Econ 810: Homework 1

Spring 2022

1 Part 1: Data

Using the PSID data in the Dropbox folder, estimate the variance of temporary and *persistent* income shocks. Suppose household i receive after-tax income Y_{it}, which takes the form:

$$log(Y_{it}) = \kappa_t + y_{it}$$
$$y_{it} = P_{it} + \epsilon_{it}$$

where $P_{it} = \rho P_{i,t-1} + \zeta_{i,t}$, with $\rho < 1$ governing the persistence of earnings. Persistent shocks ζ are such that $\zeta_{i,t} \sim N(0, \sigma_\zeta)$ and temporary shocks ϵ are such that $\epsilon_{i,t} \sim N(0, \sigma_\epsilon)$. Additionally, the shocks $\zeta_{i,t}$ and $\epsilon_{i,t}$ are independent over time and across households.

Details & suggestions

- The PSID became bi-annual after 1997. Use the years 1978-1997. Assume we are in a steady state (i.e., just estimate a single variance for permanent and temporary income.). To align with Blundell, Pistaferri, and Preston (2008) and much of the literature that uses the PSID drop the individuals from the SEO oversample.
- You'll want to impose some sample selection criteria. Be clear on how you set your sample criteria. Often people only use observations above a minimum earnings cutoff and require that individuals satisfy that cutoff [X] times to be in the sample. Make a table with some descriptive statistics on your sample.
- Don't forget to remove the life-cycle component of earnings, κ_t. Be clear on how you choose to do it. Make a graph of your predicable age earnings profile κ_t.
- To get started set $\rho = 0.97$. Make a table with your estimate of σ_ϵ^2 and σ_ζ^2.

2 Part 2: Model

Use your estimates on the labor income process from Part 1 in a life-cycle Bewley Model. Solve and simulate data from a model with the following features (essentially the model from Kaplan and Violante (2010) without retirement where the labor income process has persistent and transitory shocks):

- Agents enter the model with zero assets and are in the model for 35 years. There is no retirement.

- Agents labor income follows the income process from Part 1. Use your estimates from Part 1 for the variance of transitory and persistent shocks.

- Suppose initial permanent income $P_{i,0}$ is drawn from a normal distribution with mean zero and variance σ_{ζ_0}. To get started use the variance from Kaplan and Violante (2010).

- Suppose agents receive utility from consumption and borrow/save at an exogenously given interest rate $r > 0$. To get started set $r = 4\%$ and the discount factor of agents $\beta = .975$. Set the borrowing constraint to either zero or the natural borrowing limit. Be clear on the choices that you make.

Write down a recursive representation of this model. Solve and simulate data from this model. To get started, simulate 1000 agents for a full life cycle.[1] Using the simulated data do the following:

i. Make a graph of the average value of wealth by age in your model.

ii. Plot the variance of consumption (i.e., consumption inequality) by age in your model.

iii. Using model simulated data, complete the insurance coefficients using the Blundell et al. (2008) methodology. How do your estimates compare to the estimates reported in their paper.

iv. Finally, using model simulated data compute the true insurance coefficients (equation (4) in Kaplan and Violante (2010)). How do these coefficients compare to the results from the step above. Do your results align with Kaplan and Violante (2010)? If they do not align, what features of your model relative to Kaplan and Violante (2010) do you think led to this.

Some suggestions

- If you're rusty on solving these types of models, see the "Basic Bewley" note in the Week 1 folder on Dropbox.

- You'll need to create a discrete version of persistent earnings and transitory shock. You can use methods such as Tauchen or Rowenhurt. I've put some notes on these methods in the folder as well.

- My advice: start simple! Put down a discrete grid for assets, permanent income and the transitory shock. Solve the model for each combination of states and store the policy function.

[1] How do you know how many people to simulate? Once your code works, increase the number of simulated agents to 5000. If your answers do not chance in a meaningful way stop, if they do keep increasing the number of agents.

3 Part 3: Submission

To complete the assignment please do the following:

- Write up your findings from the data and model components. It's good practice to do this in Latex, I've put a sample file in the Dropbox folder.
- Email me your write-up and code.

References

Blundell, R., L. Pistaferri, and I. Preston (2008). Consumption inequality and partial insurance. *The American Economic Review*, 1887–1921.

Kaplan, G. and G. L. Violante (2010). How much consumption insurance beyond self-insurance? *American Economic Journal: Macroeconomics 2*(4), 53–87.