

Exercise Sheet 2

based on Pindyck-Rubinfeld Ch. 17 und 18

1. Two competing used car dealers are located along the same road. Dealer A sells high quality cars, which are carefully inspected. Each car that A buys, inspects, services and then tries to resell, incurs a cost of 8000 Euros on average. Dealer B sells cars of minor quality. B 's costs are therefore - on average - only 5000 Euros. If buyers knew the quality, they would be willing to pay 10000 Euros for a car from dealer A and 7000 Euros for a car from dealer B . However, the dealers do not have any reputation yet, hence the buyers are not able to distinguish between the quality of the cars. The buyers only know that they have a 50-50 chance of ending up with a high quality car, and thus are willing to pay 8500 Euros for a car. Dealer A considers a warranty for all of his cars. Such a warranty, which lasts t years will cost $500t$ Euros on average. He also knows that a similar warranty by dealer B would cost B - on average - $1000t$ Euros.

- (a) If A offers a one-year warranty, is this a credible signal? Would B want to match this offer?
- (b) What happens if A offers a two-years warranty?
- (c) What would be the optimal number of warranty-years for A ?

2. Let a firm's revenue function be $R = 10e - e^2$, where e denotes the effort level of a typical worker and all workers are identical. A worker chooses his or her effort level in such a way that wage (w) minus effort, i.e. $w - e$, is maximal. (The cost of each unit of effort is 1.) What is the optimal effort level for the following wage rates and what is the profit resulting from it?

- (a) $w = 2$ for $e \geq 1$, otherwise $w = 0$
- (b) $w = \frac{R}{2}$
- (c) $w = R - 12,5$

3. As chairman of the board of a huge firm you know its yearly profits given in the following table. Profits depend on market demand (given by its respective probability) and effort by the CEO.

<i>market demand</i>	<i>low</i>	<i>medium</i>	<i>high</i>
<i>probabilities</i>	0.30	0.40	0.30
<i>low effort</i>	5 mil	10 mil	15 mil
<i>high effort</i>	10 mil	15 mil	17 mil

Your job is to design a compensation package for the CEO. The firm is risk neutral and wants to maximize expected profit. The CEO wants to maximize expected utility of income according to the following utility function:

$$U = W^{0.5} \text{ when low effort}$$

$$U = W^{0.5} - 100 \text{ when high effort}$$

W is the CEO's income. This information is commonly known, you just don't know the CEO's effort. Which of the following compensation packages would you prefer?

- (a) Pay a flat salary of 575000 Euros per year.
- (b) Pay a fixed 6% of yearly firm profits.
- (c) Pay a flat salary of 500000 Euros and 50% of all profits above 15 million.

4. Studies have shown that the reduction of sulfur dioxide emissions leads to the following costs and benefits, where E is the amount (in tons) of abated (reduced) emissions and costs are given in Euros per ton:

Marginal cost of abatement: $MCA = 500 - 20E$

Marginal social costs: $MSC = 200 + 5E$

- (a) What is the socially efficient level of emissions abatement?
 - (b) What are marginal benefits and marginal costs at the efficient level?
 - (c) What are the total abatement costs at the efficient level?
5. In a market for dry cleaning the inverse demand function is $P = 100 - Q$ and (private) marginal costs are $MC = 10 + Q$. The production process generates external marginal costs of $MEC = Q$.
- (a) Calculate output and price for this good in a fully competitive market without government intervention.
 - (b) Determine the socially optimal output and price.
 - (c) What tax do you need to set such that a competitive market generates the socially optimal output level?
 - (d) What price and output will occur in a monopoly market?
 - (e) What tax would induce the monopoly to produce the socially optimal output?
6. Assume 3 groups in a community whose inverse demand functions for public television (in hours T) are given as follows:
- $W_1 = 200 - T$
 $W_2 = 240 - 2T$
 $W_3 = 320 - 2T$
- Public television is a pure public good, which can be produced at constant marginal costs of 200.
- (a) How is a pure public good defined?
 - (b) What is the efficient amount (in hours) of public television?
 - (c) How much public television would a private market provide?