 4 equations now.)

2.) **The Data:** Now you will use data from the Current Population Survey (CPS) to find some statistics that you can use to calibrate the model. First you will need to download the CPS data.

   1. First go to `https://cps.ipums.org/cps-action/variables/group`, this is where you will download the data.

   2. Change samples: In the top right you will see a "change samples" button, click it. Unclick "All Default Samples" at the top right. Go the the "Basic Monthly" tab and select all samples from January 2001- December 2018. Click "submit sample selection".

   3. From the Person → Core → Demographics/Work variables, get age (AGE), population status (POPSTAT), employment status (EMPSTAT), Unemployment duration (DURUNEMP).

   4. On the top right, click view cart. You should see some other variables in the cart that are always included. Importantly you will need year, month, and the Final Basic Weight (WTFINL). Create your final data extract.

   Now that you have all the data you need you will calculate the unemployment rate and level, as well as the job finding rate from Jan. 2001 to Dec. 2018. Since you will need to collapse the data to get totals, it is easiest to do a. and b. at the same time and then collapse the data only once.

a. Plot the monthly unemployment rate and the total number of unemployed for the civilian (drop military) working age (16+) population. Remember to use the weights when summing up individuals in each labor market state. (Hint: you will need to make a new variable since EMPSTAT disaggregates the unemployed into multiple groups. You will also need the total number of employed each month to calculate the unemployment rate.) What is the average unemployment rate over the sample?

b. Next calculate the job finding rate. Denote the total number of unemployed in month t as u_t, the job finding rate in month t as f_t, and the number of short term unemployed (those that have been unemployed for 4 or less weeks) in month t as u_t^s. If we assume that all individuals have the same job finding rate each month we can calculate the number of unemployed in month $t+1$ as, the number of unemployed in month t that did not find a job plus the short term unemployed, i.e. those that lost their job some time in month t. So

$$u_{t+1} = u_t(1 - f_t) + u_t^s$$
$$f_t = 1 - \frac{u_{t+1} - u_t^s}{u_t}$$

Calculate the total number of short term unemployed each month using the variable DURUNEMP (use the weights!). Calculate the monthly job finding rate. Plot the monthly the job finding rate. What is the average job finding rate over the sample?

c. Next construct a series for labour market tightness, θ. You already have the number of unemployed each month. Go to `https://fred.stlouisfed.org/` and get the total number of job vacancies (JTUJOL). Get the seasonally unadjusted (since the unemployment data is also not seasonally adjusted) from January 2001 - December 2018. Using your unemployment number and the vacancy number plot the monthly labor market tightness. (Be careful, vacancies from FRED are in thousands!)

3.) **The Calibration:** Now you will use the data from part 2 to calibrate the model in part 1. There are 8 parameters in the model: $\{A, \alpha, b, y, r, k, \delta, t\}$. To simplify things (and because you did not get any data about wages), normalize output to $y = 1$ and assume that $b = 0.4$. Since all the data is monthly, set the interest rate to $r = 0.0042$ (about 5% yearly rate).

a. Using the data on the job finding rate and the Cobb-Douglas matching function estimate the parameters of the matching function, A and α.
(Hint: $\ln[M(u,v)/u] = \ln A + (1 - \alpha)\ln(v/u)$)

b. Using the average job finding rate over the sample solve for a separation rate, δ, such that the model produces the average unemployment rate over the sample.

c. Using the average job finding rate solve for the tax.

d. Using the average job finding rate solve for the vacancy creation cost.