Prof. Dr. Anke Gerber

Economics of Information

1. Exam Winter Term 2013/14

Important Instructions

1. There are 90 points on this 90 minutes exam.

2. You can answer the questions either in English or in German.

3. You are allowed to use a non-programmable calculator.

4. You are not allowed to use any course material (books, slides, lecture notes etc.).

5. Please answer the questions only on the paper that is handed out to you.

6. Please write your name on each sheet of paper, number the pages and leave a margin (2.5cm) on the right of each page.

7. Please write legibly and make sure that your answers are coherent and complete.

Good Luck!

Problem 1 (10 Points)

Consider a moral hazard problem with hidden action and assume that the agent's effort is not verifiable.

1. In which case does the principal choose the same contract as under symmetric information?

   (5 Points)

2. Suppose the principal wants the agent to exert more than the minimum effort level. Give a reason why the optimal contract under asymmetric information may not have the property that the agent's wage is increasing in the result he produces.

   (5 Points)

Problem 2 (45 Points)

Bob is lazy in school and constantly gets bad grades in mathematics. Bob's mother wants to use monetary incentives to persuade Bob to spend more effort in learning mathematics. Suppose there are only two grades, a good grade (G) and a bad grade (B), and suppose Bob only has two possible effort levels, $e^H = 1$, and $e^L = 0$. The following table shows Bob's probability to get a good and a bad grade depending on his effort:

Grade

		G	B
	e^L	$\dfrac{1}{10}$	$\dfrac{9}{10}$
Effort	e^H	$\dfrac{1}{2}$	$\dfrac{1}{2}$

Bob and his mother both have expected utility functions. Bob does not care about his grade, but only about money and effort. If he receives the payment $w \geq 0$ from his mother and spends effort $e \in \{0, 1\}$ his utility is

$$U(w, e) = u(w) - v(e),$$

where

$$u(w) = \sqrt{w} \quad \text{for } w \geq 0,$$
$$\text{and} \quad v(e) = 4e \quad \text{for } e = 0, 1.$$

Bob's reservation utility is

$$\underline{U} = 1.$$

If Bob's mother pays Bob w_G if his grade is G and w_B if his grade is B, her utility is

$$70 - w_G, \quad \text{if Bob's grade is G}$$
$$\text{and} \quad 0 - w_B, \quad \text{if Bob's grade is B.}$$

When answering the following questions you can use all properties of an optimal contract that were derived in the course, i.e. you do not have to derive the solution to any optimization problem step-by-step.

1. Suppose effort is observable and verifiable (symmetric information).

   (a) Bob's mother wants to maximize her expected utility. For each effort level $e \in \{0, 1\}$, determine her payment to Bob if his grade is G and if his grade is B, if she wants Bob to exert effort e. (10 Points)

   (b) Which effort level does the mother demand from Bob in order to maximize her expected utility under symmetric information?

   (5 Points)

2. Suppose effort is not verifiable (asymmetric information).

   (a) Suppose the mother wants Bob to choose effort level $e^L = 0$. Which payments does she promise to Bob if his grade is G and if his grade is B, in order to maximize her expected utility?

   (5 Points)

   (b) Write down the optimization problem the mother has to solve in order to maximize her expected utility if she wants Bob to choose effort level $e^H = 1$.

   (5 Points)

   (c) Determine the solution to the optimization problem under (b), i.e. determine the payment to Bob if his grade is G and if his grade is B, if Bob's mother wants him to choose effort level $e^H = 1$.

   (15 Points)

   (d) Which effort level does Bob's mother demand from him in order to maximize her expected utility under asymmetric information?

   (5 Points)

Problem 3 (35 Points)

Suppose universities are competing for bachelor students. All students have an initial wealth $w = 100$ and they suffer a monetary loss $L = 10$ if they do not finish their studies within three years. All students have an expected utility function with von Neumann-Morgenstern utility function

$$u(w) = \ln(w) \quad \text{for } w > 0.$$

Whether a student finishes studies within three years or not only depends on the student's type, not on his effort, i.e. a student cannot choose strategically whether to finish his or her studies within three years or not.

There are two types of students, G and B. The probability that type G finishes his studies within three years is $p^G = \frac{3}{4}$ and the probability that type B finishes his studies within three years is $p^B = \frac{1}{2}$. Students know their type.

If a student studies longer than three years the university has costs $c = 90$. Universities offer contracts (F, R) to the students, where F is a study fee and R is a rebate if a student finishes his studies within three years. Observe that the rebate is allowed to be negative, so you should not be confused if you determine a negative rebate in one of the questions below.

Universities are risk neutral and aim to maximize expected profits, where

$$\Pi^\theta(F, R) = F - p^\theta R - 90(1 - p^\theta)$$

is the university's expected profit if it contracts with a student of type $\theta \in \{G, B\}$.

When answering the following questions you can use all properties of the equilibrium contracts in a competitive market that were derived in the course.

1. Determine the contracts that are offered to students of type G and type B in equilibrium under symmetric information, i.e. if the universities can observe the students' types.

   (15 Points)

2. Determine the contracts that are offered to students of type G and type B in equilibrium under asymmetric information, if the proportion q of type G students is sufficiently small.

   (20 Points)