Labor Economics Homework 3

Due:

1. Estimation of McCall's Job Search Model

Recall our settings from homework 1. An unemployed worker solves the following Bellman equation:

$$v(w) = \max_{s} sw + (1-s)\left[\underline{c} + \rho \int v(w')F(dw')\right],$$

where F is the CDF of the wage offer distribution $Beta(\alpha, \beta)$.

1. Use the parameters in homework 1.3 to simulate the data for one period, i.e., $\{(w_i, s_i)\}_{i=1}^{1000}$. Note that we do not observe the wage if $s_i = 0$.
2. Compute the mean wage among those who are employed. Is the mean wage you computed close with the mean wage in the distribution of wage offers?
   (Hint: $X \overset{iid}{\sim} Beta(\alpha, \beta)$ implies $\mathbb{E}[X] = \frac{\alpha}{\alpha+\beta}$.)
3. Estimate the wage distribution parameters α and β by MLE.
   (Hint: The observed wage follows a truncated beta distribution.)
4. We do know $\underline{c} = 0.1$ since it is the unemployment benefit. Estimate ρ.

Solution. 1.1, 1.2, 1.4.
See the Julia code file.

Solution. 1.3.
Notice that the reservation wage $\bar{w}$ is the threshold. The MLE estimator is

$$\arg\max_{\alpha,\beta,\bar{w}} \sum_{i=1}^{1000} s_i \log \frac{f(w_i;\alpha,\beta)}{1-F(\bar{w};\alpha,\beta)} + (1-s_i)\log F(\bar{w};\alpha,\beta),$$

where f is the PDF of the beta distribution and F is the CDF. Implementation is in the Julia code file.

2. Estimation of Crusoe's Coconuts Model

Recall our settings from homework 2. Crusoe solves the following Bellman equation:

$$v(y) = \max_c u(c) + \beta \int v(y')F(dy' \mid y, c),$$

where $F(dy' \mid y, c)$ is the transition probability from y to y' given c, with the law of motion $y' = zf(y - c)$, $f(k) = k^\alpha$ and $\log z \overset{iid}{\sim} N(0, \sigma^2)$.

1. Use the parameters in homework 2.3 to simulate the time series data $\{(y_t, k_t, c_t)\}_{t=1}^{200}$.
2. Estimate the production process parameters α, μ and σ.
3. Estimate β and γ by SMM. What moment conditions would you use?

Solution. 1.1, 1.2.
See the Julia code file.

Solution. 1.3.
I would use

$$\mathbb{E}\left[(c_t - \hat{c}_t)^2 | y_t\right] = 0,$$

but you may use other moment conditions.