

**ECONOMICS 7344 – MACROECONOMIC THEORY II, part b, Spring
2019**

Homework 2. March 27, due Wednesday April 3.

1. Consider an extension of question 2 in the first homework.

Two consumers live for 3 periods (periods 1, 2, and 3), earns \$100 in the first period and the distribution of future earnings follows a uniform distribution on the interval $[90, 110]$ in periods 2 and 3. The consumers have a quadratic utility function and is—in period 1—allowed to freely borrow and lend at an interest rate that equals his or her rate of time preference which we for simplicity set to 0 (i.e., the net rate of interest is 0). Consumer A is allowed to save in period 2 but not to borrow and the consumer has access to no other assets. Consumer B can borrow and save. Let C_t^A , C_t^B be the consumption of consumer A and B, respectively, in period t .

A) Is $E_1(C_2^B) = E_1(C_3^B)$? (Explain.)

B) Find C_1^B (and compare to the value of C_1^A that you found in homework 1).

Now assume that the agents get a further 10 dollars in period 3, and that this is known in period 1. (This is supposed to capture the logic of an announced tax break.)

C) Is $C_1^i = E(C_2^i)$, for $i = A, B$?

D) Find C_1^A and C_1^B under the new assumption. For which agent did consumption increase more (or, roughly, which agent has the larger propensity to consume).

2. A common model in economics is one where a typical agent's wage is a sum of a random walk and independent white noise. (Or some variation of that: some economists use a very persistent AR(1) instead of a random walk and some may use an MA(1) instead of the white noise. In applications, there will also be deterministic component, but let us assume that has already been subtracted out.)

Define y_t such that

$$y_t = y_{t-1} + u_t,$$

where u_t is white noise with variance σ_u^2 , and define

$$w_t = y_t + e_t,$$

where e_t is white noise with variance σ_e^2 .

Econometricians has estimated this model by matching the moments of empirical wages to the theoretical moments of this model. w_t is not stationary (it is not stable so it cannot be stationary), so econometricians instead finds the moments of Δw_t assuming that its distribution is stationary.

Find the variance, and the covariance of order one and two for Δw_t

3) (20% of 2010 Final) [NOTE: we will not have covered the material you need for question b) before Monday, and if we don't get through it Monday you will answer part b) for the next homework.]

Assume that an agent's wage income follows the AR(1) process

$$y_t = 300 + 0.5y_{t-1} + e_t \quad (*)$$

where e_t is white noise with variance 3.

Assume the agent's wage was 100\$ period 0.

- a) What is the agents expected wages in period t (for any $t > 0$)?
- b) If the rate of interest is 10 percent and the PIH holds, what is the agent's level of consumption in period 0 assuming that his or her assets at the beginning of period 0 was 1000\$.