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Seminar für Versicherungswissenschaft  
Übung “Insurance Markets“ WS 2002/2003

## Übungsblatt 7

- **7-1 Choice of care**

Assume that the loss probability varies continuously with care  $a$ :  $\pi = \pi(a)$ ,  $\pi'(a) < 0$ ,  $\pi''(a) > 0$ .

- a) Model the insured's choice of care for a given contract  $(P, C)$ .
- b) How does optimal care vary with  $y$ ,  $L$ ,  $P$  and  $C$ ?
- c) What restrictions must be placed on preferences and on the probability function for it to be true that increases in cover reduce care?

- **7-2 Moral Hazard in insurance markets**

Consider an individual who owns a warehouse that is subject to a fire danger. If it burns down she suffers a damage that is uniformly distributed over the range from \$10,000 to \$190,000. The owner's choice of care affects the probability of the loss while it does not affect its extent. If the owner takes care the probability equals  $\pi_c$  and if she is negligent it equals  $\pi_n$  where  $\pi_n > \pi_c$  holds. If she takes care that imposes a cost of  $E = \$10,000$  on her. If she is negligent  $E$  equals zero.

The insurance contract has the following form. She pays a premium  $P$  up front and if she sustains a loss  $L$  the contract specifies an amount  $C(L)$  that is returned to the owner. The owner's utility is  $u[y - L + C(L) - E - P]$  if there is a fire and  $u[y - E - P]$  if there is none. The insurers are regulated by the state and have to offer contracts that will on average net zero profits.

- a) Assume the contracts offer complete coverage  $C(L) = L$ . What will be the results in terms of the insurance policy that is offered and the level of care the warehouse owner will take?

- b) Could it be that the warehouse owner is better off if the insurers offer coinsurance  $C(L) = \gamma \cdot L$  with  $\gamma \in [0, 1]$  than if the insurers offer full coverage?

- c) Does the result from b) hold even for a contract with a deductible  $C(L) = \max\{L - D, 0\}$ ?

- d) How would your results change if we assumed that the owner could no longer affect the loss probability but the loss size?

- **7-3 Moral Hazard: Random Contracts**

Consider a situation where the agent can choose the probability of no loss  $\pi$  directly. As she faces costs of  $C(\pi)$  with  $C'(0) = 0$  and  $C'(1) = \infty$ , and her effort choice is not verifiable we have a MH problem. (It is socially beneficial to implement  $0 < \pi < 1$ )

a) What does the only contract that offers full insurance look like, if the insurance has to break even?

b) Would a contract of the following form mitigate the problem, i.e. would effort  $\pi > 0$  be implementable: If the agent incurs a loss the insurance pays the cover  $C = L$  only with probability  $p$ . With probability  $1 - p$  no payment is made (i.e. the insuree buys a lottery where she wins / is insured only with probability  $p$ ).

c) Can this contract ever be second best efficient?