

1st Group Assignment

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5329: Inequality, Household Behavior, and the Macroeconomy

Instructions

- This assignment should be completed in groups of 2-3 students, and handed in through Canvas before 10 a.m. on the 9th of April.
- This assignment contributes 10% to your final grade.
- You can hand in either an ipynb or a jl, and a pdf file. For full marks, you are expected to carefully motivate your answers. Codes should be easy to follow and well-commented. The connection of verbal answers with corresponding codes (when relevant) should be made clear, especially if they are in separate files.

Tasks

1 Deterministic model with CRRA utility

Consider the deterministic version of the consumption-saving model without borrowing limits studied in the Tuesday lecture. Starting from slide 22 we derived the solution by assuming $\beta(1+r) = 1$. In this exercise, you are asked to solve the model without making this assumption in the case when the utility function is of the CRRA (constant relative risk aversion)¹ kind, i.e.

$$u(c) = \frac{c^{1-\gamma} - 1}{1-\gamma}$$

where $\gamma > 0$, $\gamma \neq 1$ is a parameter.

1. Using the Euler-equation, express c_{t+1} as a function of c_t for any t .
2. Express c_t as a function of c_0 for any t .

¹If you don't know what is risk aversion right now, it's fine.

3. Substitute into the consolidated budget constraint.
4. Express c_0 as a function of model parameters and the economic environment. (You should have only c_0 on the LHS of the equation and no decision variables on the RHS.)
5. In the class we found that
 - consumption is constant over time
 - consumption in time 0 is affected by income and wealth only through the present value of these resources. I.e. the timing of when you receive income doesn't matter (if you keep the present value constant).

Does each of these implications survive under the current assumptions? Give some economic intuition for why (not) this is the case.
6. Let's go back to the Euler equation. Compute the elasticity of consumption growth (c_{t+1}/c_t) with respect to gross return $(1 + r)$
 - (a) How would you interpret this elasticity?
 - (b) In what way does it depend on γ ? Can you find some economic intuition for this relationship? (It might help to compare a positive γ value with $\gamma = 0$.)

2 Campbell and Mankiw (1989) vs micro data

Campbell and Mankiw (1989) use aggregate data for their analysis. Their preferred interpretation of their results is that approximately half of the population consumes their total income in every time period. Of course, this conclusion is directly untestable in aggregate data. Your task is to see how reasonable this interpretation looks in the view of PSID.

1. As in the ungraded assignment, build a variable for family-level income, keep only household heads, drop observations corresponding to times of changing family composition, keep only years when expenditure data is available, and build variables for changes (between neighboring 2 years) in expenditure and income.
2. For every household head, compute their individual-specific correlation of income changes and expenditure changes.
3. Plot the histogram of all these correlation values. [If x is any vector, *histogram*(x) would produce a histogram in Julia. Formatting (axis labels and such) works just as for *plot*(.).] In light of your findings, what can you say of Campbell and Mankiw's conclusions?

3 Performing Zeldes' tests in simulated data

Zeldes developed three tests to check whether borrowing limits matter for consumption decisions. To get some intuition of these tests and also on working with simulated data, it is useful to reproduce these results in simulated data from our model economy.

1. In the Thursday class, I'll show how to solve the model on the computer and perform test (i) in simulated data. Your task now is to reproduce tests (ii) and (iii) with the same parameters as we use(d) in class. Could you produce results that are in line with Zeldes' expectations/findings? Why (not)?
2. Lower the borrowing limit (i.e. allow the households to go into debt) and perform tests (i)-(iii) again. How do the results change? Do these findings make sense?