ECON 2080, part 1
Spring 2022
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Problem Set 3

Handed out: Wednesday 23 February. Due: Wednesday 2 March, 10:30 am.
Total: 10 points.
You can work in a group, but you must write your own answers and acknowledge all group members. Please provide your derivations and explain your answers.

Problem A (7 points)

Consider a matching model with a labor force of size 1. The matching function is Cobb-Douglas: $m(U, V) = \sqrt{U \cdot V}$, where U is the number of unemployed workers and V is the number of vacant jobs. Firms have a production function $y(N) = 2 \cdot a \cdot \sqrt{N}$, where $a \leq 1$ governs labor productivity and N denotes the number of producers in the firm. All workers are paid at a $w = \sqrt{a}$. Firms incur a recruiting cost of $r > 0$ recruiters per vacancy and face a job-destruction rate $s > 0$. The labor market tightness is $\theta = V/U$ and the employment level is $L = 1 - U$.

1. Compute the job-finding rate $f(\theta)$ and vacancy-filling rate $q(\theta)$. Assuming that labor-market flows are balanced, compute the recruiter-producer ratio $\tau(\theta)$. Compute the elasticities of f, q, and τ with respect to θ. Interpret the signs of the elasticities.
2. Assuming that labor-market flows are balanced, compute labor supply $L^s(\theta)$. Compute the elasticity of L^s with respect to θ. Interpret the sign of the elasticity.
3. Firms choose employment to maximize flow profits: $y(N) - [1 + \tau(\theta)] \cdot w \cdot N$. Compute the labor demand $L^d(\theta, a)$ by solving this maximization problem. Compute the elasticities of L^d with respect to θ and with respect to a. Interpret the signs of these elasticities.
4. Characterize tightness $\theta(a)$ and employment $L(a)$ in the model. Compute the elasticities of $\theta(a)$ and $L(a)$ with respect to a. Interpret the signs of these

elasticities.

5. Would shocks to labor productivity a create realistic business cycles?
6. Compute the amount of rationing unemployment $U^r(a)$ and frictional unemployment $U^f(a)$ in the model.
7. Prove that $dU^f/da > 0$. Interpret the result and provide some policy implications.

Problem B (3 points)

Consider an economy with a mass 1 of participants in the labor force. The Beveridge curve takes a very simple form: $v(u) = \omega/u$, where $\omega > 0$ governs the location of the Beveridge curve. Each vacancy requires the attention of a full-time worker. Finally, all production takes place in firms and there is no home production at all. As a result, social welfare is determined by the number of producers in firms.

1. Compute the socially efficient labor maket tightness θ^*. How does θ^* depend on the parameter ω?
2. Compute the socially efficient unemployment rate u^* as a function of the actual unemployment and vacancy rates, u and v.
3. Using the formulas derived in Questions 1 and 2, compute the efficient tightness, efficient unemployment rate, and unemployment gap in the United States in December 2021. What are the policy implications of your results?