Ludwig-Maximilians-Universität München
Staatswirtschaftliches Institut
Seminar für Versicherungswissenschaft
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# Übungsblatt 1

- **1-1 Risk-aversion, u-y-diagram**

  **a)** An individual has an at least twice differentiable utility function $u(y)$. It has an initial endowment $W$ and suffers a loss of size $L$ with probability $\pi = 0.5$. Calculate the individual's expected wealth. Using a u-y-diagram, compare the utility she derives from this expected wealth with the expected utility from her uncertain income. Does your result depend on the properties of the utility function?

  **b)** Derive from the properties of the utility function the individual's willingness to pay for a reduction in uncertainty concerning her income. Use your answer to differentiate between risk averse, risk neutral, and risk loving individuals. Show in the above diagram the certainty equivalent income and risk premium of a risk averse individual.

  **c)** The skewness of the utility function can be used to distinguish between risk averse and risk loving individuals. Why is it a less useful measure, though, to compare the strength of risk aversion between, e.g. , two risk averse individuals? Can you think of a more adequate measure?

  **d)** Two appropriate measures are the so-called "Pratt-Arrow coefficient of absolute risk aversion", defined as $A(y) = -\frac{u''(y)}{u'(y)}$, and the "Pratt-Arrow coefficient of relative risk aversion" $R(y) = A(y) \cdot y$. Calculate both coefficients for two individuals with utility functions $u(y) = -e^{-ry}$ and $v(y) = \frac{y^{1-\sigma}}{1-\sigma}$ and analyse their behaviour as the individuals' wealth increases. Is one individual more risk averse than the other?

- **1-2 Two-states-of-the-world diagram**

  **a)** A farmer is confronted with a world with two possible states: good and bad weather. If there is good weather, he has income $W$, which in case of bad weather is diminished by $L$. The probability for bad weather is $\pi$. Draw in a two-states-of-the-world graph the endowment point oft he farmer.

  **b)** The farmer is risk averse. Show in the diagram how much certain income, from the farmer's point of view, is equivalent to the uncertain income. How big is his risk premium?

**c)** Now the farmer can buy insurance cover against bad weather. He pays the insurance company a premium rate $p$ per unit of income that he gets in case of bad weather. Draw the insurance line. Under what conditions will the farmer optimally trade exactly so much state dependent income that he finally has the same income in both states of the world?

**d)** The farmer's utility function is $u(y)$. Calculate his marginal rate of substitution of income between the two states of the world. Draw the analogue of the problem above with an intertemporal consumption choice problem, i.e. a consumer who maximizes her intertemporal consumption subject to a budget constraint. What kind of good is "insurance" as compared to "savings"?