ECON 810: Homework 1

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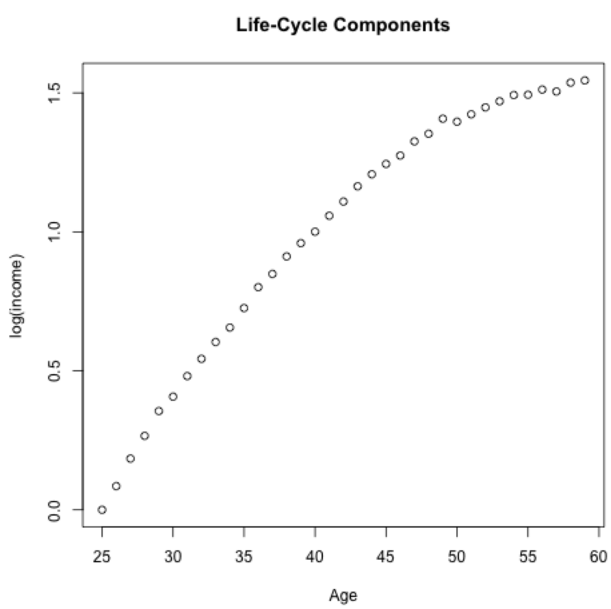
1 Part 1: Data

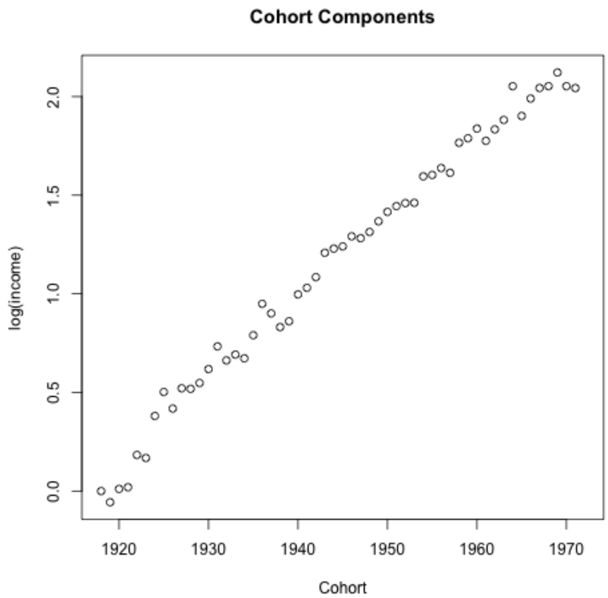
- I used PSID data with the following filters:
  - Main sample. No SEO oversample.
  - Years 1978-1997 inclusive.
  - Ages 25 to 60 inclusive. I stopped at 60 to match 35 period model in part 2.
  - I used variable `i11103` (description "HH Labor Income") as my income variable, Y_{it}. I drop observations with zero income.
  - I then use a 98% winsorization of the sample based on income. This creates implied income limits of about \$1200 to \$170000.
- I estimated the life-cycle component of earnings using age and cohort fixed effects:

$$\log(Y_{i,t}) = \alpha_0 + \sum_{j=26}^{60} \alpha_j \mathbb{1}(age_{i,t} = j) + \sum_{k=1920}^{1972} \beta_k \mathbb{1}(cohort_{i,t} = k) + \varepsilon_{i,t}$$

where $cohort_{i,t} = year_{i,t} - age_{i,t}$. The base group for age is the 25 year olds and the base group for cohort is those born in 1919. The intercept estimate is 8.14951. The estimated life-cycle components are plotted below:



The estimated cohort components are plotted below:



- Taking $\varepsilon_{i,t}$, I compute pseudo differences using $\rho = 0.97$:

$$\tilde{\Delta} y_{i,t} = \varepsilon_{i,t} - \rho \varepsilon_{i,t-1}$$

- Then estimate σ^2_ε and σ^2_ζ using the following formulas:

$$\hat{\sigma}^2_\varepsilon = \frac{-1}{\rho} Cov(\tilde{\Delta} y_{i,t}, \tilde{\Delta} y_{i,t+1})$$
$$\hat{\sigma}^2_\zeta = \frac{1}{\rho} Cov(\tilde{\Delta} y_{i,t}, \rho^2 \tilde{\Delta} y_{i,t-1} + \rho \tilde{\Delta} y_{i,t} + \tilde{\Delta} y_{i,t-1})$$

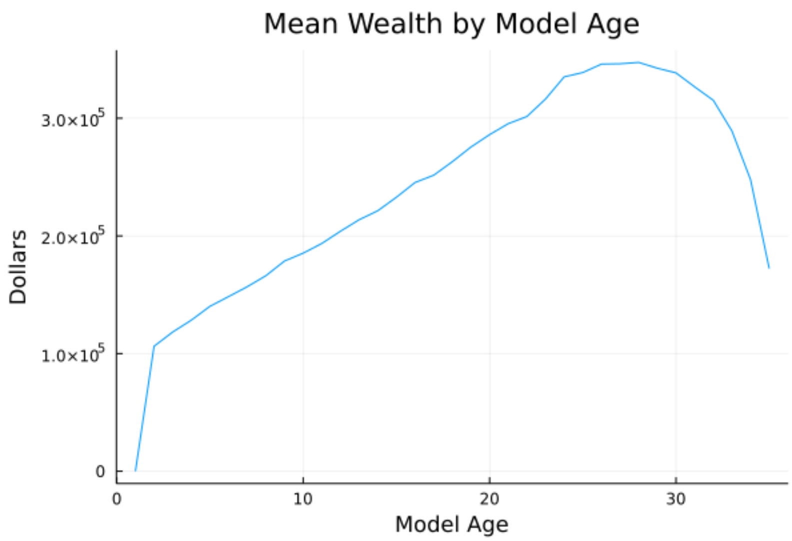
- The resulting point estimates are

	Data Moment
$\hat{\sigma}^2_\varepsilon$	0.0563
$\hat{\sigma}^2_\zeta$	0.0673

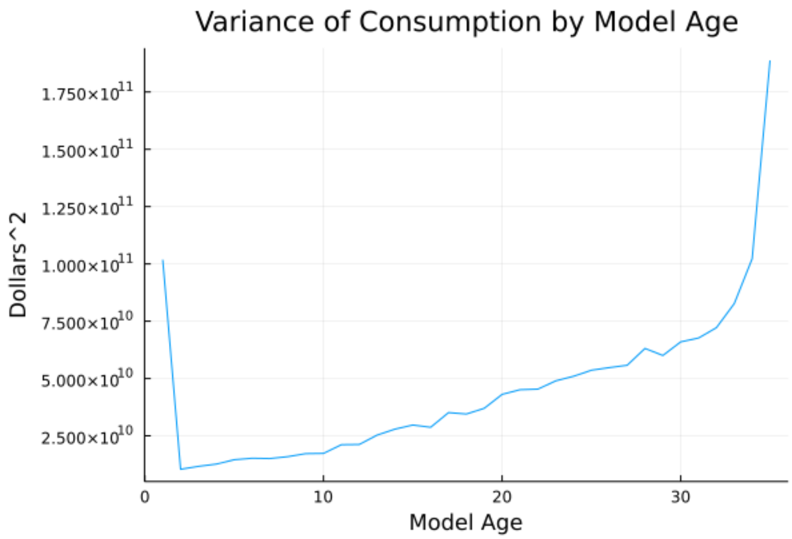
- See `part_1.R` for the implementation.

2 Part 2: Model

- Some details about I implemented the model:
  - The life-cycle component is estimate in the part 1. I use the age fixed effects (see Life-Cycle Components figure) plus the intercept of 8.14951
  - There's a zero borrowing limit.
  - The asset grid goes from \$0 to \$2,000,000 with 500 grid points.
  - Tauchen is used to discretize the persistent income shock with 5 states (using `tauchen` function from QuantEcon).
  - The transitory income shock has 5 states.
  - The model is simulated for 5000 individuals.
- The graph of average wealth by age is below:



- The graph of consumption variance by age is below:



- My results for the passthrough of the shocks are off, so I'm not reporting them here. I think there's a bug somewhere, but my time constraint is binding.

- A comparison of the variance of the shocks from the data and then recovered from the model simulation (calibrated to the data moment). Consistent with Kaplan and Violante, the implied $\hat{\sigma}_\varepsilon^2$ is pretty close, but the implied $\hat{\sigma}_\zeta^2$ is relatively small.

	Data Moment	Simulation Moment
$\hat{\sigma}_\varepsilon^2$	0.0563	0.0625
$\hat{\sigma}_\zeta^2$	0.0673	0.0196

- See the Julia scripts for the implementation:
  - `part_2_model.jl` contains code for solving the model.
  - `part_2_simulation.jl` contains code for simulating the model and manipulating the simulation results.
  - `part_2_run.jl` runs the analysis and creates figures.