U8216 Microeconomics and Policy Analysis
Fall 2000
Problem Set 6

1. In Clintonia, every citizen has a wealth of 10 and a utility represented by $U(I) = I - 0.05I^2$. Clintonians occasionally get sick, and when they do, they go to the hospital and are made immediately better. A hospital visit costs 8. There are three types of Clintonians and each has a different probability of getting sick (types are genetic and cannot be changed):

Type	Probability of Illness
Vegetarian	0.12
Carnivore	0.30
Smoker	0.60

a. (Adverse Selection) In the absence of health insurance, find the expected utility of each type of Clintonian.

b. (Adverse Selection) A private health plan, Green Cross, is set up. Membership is optional, but since everyone is risk averse, the managers assume that everybody will join. Green Cross sets their premiums according to the chance that an average Clintonian gets sick (Green Cross cannot distinguish between types). Assume there are equal proportions of each type in the population. What is the actuarial fair premium?

c. (Adverse Selection) If Green Cross charges the actuarial fair rate, will every type of Clintonian join the plan? What is the expected utility for each type?

d. (Adverse Selection) Now suppose the proportions of each type are 0.1, 0.1, and 0.8 for Vegetarians, Carnivores, and Smokers respectively. Now what is the actuarial fair premium? Will everyone now join the plan?

e. (Adverse Selection) After the 1st year of operation, Green Cross finds they have lost money. Why? They commission a study to discover the probability that a member of Green Cross gets sick. What is the probability? They fix a new actuarial fair premium based on their study. What is the new rate? Who joins the plan in the 2nd year? Why?

f. (Adverse Selection) Is the plan in (e) sustainable? What will the eventual equilibrium be? Who will buy insurance and how much will it cost under the sustainable plan?

g. (Separating Equilibrium) Suppose now that Green Cross gets smart and offers two plans. The first plan is based on the plan in (f). Call it Plan I. The second plan offers a co-payment system (Plan II). For 0.42, Plan II pays 2 if an individual gets sick and the individual pays the rest. Who buys which plan? Why? Are these plans sustainable (i.e. the firm is not losing money)? How does this strategy solve the asymmetric information problem?

h. Suppose now the government comes up with a plan that mandates health insurance. What rate will be charged (the rate will be the same for everyone and the government covers its costs)? Who gains and who loses under this plan versus the plan in (g) (i.e. who votes for the plan)?

i. Will the people of Clintonia vote for universal coverage? Will the vote be unanimous?

j. (Moral Hazard) Suppose now that Steven Segal invents a new method to quit smoking ("boot-to-the-head therapy"). This therapy is so effective that it overcomes all genetic predisposition to smoke. For a cost of only 4.2 you never become sick again (probability of getting sick becomes zero). If the private plan is in effect (people can choose Plan I or Plan II), will smokers undergo the Segal therapy? Suppose the government plan is in effect, will smokers undergo the therapy? Explain.

k. Briefly summarize in words what you have learned about moral hazard, asymmetric information, separating equilibrium, deductibles, and so forth and their relevance to government-provided and privately-provided health insurance. Are these concepts applicable to government-provided disaster relief programs and privately-provided car insurance?

2. Owners of a firm know that their profits depend on two things: how hard the manager works and the state of the economy. Managers exert either maximum or minimum effort. The economy can be either good or bad. Outcomes are given below:

	Good Economy	Bad Economy
Maximum Effort	700,000	400,000
Minimum Effort	400,000	200,000

The economy is good or bad with equal probability. The manager faces a cost of effort of C=55,000 for maximum effort and C=0 for minimum effort (she can always spend her time selling Amway over the phone and make 55,000; if she exerts maximum effort, she doesn't have time to peddle Amway). The firm considers paying the manager according to one of the schemes below. Evaluate each scheme for its incentive effects on the manager's performance and the firm's expected profits. Assume the manager is risk-neutral.

a. A flat salary of 30,000 that is not tied to firm performance.

b. A bonus of 0 if profits equal 200,000 or 400,000 and a bonus of 120,000 if profits equal 700,000.

c. A bonus given by the formula: Bonus = $0.20 \times$ (Profit - 300,000).

d. A bonus given by the formula: Bonus = $0.24 \times$ (Profit - 300,000).

3. In light of Amazon.com's depressed stock price, Jeff Bezos has to settle for a used Learjet. If he buys one from the classifieds, there is a 5% chance that he gets jibbed (badly maintained aircraft). If he goes through a reputable agent (check out www.ogarajets.com) then the risk of getting a bad aircraft is reduced to 0.5%. If a good used Learjet is worth $20 million to Jeff and a bad used Learjet is only worth $12 million to him, and Jeff's utility of using his aircraft is given by $U = \sqrt{M}$, then how much is he willing to pay a used aircraft agent?

4. People who have gene A have a 50% chance of getting cancer and no chance of getting a heart attack. People without gene A have a 1% chance of getting a heart attack and no chance of getting cancer. Those who get cancer incur $100,000 in medical expenses. Those who get a heart attack also incur $100,000 in medical expenses. There are no other diseases and no other forms of medical care provided.

In the population, 10% of people have gene A.

a. Suppose that no one knows anything about gene A. What is the actuarially fair premium for cancer coverage insurance in this population? What is the actuarially fair premium for heart attack coverage insurance? For coverage of all forms of medical care?

b. Suppose that gene A is discovered, along with a test for it and knowledge of its implications. Suppose further that people can have themselves tested for gene A but no one else will know if they have gene A. Insurers are banned from collecting such information. What kinds of policies will insurers start to offer? What profits can be made initially?

c. In equilibrium, what kinds of insurance policies are offered? Who selects each kind of policy? What are the actuarially fair premiums of the policies?

d. Suppose that the outcry over the expense of insurance for cancer coverage caused the government to propose a risk adjustment scheme for health insurance that would eliminate such high premiums. Describe how such a scheme would work. What premiums would individuals pay? How much would insurers receive? What government regulations would be required for such a scheme?

5. (*optional*) Consider the market for used cars. There are lemons (low quality cars) and cream puffs (high quality cars). You are provided with the following valuations of buyers and sellers of each type:

	Value to Seller	Value to Buyer
Lemon	2	3
Cream Puff	10	12

The value to the buyer represents the maximum price she will pay for a car of the given type. Assume buyers are risk neutral. (e.g. if a car has a ½ probability of being a lemon and a ½ probability of being a cream puff the buyer would be willing to pay at most ½×3 + ½×12 = 7½.) The seller's valuation is the minimum price for which she will sell the car.
In (a)-(c), suppose there is only one price for cars.

a. Consider the range of prices 0 to 15. At each price would there be trade in cars? If so, what quality? Assume that $\frac{1}{3}$ of the cars are lemons and $\frac{2}{3}$ are cream puffs.

b. Same as (a), but change the proportions to $\frac{1}{6}$ lemons and $\frac{5}{6}$ cream puffs.

c. Can you compute the maximum proportion of lemons that the market can sustain (i.e. so that cars of both types will be traded)?

In (d)-(f), now different prices are allowed for each type. $P_{\text{cream puff}}=12$, $P_{\text{lemon}}=2$.

d. Now car inspection is possible, for a fee. The inspector's word is always taken as true. If the inspector says a car is a lemon, the buyer believes her. But the sellers know that the inspector is only right ¾ of the time. What fee, if any, can be set that will allow the two types of cars to separate themselves?

e. Now suppose the probability that the inspector is right is 90%, and the fee is 1. Will there be successful separation (i.e. buyers willing to buy lemons at the lemon price, and sellers willing to sell at that price; and the same for cream puffs)?

f. (*Difficult*) Finally, suppose that buyers begin to catch on that the inspector isn't right all the time. Will the answer to (e) change? (Hint: consider the maximum price you would pay for a car classified as a cream puff. This depends on the probability that a car is, in fact, a cream puff if its classified as one by inspection. This probability can be computed using Bayes' Rule.) Is the buyer's expected valuation given this probability compatible with the sellers' minimum price?