

1. Assume that a person lives for the first year with certainty, and has a probability p of living a second year (he dies with certainty after the second year). He maximizes expected utility over the utilities of consumption in the two periods, with the only uncertainty being given by p . Suppose that

$V = u(C_1) + pu(C_2)$, where we assume p is the only source of “discounting”, and u is increasing and concave. Suppose his expected wealth is $W = Y_1 + pY_2$, where Y_1 is his income in period 1, he only receives Y_2 if he survives, and the interest rate is zero. Without an annuity, he can trade across time but cannot leave negative wealth to period 2. However, he can take out an annuity that insures him in case he lives for the second year, and the annuity offers actuarially fair prices.

- a. Define actuarially fair, and determine whether he would take out such an annuity.

- b. With such an annuity determine the relation between C_1 and C_2 .

Suppose he can change his incomes in periods 1 and 2 by investing (assume he buys the annuity).

- c. Would p affect his incentive to invest in human capital, where he spends money on education at the beginning of period 1 in order to increase earnings in the second period? Discuss.

- d. Would p affect his investment in physical capital, where he invests at the beginning of period 1 to get capital at the end of the period that is marketable?

Suppose now he can spend resources (say on a genetic test) in the beginning of period 1 that would inform him with certainty whether or not he will be alive in period 2.

- e. Assume the price of annuity insurance is the same as in part a. If he could first buy an annuity and then take the test, would he want to take the test? Why or why not? If everyone is identical, and the competitive insurance companies expect everyone to take the test, would that affect the price of annuities?

- f. If he could elect to take the test before he would buy the annuity, but could not take the test after he bought it, and if the results of the test became public knowledge, would he want to take the test?

g. Many people who are possibly vulnerable to having a defective gene that causes an incurable and deadly disease called Huntington’s disease, in fact choose not to take a simple blood test that would determine whether they have this gene. How might you change the utility function V that would make reluctance to take the test more likely?