Econ 810: Homework 2

Spring 2022

1 Part 1: Data

The data assignment this week has two parts. One part will use our PSID dataset from last week the other part will require you to simulate data.

1.1 Earnings gains while employed

In this section, we are going to produce a moment from the PSID earnings data that we will compare to the estimates from the model in Section 2. Using the PSID data, individuals who have been working full-time in two consecutive years (easy way to do this, set a lower bound on annual hours that aligns with working full-time for a full year). What is the average change in earnings for these individuals?

1.2 Earnings losses while unemployed

In this section, you will simulate data for a sample of "job losers" and job stayers. Then using the simulated data, you will test that you can recover the parameters that govern the simulation using the distributed lag framework from class. Try the following:

- **Step 1:** Simulate data on 500 job losers and 500 job stayers for 11 years. In year 1, suppose all individuals make \$30,000 plus some random (mean zero) noise. In years 2-5 (the pre-layoff years), suppose all individuals earnings increase by \$1000 + random noise. For the job losers sample suppose in year 6 their earnings decline by 9,000 plus noise, and then resume increasing by 1000 per year (plus noise) until year 11. For the job stayers sample suppose in year 6 through 11 they continue to have an average increase in earnings of 1000 (plus mean zero noise).
- **Step 2:** Using the simulated data from step 1, estimate the distributed lag framework from class,

$$Y_{i,t} = \alpha_i + \gamma_t + \sum_{k=-4}^{5} \beta_k D_{i,k} + \epsilon_{i,t}$$

  - where α_i is an individual fixed effect , γ_t are year fixed effects, $D_{i,k}$ are dummy variables denoted when an individual i is k years from layoff.

- To complete the data assignment report the coefficient estimates from estimating the distributed lag framework. What are the values of β_k and γ_t ? What do you think they should be equal to?

2 Part 2: Model

Consider a simplified life-cycle version of the model in Ljungqvist and Sargent (1998). Suppose workers have linear utility (risk neutral) and live for T periods. To find jobs, workers exert search intensity s at utility cost $c(s)$. Given that effort, $\pi(s)$ is the probability of receiving a job offer. Job offers are drawn from stationary distribution $F(w)$. When employed, suppose that each period there is a probability δ of being laid off. Let h denote human capital, and take home pay will be wh. When unemployed, workers receive a transfer b, which is common to all workers.

Suppose that human capital lies on a grid $h \in \{\underline{h}, \underline{h}+\Delta, ..., \bar{h}\}$, and following the human capital process in Jarosch (2014). If unemployed, human capital falls by Δ with probability ψ_u. When employed, human capital increases by Δ with probability ψ_e.

The value function for the unemployed is given by,

$$U_t(h) = \max_s b - c(s) + \beta \mathbb{E}_{h'|h,U} \left[\pi(s) \int_w \max\{W_{t+1}(w, h', U(h')\} dF(w) + (1 - \pi(s)) U_{t+1}(h') \right] \quad \forall t \leq T$$

$$U_{T+1}(h) = 0$$

subject to the law of motion for human capital among the unemployed.

The value function for the employed is given by,

$$W_t(w, h) = wh + \beta \mathbb{E}_{h'|h,W} \left[(1 - \delta) W_{t+1}(w, h') + \delta U_{t+1}(h') \right] \quad \forall t \leq T$$

$$W_{T+1}(w, h) = 0$$

2.1 Calibration

- Set model period to 1 month, and life-cycle to 30-years ($T = 360$).
  - Set the discount factor to $\beta = \left(\frac{1}{1+r}\right)^{\frac{1}{12}}$ where $r = 0.04$.
- Set probability of being laid off to 3.3%
- Put human capital on a grid between 1 and 2 with 25 evenly spaced grid points

- Have newborns start as unemployed and draw their human capital from a uniform distribution.
  - If you want do something fancier: have newborns draw their human capital from a distribution $G(w) \sim N(\mu_w, \sigma_w)$, where the mean puts the mass towards the bottom of the grid. What moments seem useful to calibrate these parameters?
- Set the search cost to be $c(s) = 0.5s$.
- Set the probability of drawing an offer to $\pi(s) = \sqrt{s}$
  - Define a grid of search effort choices between 0 and 1 with 41 grid points.
- Set the wage offer distribution to be normal with a mean of 0.5 and variance of 0.1.
  - Set a grid of offers with 41 points.
- Pick a set of parameters for the probability of having human capital increase during employment spells ψ_e and decrease during unemployment spells ψ_u. Report the initial values you pick.

2.2 Assignment

- Solve the model with VFI and simulate a mass of agents.
  - In the VFI there are two policy functions to store: (1) search policy function and (2) reservation wage by human capital. Each policy function is also a function of age.
- Plot the search policy function and reservation wage as function of h for a few selected ages.
- In the simulated data, plot the distribution of human capital among the employed and unemployed. Do the distribution look like you would expect?
- In the simulated data, what is the average gain in earnings for individuals who are working for two consecutive years (i.e., 24 periods without a δ shock)? How does this estimate compare to your estimate from the PSID data in Section 1? How does this estimate vary as you increase/decrease the parameter ψ_e.
- In the simulated data, plot the average path of earnings from 6 months before to 2 years after an unemployment spells (i.e., a δ shock in your model). What is the percent decline in earnings after 2-years? How does this compare to the data reported in Davis and von Wachter (2011) or Jarosch (2014)? What happens if you increase/decrease ψ_u.

3 Part 3: Submission

To complete the assignment, please do the following:

- Write up your findings from the model and data components.
- Email me you write up and code.

References

Davis, S. J. and T. von Wachter (2011). Recessions and the costs of job loss. *Brookings Papers on Economic Activity*, 1–73.

Jarosch, G. (2014). Searching for job security and the consequences of job loss.

Ljungqvist, L. and T. Sargent (1998). The european unemployment dilemma. *Journal of Political Economy 106*(3), 514–550.