1) (Perloff 18.1.1, p. 677) According to a 2007 study by the Federal Trade Commission, 4.8 million U.S. consumers were victims of weight-loss fraud, ranging from tea that promised to help people shed pounds to fraudulent clinical trials and fat-dissolving injections. Do these frauds illustrate adverse selection or moral hazard?

2) (Perloff 18.1.2, p. 677) California set its own earthquake insurance programme for homeowners. The rates vary by zip code, depending on the proximity of the nearest fault line. However critics claim that the people who set the rates ignored soil type. Some houses rest on bedrock; others sit on unstable soil. What are the implications of such rate setting?

3) (Adapted from Perloff 18.1.5, p. 677) While self-employed workers have the option to purchase private health insurance, many – especially younger – workers do not, due to adverse selection. Suppose half the population is healthy and the other half is unhealthy. The cost of getting sick is \$1,000 for healthy people and \$10,000 for unhealthy people. In a given year, any one person (regardless of health) either becomes sick or does not become sick. The probability that any one person gets sick is 0.4. Each person's utility function is $u(y) = y^{0.5}$, where y is the person's wealth. Each worker's initial wealth is \$30,000. Although each person knows whether he or she is healthy, the insurance company does not have this information. The insurance company offers complete, actuarially fair insurance. Because the insurance company cannot determine whether a person is healthy or not, it must offer each person the same coverage at the same price. The only costs to the company are the medical expenses of the coverage. Under these conditions, the insurance company covers all the medical expenses of its policyholders, and its expected profit is zero.
   a) If everyone purchases insurance, what is the price of the insurance?
   b) At the price you determined in part a), do healthy people purchase the optimal amount of insurance?
   c) If only unhealthy people purchase the insurance, what is the price?
   d) At the price you determined in part c), do the unhealthy people purchase the optimal amount of insurance?
   e) Given that each person has the option to purchase insurance, which type actually purchases insurance? What is the price of the insurance? Discuss the adverse selection problem.
   f) If the insurance company were able to tell in advance if a prospective costumer is healthy or unhealthy, which pricing policy would it practice? What are the efficiency implications of the firm's inability to identify the customer's type?

4) As in the previous problem, half of the population are healthy and the other half are unhealthy, and the insurance company is unable to tell whether a prospective customer is healthy or unhealthy. The probability that a person becomes sick is 10%. When they do get sick, healthy people face costs of €17,000 and the unhealthy ones €27,000. The insurance company's only expenses are payments to policyholders, and it charges prices so as to break even. Each person has initial wealth €30,000.
   a) How much must the insurance company charge if everybody buys health insurance?
   b) In the Mainland each person's utility of their wealth is $u(w) = \ln w$. What is the most that healthy people would be willing to pay for health insurance? How about the unhealthy people?
   c) Will there be adverse selection? Who will buy insurance and at what price?
   d) On the Islands each person's utility of their wealth is $v(w) = w^{0.5}$. What price will the insurance company charge? Is there adverse selection? Compare the market equilibria in the Mainland and the Islands and explain any differences.
   e) The insurance company realised that on the Islands only 20% of the population is unhealthy. Does this finding change the market equilibrium you found?

5) (Adapted from Perloff 18.3.5, p. 677) Suppose that everyone in the used-car example in the text is risk neutral, potential car buyers value lemons at \$2,000 and good cars at \$10,000, the reservation price of lemon owners is \$1,500, and the reservation price of owners of high-quality used cars is \$8,000. The share of potential sellers who own lemons is θ.
   a) What is the maximum price potential buyers are willing to pay for a used car if θ is 40%? Will there be adverse selection? What is the market equilibrium assuming there are a lot more potential buyers than potential sellers? And if there were more potential sellers than potential buyers?
   b) And if θ is 20%? Assume henceforth there are more potential buyers than sellers.
   c) For what values of θ will all cars be sold?
   d) Explain why the value of θ makes a difference.
   e) Suppose now sellers incur a transaction cost of \$600 (beyond their reservation price) to sell a car. What is the equilibrium if $\theta = 0.2$?
   f) And if $\theta = 0.4$?
   g) Is there any lemon-only equilibrium for any value of θ?
   h) Is there any equilibrium where all cars are sold for any level of θ?
   i) What difference would it make to your previous answers if buyers were risk-averse? And if sellers were risk averse?
   j) We saw that without transaction costs risk-neutral people would buy all used cars if $\theta \leq 25\%$. Suppose now that $\theta = 22\%$, there are no transaction costs, buyers have initial wealth €15,000 and utility function

$u(w) = \ln w$ where w is total wealth, including the used car, if they buy one, valued at their subjective value ($10,000 for a good car, $2,000 for a lemon). What is a buyer's probability distribution over final wealth if they buy a car at price p?

k) What is the equilibrium with $\theta = 22\%$. What would be the equilibrium price and which cars would be sold if buyers were risk-neutral?

6) (Perloff 18.3.3, p. 678) Many potential buyers value high-quality cars at the full-information market price of p_1 and lemons at p_2. A limited number of potential sellers value high-quality cars at $v_1 \leq p_1$ and lemons at $v_2 \leq p_2$. Everyone is risk neutral. The share of lemons among all used cars that might potentially be sold is θ. Under what conditions are all the cars sold? Are there any conditions under which no cars are sold?

7) Modify the used-car example of exercise 5 so that there is adverse selection (for some θ) but the market for good-quality cars does not disappear altogether.

8) (Perloff 18.2.1, p. 678) Some states prohibit companies from using car owners' home addresses to set auto insurance rates. Why do insurance companies use home addresses? What are the efficiency and equity implications of forbidding such practices?

9) Firms in Alvor de Cima know that half of the local workers have high ability and marginal product €50,000, and the other half have low ability and marginal product €20,000. The labour market is competitive, and each firm has to pay wages equal to marginal product of labour (average marginal product if individual marginal products are not known). All workers are willing to take a job as long as it pays at least €15,000, as they could not earn more than that otherwise.
   a) What wages rates will prevail if firms can tell whether a worker has high or low ability? And if they cannot? Is there any loss of efficiency if firms cannot tell whether a worker has low or high ability?
   b) Suppose firms cannot observe directly whether a worker has high or low ability. Workers can however engage in a training programme and obtain a certificate on successful completion of it. The opportunity cost of obtaining this certification is higher for low- than for high-ability workers because it takes them longer to successfully complete the programme. The programme does not change workers' marginal product. What will the equilibrium wages be if the opportunity cost for low- and high-ability workers is respectively €35,000 and €10,000?
   c) And if it is €45,000 and €35,000?
   d) €35,000 and €25,000?
   e) Assume the opportunity cost is €35,000 for low-ability workers. For what values of the high-ability workers' opportunity cost will there be a pooling equilibrium only? And a separating equilibrium only? And both equilibria?
   f) Discuss the efficiency of the certification programme. Consider the possibility of it increasing marginal product of labour or not increasing it.

Multiple-Choice Questions

1) After buying insurance against car theft Ana starts leaving her car on the street at night rather than in the garage. This is an example of:
   a) Adverse selection.
   b) Moral hazard.
   c) Signalling.
   d) None of the other options are correct.

2) Adverse selection may occur if:
   a) Everybody has full information.
   b) Only if sellers have more information than buyers.
   c) Only if buyers have more information than sellers.
   d) None of the other options are correct.

3) Which of the following is the best example of adverse selection?
   a) Bela buys a used car which turns out to be worth a lot less than what she paid for it.
   b) Sellers have more information about the product than buyers have.
   c) Insurance companies cannot observe the action their of policy holders.
   d) None of the other options is an example of adverse selection.

4) All health-insurance companies but one require medical examinations from their prospective customers. The one that does not will likely charge:
   a) A lower rate than the others.
   b) The same rate as the others.
   c) A higher rate than the others.
   d) The information is not enough to answer.

5) Health-insurance companies usually require that prospective customers undergo medical examinations to reduce:
   a) The chances of the customer dying before signing the contract.
   b) Adverse selection.
   c) Signalling.
   d) Moral hazard.

6) In the labour market, a university degree is a signal only if:
   a) Able workers find it advantageous to obtain it, but unable workers don't.
   b) Unable workers find it advantageous to obtain it, but able workers don't.
   c) All workers find it advantageous to obtain it.
   d) It will always be a signal.

7) In a labour market, assuming unable workers have no interest in obtaining the signal, separating and pooling equilibria will be both possible if and only if:
   a) Able workers prefer to obtain the signal rather than earn the pooling wage.
   b) Able workers prefer to obtain the signal rather than earn the low-ability wage but prefer the pooling wage rather than obtain the signal.
   c) Able workers prefer to earn the pooling wage rather than obtain the signal.
   d) In no circumstances are both equilibria possible.

Answers

1) Adverse selection. Most consumers cannot tell in advance whether such treatments are effective or not, and unscrupulous people sell fake treatments, presumably because they are cheaper to produce than effective treatments. As people cannot tell whether a treatment is effective or not they will be willing to pay only an average price that is too low for producers of good treatments, and it will be mainly the fake treatments that will be sold.

2) Probably adverse selection. Expected losses will be higher on unstable soil. Insurance companies ignore this and charge an average rate. Many people living on bedrock face low expected losses, and will prefer not to buy insurance.

3.a) $2.200.
3.b) No. With insurance their wealth would be $27,800, less than in their worst outcome without insurance.
3.c) $4,000.
3.d) They do. Their expected utility is 160.5 without insurance, and 161.2 with insurance. In fact this calculations were unnecessary. As the insurance premium is equal to the expected loss, their expected wealth is the same with and without insurance, so they will prefer the risk-free option.
3.e) Only the unhealthy buy insurance, at a price of $4,000. Even at a price of $2,200 – that would allow the insurance company to break even if equal number of healthy and unhealthy people bought insurance – the healthy people would not buy – this is adverse selection – and the company would make a loss.
3.f) As the firm merely breaks even it would charge an unhealthy person $4,000, and a healthy one $400. Healthy people would buy at $400 (same argument as in part d)). The firm's inability to identify the customer's type causes loss of efficiency: healthy people would be happy to buy insurance at a price that would benefit them and the insurance company, but the company cannot identify them and so cannot offer the lower price to them only.

4.a) €2,200.
4.b) €2,406.71 and €6,170.15 respectively.
4.c) Everybody will be willing to buy health insurance at €2,200, so there will be no adverse selection.
4.d) A healthy person would pay at most €2,015.29, so will not buy insurance at €2,200. So there is adverse selection. An unhealthy person is willing to pay at most €3,962.37. If selling only to unhealthy people the insurance company will break even with a price of €2,700, so unhealthy people will buy at this price. Mainlanders are more risk averse, and therefore are willing to pay more for the insurance. So even the healthy people will buy at €2,200, and the insurance company breaks even selling at that price to everybody.
4.e) Now the company breaks even with a price of €1,900, which even healthy islanders are willing to pay. So there will be no adverse selection.

5.a) $6,800. There is adverse selection because owners of high-quality cars will not sell for less than $8,000. If there are more potential buyers than potential sellers, all lemons will be sold a $2,000 each; otherwise at $1,500.
5.b) $8,400. All cars will be sold at $8,400. There is no adverse selection.
5.c) $\theta \leq 25\%$.
5.d) If lemons and good cars are offered for sale, the lower the proportion of lemons θ the higher the expected value of a used car for a potential buyer. If θ is low enough this value will exceed the minimum value sellers of good cars will accept, and good cars are offered for sale.
5.e) High-quality car owners will not sell for less than $8,600 now, which is more than the $8,400 buyers are willing to pay. With no high-quality cars on the market, buyers will not pay more than $2,000, but sellers will not sell for less than $2,100. There will be no market.
5.f) There will be no market for the same reason as above.
5.g) No, because with lemons only, buyers will not pay more than $2,000, and sellers will not accept less than $2,100.
5.h) Yes if $\theta < 0.175$. With $\theta = 0.175$ potential buyers are willing to pay $8,600, which is the minimum potential sellers will accept.
5.i) When both lemons and good cars are sold a buyer does not know which type he is being offered. A risk-neutral buyer is willing to pay the expected value of the car; a risk-averse buyer will not be willing to pay as much. So in parts c) and h) above θ would have to be lower for potential buyers to be willing to pay a price owners of good cars would accept. When goods cars are not sold, there is no uncertainty, and even risk-averse buyers are prepared to pay $2,000. Sellers do not face any uncertainty, so it does not matter if they are risk averse.
5.j) (€25,000 – *p*, 78%; €17,000 – *p*, 22%).
5.k) All cars will be sold if buyers are willing to pay at least €8,000. Their expected utility is 2.69 if they buy the car at €8,000. The utility of initial wealth is 2.71, so they prefer not to buy the car at this price. Only lemons will be sold. Risk neutral buyers would buy all cars at $8,240 each.

6) If all cars are sold risk-neutral consumers are willing to pay $(1 - \theta)p_1 + \theta p_2$. Owners of high-quality cars will be willing to sell if this exceeds their reservation price, that is $(1 - \theta)p_1 + \theta p_2 \geq v_1 \Leftrightarrow \theta \leq (p_1 - v_1)/(p_1 - p_2)$.

7) What you need is owners of good cars with different reservation prices. For instance if some owners of high-quality cars are willing to sell for less than what consumers are willing to pay for a lemon, then they will always sell. In fact, then consumers would be willing to pay more for a random car than they would for a lemon, which means that some other owners of high-quality cars might find that price attractive and sell as well.

8) Probability of theft or accident varies from place to place. If companies are forced to charge the same rates everywhere, drivers in high risk areas have a greater incentive to insure than drivers is safer areas. This causes inefficiency: some drivers in safe areas are unwilling to pay the high rates that are necessary for insurers to cover costs in high risk areas, but they might be willing to pay a lower rate that insurers would like to offer them but cannot because of the prohibition. The Prohibition also redistributes surplus from the drivers in safe areas who buy insurance to the drivers in risky areas.

9.a) €20,000 to low-ability workers and €50,000 to high-ability workers if they can tell ability; the expected marginal product of labour, €35,000, if they cannot tell ability. There is no efficiency loss, as all workers will take a job anyway. (But there would be an efficiency loss, for instance, if some high ability workers could earn, say, €40,000 at home, and firms were paying only €35,000 to everyone.)

9.b) There is no pooling equilibrium but there is a separating equilibrium: with wages of €35,000 high-ability workers would obtain the certification, and firm would start paying €50,000 to certificate-holders, who would have net earnings of €40,000, and €20,000 to people without a certificate, who would not want a certificate because their net earnings would be €15,000 with one.

9.c) There is only a pooling equilibrium: even for high ability workers obtaining a certificate would lead to lower net earnings even if people without a certificate earned only €20,000.

9.d) Both pooling and separating equilibria are possible. If nobody has a certificate and wages were €35,000, even high-ability workers would not want the certification, as their net earnings would fall to €25,000. If firms are paying €50,000 to people with certificates and €20,000 to people without one, all high-ability people would want one because they would have net earnings of €25,000 rather than €20,000.

9.e) If the opportunity cost for high-ability workers is higher than €30,000 there is a pooling equilibrium only; if it is lower than €15,000 there is a separating equilibrium only; if it ranges from €15,000 to €30,000 both equilibria are possible (same reasoning as in 9.d)).

9.f) The programme will be efficient only if it raises productivity by more than its cost.

Answers to Multiple-Choice Questions

1b 2d 3d 4c 5b 6c 7b.