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Department of Economics
Seminar für Versicherungswissenschaft
Übung "Insurance Markets" WS 2002/2003

Übungsblatt 6

- **6-1 Adverse selection in insurance markets**
  In a particular population everyone runs the risk of loosing $ 1,000 randomly. Each person's loss occurs independently from anybody else's. The probability π that the loss L occurs depends on the individual's type. 90% of the population are of the l type, who's loss probability π_l equals 10%. The rest of the population is of the h type and faces L with $\pi_h = 60\%$. Every individual knows his type, but nobody else does and there is no way to signal one's type. Each individual's utility is given by $u(y) = 1 - e^{-\lambda y}$. (For this form you have to regard y as a random variable that either equals $y_1 = -pC$ or $y_2 = (1-p)C - L$, depending on the occurance of the loss.)

  a) The government regulates the insurance market and only allows pooling contracts. Assume that the government either allows only the same contract to be offered by every company or that there is only one single company in the market. It demands the insurance companies to break even, i. e. to make zero profits.

  i) Do there exist pooling full insurance equilibria for $\lambda = 0,002 (0,0005)$?

  ii) For $\lambda = 0,0005$, does there exist any zero-profit pooling contract which would represent an equilibrium?

  b) Now the government abandons regulation, and a competitive insurance market emerges.

  i) What happens to a company that still offers a pooling contract?

  ii) What are the Rothschild-Stiglitz contracts in this competitive insurance market? (Calculate P_l, P_h and C_h^{RS}, where $P_l = p_l \cdot C_l$. Do not try to calculate C_l^{RS}, but express C_l^{RS} as an implicit function of λ.)

- **6-2 Adverse selection in insurance markets with more than two types of agents**

  Assume we have three different types of agents, who only differ in their probability π of suffering a loss L. Repeat your analysis in the Rothschild-Stiglitz framework and show that there are now two inefficient contracts whereas there is still no-distortion at the top! (diagrammatical argumentation is sufficient)

- **6-3 Adverse selection: Single-Crossing-Property, Exclusiveness, Equilibrium-non-existence**

  The existence of a Rothschild-Stiglitz separating equilibrium hinges on several crucial features. Some of them will be discussed below:

  a) Single-Crossing-Property: Show that for every contract with premium P and indemnity I offered, the slope of the indifference curve of the low risks in a two-states-of-the-world diagram is steeper than the slope of the high risks. This implies that indifference curves cross only once.

  b) Exclusiveness of contracts:

  i) Why is it necessary to make the implicit assumption that an insurer can observe the total amount of cover bought by an insured from all insurers?

  ii) How does an insurance company solve this monitoring problem in the real world?

  c) Destabilizing pooling contracts:

  What is the role of the share of high risk persons in society in this context?

- **6-4 Adverse Selection: Categorial discrimination**

  a) Suppose that sex is a perfect signal for the probability of facing a loss. A man's probability π_m is greater than a woman's probability π_f. Argue whether it is Pareto improving to allow discrimination with respect to sex

  i) if there is a RS equilibrium. (use a graph for your argumentation)

  ii) if there is a WMS equilibrium. (use a graph for your argumentation)

  b) How would your answers change if sex was only be an imperfect signal for a person's loss probability? (use a graph for your argumentation)

  c) There is some evidence that even car insurers face adverse selection problems. After the market for car insurances in germany was de-regulated insurers immediately tried to discriminate against the insurees according to many variables. Here we analyse a situation where two insurance companies are in the market and each of them chooses another variable to separate its

customers. They either use the customers' sex (company 1), or whether they are younger or older than 35 (company 2). The table below indicates the absolute numbers of insurees and the loss probability according to the categories.

sex	> 35	< 35
female	30	20
male	40	50

absolute number of insurees

sex	> 35	< 35
female	$0,1$	$0,15$
male	$0,15$	$0,24$

loss probability according to categories

The loss is either 100 or 0. After calculating the loss probabilities for each category assume that both insurance companies set the fair premium rate. Remember that company 1 only offers contracts discriminating with respect to sex, while company 2 distinguishes only between young and older insureds.

What contract are the customers going to choose? Name each type's (women under 35, women over 35, and so on) optimal choice. Calculate the profits of the insurance companies. Is this an equilibrium?