

**Economics 205B**  
**Winter 2008**

**Problem Set 3: Due Wednesday, February 13**

1. For this question, use the same model you used for question 2 of Problem Set 2.
  - (a) Use the model's numerical solution to simulate time series of length 40 years (160 quarters) for all the variables of your model. (Hint: To have Uhlig's programs do this, simply add the following commands just before the "do\_it" command: `DO_SIMUL = 1;` `SIM_MODE = 1;` `SIM_LENGTH = 160;` `SIM_RANDOM_START = 1;` `SIM_GRAPH = 1.`) (Second hint: type "help options" at the matlab command line to see the full list of options Uhlig provides.) When you run `BASIC_RBC` (or what ever the name of your program is), you will get a plot of the simulated time series for all the variables of your model. The simulation will be 160 periods long. If you have  $N$  variables in your model, the simulated series will be stored in an  $N \times 160$  matrix called `sim_xyz`.
  - (b) From the simulated data, calculate the real wage and construct a scatterplot with the real wage on the vertical axis and employment on the horizontal axis. (Hint: If `rw` is your real wage series and `em` is employment, try `plot(rw,em,'+')`.) Does it look like what you expected?
  - (c) How would you expect your plot to change if you reduced the wage elasticity of labor supply (the parameter  $\eta$ )? Do another simulation and construct a plot to verify your expectation.
  - (d) Add in a fiscal shock to the model. Assume the government purchases  $G_t$  and this spending is financed by lump-sum taxes. The economy-wide resource constraint becomes

$$Y_t = C_t + [K_{t+1} - (1 - \delta)K_t] + G_t.$$

Assume  $\hat{g}_t = \rho_g \hat{g}_{t-1} + s_t$ , where  $\hat{g}_t$  is defined by  $G_t = G(1 + \hat{g}_t)$  and  $s_t$  is a white noise fiscal shock. Assume the standard deviation of the fiscal shock and the serial correlation coefficient  $\rho_g$  are

the same as the values used for the productivity shock. Finally, assume the steady-state value of  $G/Y = 0.3$ . Redo your simulations and construct another plot of the real wage and employment. Does it look like what you expected? Explain.

- (e) How would you expect your plot to change if you increased the standard deviation of the fiscal shock by a factor of 10? Do another simulation and construct a plot to verify your expectation.

2. Suppose the utility function used in question 1 of problem is replaced with one that reflects habit persistence on the part of households:

$$u(c_t, 1 - n_t) = \frac{(c_t - bc_{t-1})^{1-\sigma}}{1 - \sigma} - \Psi \frac{n_t^{1+\eta}}{1 + \eta}, \sigma, \eta > 0$$

- (a) Set of the social planner's problem for the economy with this utility function.
- (b) Derive the first order conditions. What form does the Euler condition take? Explain.
- (c) Derive the linearized version of this model.

3. Walsh, Chapter 2, page 91, Problem 1.
4. Walsh, Chapter 2, page 92, Problem 8.
5. Walsh, Chapter 2, page 93, Problem 11.
6. Walsh, Chapter 3, page 132, Problem 6.