

**Econometrics I, Part II**  
**Assignment 1**  
**Fall 2007**

*Today's Date: 10/30*

*Due Date: 11/6*

In this exercise you are asked to estimate a structural two-state (employment and unemployment) search model. Given the discussion we had in class, we know that it is necessary to make a functional form assumption regarding the “true” wage distribution,  $F(w)$  whenever it is assumed that  $P(w < w^*) > 0$  in the population. You are asked to estimate the model twice, under two different assumptions on the functional form of the wage offer distribution.

1. Let  $w$  be an independently and identically distributed (i.i.d.) draw from a lognormal distribution, with density

$$f(w) = (\sigma_w w)^{-1} \phi\left(\frac{\ln(w) - \mu}{\sigma_w}\right), \quad w \geq 0,$$

where  $\mu$  and  $\sigma_w (> 0)$  are unknown parameters to be estimated and  $\phi$  denotes the probability density function of a standard normal random variate. The cumulative distribution function (c.d.f.) is given by  $\Phi\left(\frac{\ln(w) - \mu}{\sigma_w}\right)$ , where  $\Phi$  is the standard normal c.d.f.

2. Let  $w$  be an i.i.d. draw from a negative exponential distribution, the density of which is given by

$$f(w) = \alpha \exp(-\alpha w), \quad w \geq 0,$$

where  $\alpha (> 0)$  is an unknown parameter to be estimated. The c.d.f. of  $w$  is  $F(w) = 1 - \exp(-\alpha w)$  in this case.

## 1. Exercises

1. Under both assumptions regarding the wage offer distribution, you are to obtain maximum likelihood estimates of  $\lambda$ ,  $\eta$ ,  $w^*$ , and either  $(\mu_w, \sigma_w^2)$  or  $\alpha$ . In both cases, after obtaining estimates of these parameters, “back out” an estimate of  $b$  under the assumption that  $\rho = .005$ . You can perform the exercise either for the entire sample, or for one (or more) subsamples (i.e., a (gender,race) pair). You should also report the appropriate asymptotic standard errors associated with the estimated parameters (except for the point estimate of  $b$ ).

2. Determine the effect of a 10 percent increase in  $\lambda$  on the expected duration of search and the mean accepted wage under both assumptions on  $F$  using your point estimates from (1).

## 2. Data

The data set is in a text file named `cps2002.txt` so that you can use it with whichever programming language you choose. The data are extracted from the October 2002 Current Population Survey, and contain observations on individuals 25-34 years of age. Only individuals working or unemployed are included in the file. The layout is

Column	Variable	Values
1	Weekly Wage	> 0 for employed individuals
2	Search Duration (Months)	> 0 for unemployed
3	Gender	1 male; 2 female
4	Race	1 white; 2 black

Some very low weekly wage draws have already been excluded from the data set. Total sample size is 2907.

You should estimate the structural search model for at least one demographic group (i.e., a {Gender,Race} pair. Prior to estimation, divide weekly wage data by 100 to get the parameters to be of similar orders of magnitude (important for nonlinear estimation). If possible, obtain the appropriate large sample standard errors associated with your point estimates.