



UNIVERSITÄT KONSTANZ

Insurance Management

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Professor Schlesinger

KLAUSUR

Answer **any 4** of the following 5 questions. Answers may be written in German or in English. Each question answered is worth 25 points (100 points in total). To get full credit you must show how you derive your answers. You need to earn at least 50 points to pass the course. Note that I will not grade all 5 questions, so only answer 4. **Please write neatly.**

YOU MUST TURN IN THIS QUESTION SHEET WITH YOUR EXAM!

1. Give a brief description of each of the following:

- (a) The Combined Ratio
- (b) A Surplus Share Reinsurance Treaty
- (c) Facultative Reinsurance
- (d) A Reinsurance Sidecar
- (e) An Industry Loss Warranty

2. Mr. Jack Werth has risk-averse preferences. His level of absolute risk aversion is both decreasing and convex in wealth. Jack currently buys an insurance policy that pays for 60% of any loss. The premium is set equal to the policy's actuarial value plus a positive premium loading factor of $\lambda > 0$. Show whether or not each of the following two statements is true. All credit for this problem for showing your work (not just for stating "true" or "false").

- (a) An increase in λ will cause Jack to buy less insurance.
- (b) The addition of a zero-mean independent background risk $\tilde{\varepsilon}$ will cause Jack to buy more insurance.

3. A risk-averse firm has cash of €100 million, plus it owns two buildings which have the same value of €40 million each. The buildings are subjected to a risk of a total loss with identical probabilities $p = \frac{1}{4}$. Because these buildings are located far away from each other, the risks are independent. Suppose that the risk manager has a total budget of €8 million to spend on insurance premiums in order to cover the two risks. Insurance is available at an actuarially fair premium.

- (a) Suppose that coinsurance is available for each building separately. Show that choosing an equal coinsurance rate for each building (i.e. $\alpha_1 = \alpha_2$) is the optimal strategy for the premium of €8 million?
- (b) Suppose instead that one deductible policy is available to cover both losses. How much deductible insurance can the firm buy for its €8 million premium? (In other words, determine the level of the deductible that the firm can purchase.)
- (c) Show that the insurance chosen in part (b) dominates the insurance chosen in part (a) via second order stochastic dominance.

4. Consider a two-state model of insurance demand. The insured has two possible levels of effort: either she takes effort or she takes no effort. Taking effort will lower the probability of a loss. Effort is unobservable by the insurer and effort costs the insured c units of utility. Suppose that insurance is offered at a fair price.

- (a) Characterize insurance premium and the insurance demand under moral hazard.
- (b) Suppose that effort becomes more costly, so that one unit of effort costs d units of utility, where $d > c$. Will the level of insurance purchased go up or go down? Explain carefully.

5. Consider a risk-averse consumer who buys deductible insurance. Assume that there is a positive premium loading $\lambda > 0$.

- (a) Write out the first-order condition for choosing the optimal level of deductibility for an insurance policy and show that a positive deductible, $D^* > 0$, is optimal.
- (b) Show that an increase in risk aversion for the consumer in part (a) will cause her to choose a lower deductible, *ceteris paribus*.

NOTE: ALL HANDYS MUST BE TURNED OFF. THE USE OF A HANDY DURING THE EXAM IS GROUNDS FOR FAILURE. (If you have some personal or medical reason that your Handy should stay on, please first get the permission of Professor Schlesinger prior to starting your exam)

Checklist before turning in your exam:

- PUT YOUR MATRIKEL-NUMBER ON THE FIRST PAGE OF THIS EXAM**
- CHECK TO BE SURE THAT YOU ANSWERED 4 (AND ONLY 4) QUESTIONS**
- DO NOT FORGET TO INCLUDE ALL OF THE PAGES WITH YOUR ANSWERS**
- REMEMBER TO TURN IN THIS QUESTION SHEET WITH YOUR EXAM**