Weighing probability information dependent on its precision in decisions under uncertainty

Humans often have to make decisions although they can't foresee which consequences they will show. Those choices are called "decisions under uncertainty" and they are the topic of this thesis.

Theories, which seek to describe human behavior under uncertainty, usually emphasize two aspects. These can, somewhat simplified, be captured in two questions: "How desirable will my situation be if my decision works out well?" and "how likely will this occur?". The last aspect, likelihood of success, can be more or less precise. It can be stated accurately for a bet upon the outcome of a coin flip but this is impossible for a bet upon a soccer play.

This theses explores up to what extent precision of success probability effects decisions under uncertainty. It seems plausible to assume that imprecise (or *ambiguous*) probabilities will cause decision makers to base their choices more on the first mentioned value aspect (*weighing hypothesis*). Indeed, authors have argued for this point of view (Wallsten, Budescu & Tsao, 1997). However, research, on which this assumption was based, suffers from severe methodological problems as will be shown here. A proper method is developed.

The chosen paradigm presents sets of six lotteries, which either pay some benefit $€$ with the likelihood P or else nothing, to subjects which are required to rank order the lotteries in a set due to attractiveness. In three experiments the precision of likelihood information is varied. Usually each success probability is depicted as a wheel of fortune, larger winning areas indicating better chances. In this cases ambiguity of probabilities is varied by means of an occlusions which conceals some part of the spinners, with the effect that the size of the winning area (and thus the success probability) can not be judged precisely. Experiment III establishes ambiguity alternatively by describing chances with words (e. g. "rather low probability") which allow only for an imprecise judgment of probabilities.

It is possible to infer from the attractiveness rankings, which the subjects provide, how much they base their decisions on value information and how much on probability information.

Data do not support the weighing hypotheses. On the contrary, decisions are found to be based more on probability information as it becomes less precise. A weak opposite tendency in the domain of losses indicates that this phenomenon is rooted in subjects' acting more cautiously in the face of ambiguity.

By means of a computer simulation, which considers a broad variety of ancillary conditions, I explore which effect this phenomenon in particular and imprecision of probability information in general have upon decision quality. It shows that the discovered effect has only very small consequences. The simulation allows to draw some important conclusions: (i) Decisions under uncertainty are very robust; imprecise information as well as suboptimal strategy curtail decision quality only little. (ii) A simple decision strategy may lead to very good results if it is followed strictly. Therefore, trainings in this domain should not emphasize the development of a complex and fine tuned strategy but it should highlight the need to *strictly* adhere to a policy of manageable complexity. (iii) Efforts directed towards increasing information precision will show steeply declining marginal

returns. (iv) In very most cases the degree of information precision should not be taken into account at all.