Economics 205C
Spring 2016

Problem Set 4: Due in class, Thursday June 8

1. Assume firms have a limited ability to monitor their workers. There are a large number of workers $\overline{L}$. Workers maximize expected discounted utility.

$$U_0 = \mathrm{E}_0 \sum_{t=0}^{\infty} \beta^t u(t)$$

where

$$u(t) = \begin{cases} w(t) - e(t) + b(t) \text{ if employed} \\ b(t) \text{ if unemployed} \end{cases}$$

e is effort: e is either 0 or $\overline{e} > 0$. The term $b(t)$ is non-labor income (i.e., income independent of employment status). Workers are either working and exerting effort (E), working and shirking (S), or unemployed (U). Each period workers face an exogenous probability $\delta > 0$ of losing their job. An employed worker who shirks faces a probability q each period of being detected and fired. The probability an unemployed worker finds a new job is a per period. Unemployed workers receive an unemployment benefit b per period.

   (a) Write down the value of each state the worker can be in.
   (b) Does difference in the value of being employment relative to unemployed depend on $b(t)$? Explain.
   (c) Derive the no shirking condition. What is the equilibrium wage? Does it depend on $b(t)$?
   (d) What is the per period flow into unemployment? What is the flow out? What is the equilibrium value of a?
   (e) Suppose firms produce output according to $F(e(t)N(t)) = A[e(t)N(t)]^{\alpha}$, where $0 < \alpha \leq 1$ and $N(t)$ is per-firm employment. Firm profits are

$$A[e(t)N(t)]^{\alpha} - w(t)N(t),$$

   where we have imposed the result that the wage ensures all employees exert effort. Using the equilibrium wage you found in part (c) and the assumption firms maximize profits, solve for the equilibrium employment and wages. How does a rise in $b(t)$ affect the equilibrium? Explain.

2. Consider a standard new Keynesian model with sticky prices and wages; both adjust according to a simple Calvo model but with different degrees of stickiness.

   (a) What are the driving variables for price inflation and wage inflation?
   (b) *Carefully explain* the factors generating inefficiencies in this economy.
   (c) Suppose fiscal taxes and subsidies are used to eliminate the *average* distortions caused by imperfect competition. Can monetary policy eliminate the remaining distortion(s)? Carefully explain your answer.

(d) Discuss the factors that influence the relative weight the policy maker should put on maintaining price inflation and wage inflation at zero, i.e., what determines the weights λ_π and λ_w in a loss function of the form

$$\frac{1}{2}\mathrm{E}_t \sum_{i=0}^{\infty} \beta^i \left[\lambda_\pi \pi_{t+i}^2 + \lambda_x x_{t+i}^2 + \lambda_w \left(\pi_{t+i}^w\right)^2\right],$$

where π_t is price inflation and π_t^w is wage inflation?

(e) **Optional**: Given the loss function from part (d), write a dynare model file to find the response to a positive productivity shock in a new Keynesian model with sticky prices and sticky wages under the optimal commitment policy. (Hint: you could modify NKM_optc.dyn.) Use the values given in the lecture slides to calibrate the model. Set $\omega_p = \omega_w = 0.75$. Now repeat but set $\omega_w = 0.0001$ (essentially flexible wages). How do your results differ?

3. In a search and matching model of unemployment, suppose the steady-state value of a job vacancy and the value of a filled job to a firm are given by

$$V^V = -c + \beta\left[qV^J + (1-q)V^V\right]$$

and

$$V^J = \mu x - w + \beta(1-s)V^J,$$

where c is the vacancy posting cost, β is the discount factor, q is the job filling rate, s is the separation rate, x is the output produced by the match, w is the wage, and μ is the firm's markup.

(a) Using the assumption of free entry in vacancy posting, what is the equilibrium value of a job vacancy?

(b) Using your result in (a), solve for the value of a filled job as a function of the cost of posting a vacancy, β and the job filling rate. *Explain* why the value of a filled job falls as it becomes easier to fill jobs (i.e., why does V^J fall when q rises?)

(c) Suppose the value to a worker of being employed rather than unemployed is

$$V^e = w - b + \beta(1-s)V^e,$$

where b is an unemployment benefit. What is the joint surplus to the worker and the firm of being in a match? Explain how the joint surplus is affected by the wage.

(d) Suppose the wage is set in Nash bargaining between the worker and the firm, with the worker receiving a share η of the joint surplus. Show that

$$w = (1-\eta)\,b + \eta\mu x.$$