Ludwig-Maximilians-Universität München
Department of Economics
Seminar für Versicherungswissenschaft
Übung "Insurance Markets" WS 2002/2003

Übungsblatt 2

- **2-1 Demand for insurance and risk aversion**

  a) Consider two individuals with utility functions $u(y) = ln(y)$ and $v(y) = y^{\alpha}$. Are $u(y)$ and $v(y)$ possible utility functions for risk averse individuals? Calculate for both individuals the Pratt-Arrow coefficients of absolute risk aversion.

  b) Both individuals have an initial endowment W and suffer a loss L with probability π. They can now buy insurance cover C for a premium rate p. Calculate for both individuals their optimal demand for insurance C^*.

  c) Show for $u(y) = ln(y)$, and give an intuitive explanation, under what conditions the optimal demand for insurance can be negative.

  d) The insurance company demands in addition to the actuarially fair premium rate $p = \pi$ a constant payment k in order to cover fixed costs. Using a diagram, show that if k is small, full insurance is still the optimal choice for the individual. What is the maximum k_{max} such that the individual still buys insurance? Is k_{max} the same for both individuals (argue without calculating the respective k_{max})?

- **2-2 Demand for insurance and certainty equivalent income**

  a) A risk averse individual with initial endowment W suffers a loss L with probability π. She can buy insurance cover from a risk neutral insurance company, who makes zero profits, for a premium rate p. Show in a two-states-of-the-world graph the individual's certainty equivalent income and risk premium, the optimal premium amount pC^* and cover C^*, and draw the insurance company's zero profit line and its slope.

  b) The loss L, which the individual still incurs with probability π, is now uniformly distributed in the interval $L \in [L_{min}, L_{max}]$. The only available insurance policy requires a premium $\pi \cdot B$ and pays an amount B in the event of any loss, with B being the expected value of the loss, given there is a loss. Will the individual buy this insurance contract?
  (Hint: Compare the two lotteries with respect to their riskiness and recall what you know about SOSD (Second Order Stochastical Dominance). Be aware that

the individual has the same expected wealth with and without buying the insurance contract.)

c) The loss is now uniformly distributed on the interval $L \in [0, W]$. What does this mean for the individual's income? What is the certainty equivalent income, if the individual has the utility function $u(y) = y^{\alpha}$? Compare the certainty equivalent income to the expected value of the uncertain income. What happens if $\alpha \to 1$? Is an insurance company who leaves exactly the certainty equivalent income to the insured likely to make zero profits?

- **2-3 Comparative statics with respect to the premium rate**

a) A risk averse individual with loss probability π can buy insurance cover C against a loss L for a premium rate $p = \lambda\pi$, with $\lambda > 1$. Draw the individual's initial and final endowment, the insurance line and its slope in a two-states-of-the-world diagram. Show analytically that the individual is not going to buy full insurance.

b) Now the insurance company increases λ. Argue in the diagram and intuitively, that the individual's demand for insurance can rise or decline.

c) The insurance company decides to demand the actuarially fair premium rate π, but to also require a fixed payment k in addition to the premium (i.e. $P = k + \pi C$) in order to cover administrative expenses. Does this kind of "unfair" premium have a different effect on the optimal demand for insurance than a premium rate $p > \pi$ (proof analytically and in the diagram)?

d) Show that an increase in k decreases the optimal demand for insurance if the individual has an IARA utility function and if the insurance company demands a premium $P = k + \lambda\pi C$ with $\lambda > 1$.