

Problem Set 4

Due in lecture Thursday, November 4

1. Consider a consumer whose behavior is described by the permanent-income hypothesis. In response to an unexpected, permanent fall in his or her labor income, the consumer will:

- A. Borrow against future income to keep his or her consumption unchanged.
- B. Immediately reduce consumption by the amount of the fall in labor income.
- C. Gradually reduce consumption by the amount of the fall in labor income.
- D. Gradually reduce consumption by more than the amount of the fall in labor income.

2. (Consumption with state-contingent goods.) Consider a consumer who seeks to maximize  $E \left[ \sum_t \frac{1}{(1+\delta)^t} U(C_t) \right]$ ,  $U'(\cdot) > 0, U''(\cdot) < 0$ . The consumer can purchase state-contingent goods; the price of consumption at date  $t$  in state  $s$  is  $p_{st}$ . The probability that the state on date  $t$  is  $s$  is  $\pi_{st}$ . Thus, for each  $t$ ,  $\sum_s \pi_{st} = 1$ , and we can write the consumer's objective function as  $\sum_t \sum_s \pi_{st} \frac{1}{(1+\delta)^t} U(C_{st})$ . Finally, the consumer's labor income (which he or she takes as exogenous) in state  $s$  in period  $t$  is  $Y_{st}$ . Thus, the budget constraint is  $\sum_t \sum_s p_{st} C_{st} \leq \sum_t \sum_s p_{st} Y_{st}$ .

- a. Set up the consumer's maximization problem, and find the first-order condition for  $C_{st}$ .
- b. Consider two states in some period  $t$ ,  $s'$  and  $s''$ . Under what conditions is consumption the same in the two states? (That is, under what conditions is  $C_{s't} = C_{s''t}$ ?)
- c. Consider state  $s'$  in period  $t'$  and state  $s''$  in period  $t''$ . Under what conditions is  $C_{s't'} = C_{s''t''}$ ?
- d. Consider 2 consumers that who only in their  $Y_{st}$ 's. Show or provide a counterexample to the following claim: If Consumer 1's consumption in one period is greater than Consumer 2's consumption in that period, Consumer 1's consumption in each period is greater than Consumer 2's consumption in the same period.
- e. Suppose that both consumers have constant relative risk aversion utility, with the same coefficient of relative risk aversion. What, if anything, can one say about how the ratio of Consumer 1's consumption to Consumer 2's consumption behaves over time?
- f. In practice, we often see consumption reversals (that is, one consumer initially having consumption higher than another, but later having lower consumption). List 2 or 3 ways the assumptions of this problem could fail that could make such reversals possible; explain each possibility in no more than a sentence.

(OVER)

g. Suppose that in some period, the realization of  $s$  is the one that has the highest value of  $p_{st}Y_{st}$  for that period for the consumer. How, if at all, will that affect the consumer's consumption in later periods?

3. Romer, Problem 7.8. (Note: In part (c) of the problem, " $E_t$ " denotes expectations conditional on information available at time  $t$ . Everywhere else in the problem, it denotes purchases. Sorry about that!)

4. Romer, Problem 7.5.

EXTRA PROBLEMS (NOT TO BE HANDED IN/ONLY SKETCHES OF ANSWERS WILL BE PROVIDED)

5. Romer, Problem 2.2.

6. Romer, Problem 7.3.

7. Romer, Problem 7.6.