EC 387 Problem Set 2

1. Suppose that Bernard is offered a simple lottery in which a single die is rolled. If the die comes up 1 or 2, he wins $30, and if it comes up 3,4,5 or 6 he loses $10. Bernard is just indifferent between taking this simple lottery and not taking it.
    a) What is the expected value of this lottery?
    b) Can you tell from this information whether Bernard is risk averse, risk neutral, or risk loving? Explain
    c) What is the risk premium that Bernard is being paid in order to accept this lottery? Show how you came up with this number.

2. Maria's utility function is $U = 5\ Y$ where U is utility and Y is wealth.
    a) Is Maria risk adverse, risk neutral, or risk loving?
    b) Will Maria be willing to purchase any actuarial fair insurance against a loss? Why or why not?
    c) Suppose that Richard's utility function is $U = Y^{½}$. Is he risk adverse, risk neutral, or risk loving?
    d) Will Rich be willing to purchase any actuarial fair insurance against a loss? Why or why not?

3. Suppose Karina has the utility function $U = (Y/1000)^{1/2}$, that is, the square root of her income divided by 1000. Her initial income when healthy is $36,000 and there is a 50% chance that she will suffer a financial loss which reduces her income by $20,000.
    a) What is the expected value of her income?
    b) What is her utility when healthy and when sick? What is her expected utility?
    c) What is her expected utility if she purchases an actuarially fair insurance policy that fully insures her from this risk? What premium will the insurer charge to just break even if there are no loading costs?
    d) What is the certainty equivalent income for this risky income, which is to say the level of income such that Karina will be just indifferent between having this income for sure and facing the risky income described above.
    e) What is the risk premium that she will be willing to pay to avoid this risk and be able to fully insure?
4. Suppose that when Michael is healthy he does not demand any doctor's visits. When he is sick his demand function for physician visits is summarized by the demand curve $Q = 10 – P^D/10$ where Q is the quantity of visits and P^D is the demand price of a visit. Assume that doctor's visits are the only type of medical care Michael uses, and this illness is the only risk facing him. Michaels probability of becoming sick is $\delta = .5$
    a) How many visits will Michael consume when sick if he has no insurance and the price of a visit is $50? How much does he spend on medical care when sick?
    b) What is Michael's expected spending on physician visits when he has no insurance?
    c) Explain whether an insurance company will be able to make a profit by offering full insurance coverage for all physician visits and charging a premium of $125.
    d) How many visits will Michael consume when he has full insurance when sick, so that the demand price is zero? If the supply price of a visit remains at $50, what is the total cost to the insurer when Michael is sick? What is the actuarially fair premium for the insurance company to offer Michael?

5. Suppose that the market demand for medical care is summarized by the demand function

$$Q^D = 100 - P^D$$

And the market supply function is

$$Q^S = -20 + P^S/2$$

a) Calculate the equilibrium quantity and price in this market assuming no insurance is available. Draw a graph to illustrate your solution.

b) Suppose that health insurance is available that provides for a 50% coinsurance rate, i.e., $P^D = .5\ P^S$. Calculate the new equilibrium demand price, supply price and quantity in this market. Show this result graphically.

c) Show the deadweight loss from insurance in this example on your graph by shading it in and labeling it DWL.

6. Suppose that the demand curve for health care is $Q^D = 1000 - 500P^D$ where Q^D and P^D are the demand quantity and demand price of health care and prices is expressed as a proportion of marginal cost. Assume that the marginal cost is 1 and supply is perfectly elastic.
    a) Draw this demand curve on axis where Q^D is on the horizontal axis and P^D is on the vertical axis. Show the impact of adding insurance with a cost share of c = .2. How much health care will this person consumer?
    b) Now draw this demand curve on an axis where Q^D is on the horizontal and PS (the supply price of health care) is on the vertical axis. Show the impact of adding insurance with a cost share of c = .2. How much health care will this person consume?\

7. Jenny is just indifferent between a lottery of {0, 500; ½, ½} (i.e., a fifty percent chance of winning $500) and a fixed prize of $200.
    a) What is the expected earnings from this lottery?
    b) What is the variance of the earnings from this lottery?
    c) What is the risk premium Jenny assigns to avoiding this lottery?
    d) Using the formula that we derived that relates a person's ARA (absolute risk aversion) to the risk premium, what is Jenny's ARA what is Jenny's ARA as revealed by this experiment?
8. Jenny is just indifferent between a lottery of {0, -$500; ½, ½} (i.e., a fifty percent chance of losing $500) and a paying a fee of $200.
    a) What is the expected earnings from this lottery?
    b) What is the variance of the earnings from this lottery?
    c) What is the risk premium Jenny assigns to avoiding this lottery?
    d) Using the formula that we derived that relates a person's ARA (absolute risk aversion) to the risk premium, what is Jenny's ARA as revealed by this experiment?
9. Draw a utility function for Jenny that is consistent with these two experiments.