**Econ 302:** Microeconomics II - Strategic Behavior

Problem Set #9 – July 12, 2016

1. True/False/Uncertain?

   a) Given two lotteries with the same expected value, a risk-averse individual prefers the lottery with the smaller spread in outcomes.

   b) Adverse Selection is a market failure that occurs when individuals have information about the good that they sell but cannot communicate this information to the market.

2. Jill has a utility function of the form $v(y) = \sqrt{y}$, where $y$ is her income (wealth). Her initial wealth is \$ 4. She also has a lottery ticket that will either be worth \$ 12, \$ 5 or \$ 0, all with equal probability.

   a) What is the lowest price $p$ at which she would be willing to sell the ticket?

   b) Jill's friend Joe has a utility function $v(y) = y$. Would he want to buy the ticket? Do you need your answer in a) to solve this question?

3. Pete is building himself a fancy house that is located in an area where there are lots of wild fires. Once completed, his house is worth 20 (measured in \$ 10,000) but if it burns down, the lot on which it is built on would only be worth 4. Pete currently has 5 in safe assets. His utility from wealth $y$ is $u = \sqrt{y}$. The probability that the home burns down is $\frac{9}{16}$.

   a) Calculate Pete's expected utility if he doesn't buy fire insurance. Determine his certainty equivalent and show that it is smaller than his expected wealth.

   b) Let $\pi$ be the total premium that an insurance company charges Pete to fully insure himself against fire risk. Write down Pete's expected utility from the insurance and the expected profit from the insurance company as functions of the total premium $\pi$. Show that there is a range for $\pi$ such that full insurance constitutes a Pareto improvement relative to the situation in a).

4. Consider the market for health insurance. About 25 percent of the customers are high risk (smokers), the rest are low risk (non-smokers). Smokers face a 10 percent chance of developing lung cancer in any given year. For non-smokers, the corresponding figure is only 5 percent. Treatment for lung cancer costs \$ 3,600. All individuals have the same utility function, $u(y) = \sqrt{y}$ and the same wealth of $y = 10,000$. Suppose there is a single public health insurer who must offer full insurance at actuarially fair rates (i.e. make zero expected profits).

a) If smoking is observable, what are the rates? Is the outcome efficient?

b) Now suppose the insurer cannot distinguish smokers from non-smokers. What is the equilibrium under asymmetric information? Is the outcome efficient?

c) Suppose health insurance is compulsory. How does this affect your answers in part a) and b)? Determine the welfare effects of such a policy.

Further questions for review.

1. Harry and Sally are neighbors. Each owns a car valued at $ 10,000. Neither has comprehensive insurance (which covers losses due to theft). Harry's wealth, including the value of the car, is $ 80,000. Sally's wealth, including the value of her car, is $ 20,000. Harry and Sally have identical utility functions $u(W) = W^{\frac{2}{5}}$, where $W$ is wealth. They can park their car on the street or rent a garage. There is a 50% chance of theft if they leave their cars on the street, while cars in garages are safe.

a) What is the largest amount that Harry is willing to pay to park his car in a garage. How about Sally?

b) Compare Harry's with Sally's willingness to pay. Why do they differ? Include a comparison of their Arrow-Pratt measures of risk aversion in your answer.

2. Winfred Whiz is on the quiz show 'Who wants to be a millionaire?'. He has already won $ 2000 and now must make a choice whether to pocket this money now and go home, or whether to continue and answer the next question. If Winfred answers the question correctly, the money will be doubled and he will be able to take home $ 4000. If his answer is false, however, all the money is lost and he will receive a set of encyclopedias valued at $ 500 as a consolation price. If Winfred's initial wealth is $y = \$1000$ and his utility function can be described by $v(y) = 1 - \frac{1000}{y}$, how likely should he give a correct answer for continuing to make sense?

3. There are two kinds of drivers: Speeders who drive risky and thus have a probability of 1/4 of getting into an accident each year, and Slowers whose probability of an accident is 1/9 . An accident results in costs of $ 36. Each type has the same utility functions of $u = \sqrt{y}$ , where $y$ is income. Without insurance, they earn incomes of $ 100 per year.

a) Calculate each type of driver's expected utility without insurance.

b) Suppose the insurance company ICBC knows who drives safely and who drives risky, and offers full insurance at actuarially fair rates. What is the total premium for each type, and will people buy the insurance?

c) Now suppose that ICBC does not know who is a speeder and who is not. It only knows that half the population speeds while the other half drives safely. Would they break even (make zero expected profits) if they would offer full insurance at a total premium of $ 6.5 per year? Discuss!

4. Newly single dad Tom Cruise needs to hire a nanny for his spoiled daughter. There are two types of nannies: good nannies, who are loving & energetic ($i = G$), and bad nannies who are draconian & lazy ($i = B$). Tom's value of their productivity $a_i$ (monetary equivalent his daughter's happiness) and the relative frequency of each group is

| | $i = B$ | $i = G$ |
|---|---|---|
| $a_i$(in \$/*hour*) | 9 | 15 |
| rel. frequency | $\frac{2}{3}$ | $\frac{1}{3}$ |

The labor market is competitive, so Tom must offer a nanny the (expected) value of her productivity.

a) Suppose nannies know their type but Tom does not. He only knows the relative frequencies of either type in the population. Based on that information, what hourly wage would he offer? Assuming that in alternative employment opportunities, good nannies would earn $ 12 and bad nannies would earn $ 4, who would want to work for Tom?

b) What type of nannies will Tom necessarily hire in equilibrium and what will their wages be? Is this equilibrium Pareto efficient? Give an intuition of your finding!

c) Sally is an applicant (of unknown type). Tom thinks about hiring her on a probationary basis for one period some wage $w_1$ and – provided her productivity during the probationary period was at least $a_G = 15$ – to continue employing her for a second period at some wage $w_2$. Assuming Sally (and Tom) only cares about the wage sum in both periods, $w_1 + w_2$, is it possible to choose the values of $w_1$ and $w_2$ so as to only make the job attractive only to good nannies? Discuss!