Homework 1: Labor Economics

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1 Preliminary analysis

1. Visit the BHPS website and familiarise yourself with the basic structure and contents of the BHPS data. What features make it a suitable data set for the estimation of the BM model?

2. Open the file and answer the following questions:

   (a) What is the sample size? What is the sex ratio in the sample?
   (b) What is the sample unemployment rate? What is the sample unemployment rate of men? Of women? Or workers in each education category?
   (c) What proportion of initial spells are right-censored? Answer the same question for each type of first spell (job or unemployment spell).

3. Construct the initial (spell-1) cross-sectional CDF (`G`) and density of log wages `logw1`. Produce the plots of these two objects.

4. Create a variable categorising `logw1` into 25 bins (ie, percentiles 1-4, 5-8,9-12,...,97-100) and a variable containing the mean spell-1 duration (`spelldur1`) within each of these 25 bins. Plot those mean durations against the wage percentiles. Is this consistent with the BM model?

5. Explain how one can obtain a non-parametric estimate of the wage sampling distribution F from the data. Construct this non-parametric estimate, and plot it on the same graph as `G`. Is this consistent with the theory? What else can you say about the estimate of F?
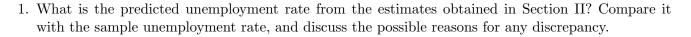
2 Estimation

1. Write code for the MLE estimation of the BM model following the two-step protocol of Bontemps, Robin and Van den Berg (1999).

2. Write code for computing the standard errors of the estimates δ, λ_0 and λ_1, explaining the assumptions upon which those standard errors rely.

3. The file `BM_data_simulated.csv` contains artificial data resulting from a simulation of 5,000 workers behaving according to the BM model with parameters $\delta = 0.01$, $\lambda_0 = 0.1$, $\lambda_1 = 0.05$ (monthly values). Run your ML estimation routine on the simulated data, and check that your estimates against the true parameter values.

3   Playing around with the model

1. What is the predicted unemployment rate from the estimates obtained in Section II? Compare it with the sample unemployment rate, and discuss the possible reasons for any discrepancy.

2. Construct kernel density estimates of the cross-section distribution of wages $g(w)$ and of the sampling distribution $f(w)$. Plot both densities on the same graph.

3. Construct the distribution of firm productivity that rationalises the observed wage distribution within the BM model. Plot firm productivity against wages, and against the cross-section CDF of wages $G(w)$. Do you notice anything wrong?

4. Looking at the predicted profit rate of high-productivity firms, what else can you say about the BM model?