

Exercise List 2: Moral Hazard

Exercise 1. Consider the contract design problem of a principal who maximizes expected profit. The principal's revenue is a random variable whose distribution depends on the effort exerted by an agent, $e \in \{0, 1\}$, as described in the following table:

	$x_1 = 0$	$x_2 = 10$	$x_3 = 25$
$p(0)$	$\frac{4}{10}$	$\frac{4}{10}$	$\frac{2}{10}$
$p(1)$	$\frac{2}{10}$	$\frac{4}{10}$	$\frac{4}{10}$

The reservation utility of this agent is $\underline{u} = 1$, his cost of effort is $v(e) = e^2$ and his von Neumann-Morgenstern utility function is $u(w) = \sqrt{w}$. Determine the optimal contract when effort level is observed and when it is not.

Exercise 2. A salesman's probability of selling an encyclopedia is $p \in (0, 1)$ if he exerts effort, and $1/2$ otherwise. His cost of exerting effort is 20, and his reservation utility is $\underline{u} = 50$. A sale generates a revenue of 200 euros to the company. Both the salesman and his company are risk-neutral.

(a) The company cannot monitor the salesman, but can pay him wages contingent on success. Write down the company's contract design problem. Calculate the optimal contract for each $p \in (0, 1)$. Is the optimal contract socially optimal? Explain this result.

(b) Now suppose the salesman is risk averse, and his von Neumann-Morgenstern utility function is $u(w) = 20 \ln w$. Determine the optimal contract for $p = 4/5$.

Exercise 3. An individual faces the risk of having an accident leading to loss of 36 euros with probability $3/4$. If he undertakes a precautionary action at cost $c = 4/10$ he may reduce this probability to $1/2$. In addition, the individual may subscribe an insurance contract specifying a premium of x euros and a compensation of y euros in case of accident. The von Neumann-Morgenstern utility function of the individual is $u(w) = \sqrt{w}$ and his initial wealth is $W = 100$ euros. Whether or not he undertakes the precautionary action is not observed, but the occurrence of the accident is a contractible event. Determine the optimal insurance contract assuming that the insurance company is risk neutral.

Exercise 4. Exercises 2, and 3 in chapter 3 Macho and Perez-Castrillo's textbook.