Description for the general public.

Decision-making under conditions of risk and uncertainty is one of the key topics in behavioral and experimental economics. This is best evidenced by the 2002 Nobel Prize in Economics awarded to Daniel Kahneman for his work on Prospect Theory. This theory explained some of the violations (e.g. the Allais paradox) of Expected Utility Theory - the foundation of normative and rational economic behaviors.

Despite its popularity Prospect Theory is not the only one that describes people's behaviors under conditions of risk. In 2011, the author of this grant came up with the decision utility model that describes such behaviors in an alternative way. The idea was to consider the impact of the outcome range on prospect valuation. Interestingly, this concept enabled famous Expected Utility paradoxes to be explained without recourse to the probability weighting function postulated by Prospect Theory.

Range effects were first considered by Parducci (1965) in his Range-Frequency Theory. This theory assumes that a given stimulus (e.g. a product price) is judged according to two principles: 1). its location relative to the subjective end values (range principle), 2). its rank among other stimuli (frequency principle). For instance, the range principle says that a given price of $50 will be regarded as low in the range of all prices from $40 to $100, but as high in the range from $0 to $60. On the other hand, the frequency principle says that a given price of $50 will be regarded as low when the majority of prices is in the order of $20-$30, but as low when the majority of prices is in the order of $70-$80. The final judgment function is a weighted sum of the range and the frequency principles. It was well documented that that Range-Frequency Theory described judgments more accurately than the alternative Adaptation-Level Theory (Helson, 1964), which later became the psychophysical foundation of Prospect Theory.

The decision utility model applies only the range principle with an additional assumption that the stimuli perception is their linear function (the frequency principle and nonlinear perception, regarded as the second order effects, were left for a future version of the model). However, the research conducted during the former grant showed that the new model is more accurate than Cumulative Prospect Theory in the case of lotteries involving more than two outcomes (for binary lotteries the models are essentially equivalent). There is, however, also experimental evidence that is not accommodated by range effects. A preliminary analysis of this experimental data (as well as of other data known in the literature) suggests that it is the frequency principle that may help explaining the patterns observed.

The aim of this proposal is thus to come up with a model of decision-making under conditions of risk that fully implements both Parducci's principles, as well as postulated by him a nonlinear perception of stimuli (similarly, in economics, utility is not a linear function of monetary consequences). This should allow more experimental evidence to be accommodated and thus offer possibly even a greater advantage over Cumulative Prospect Theory.

First, experiments will be conducted to verify the impact of the distribution (frequency) and the range (stimuli perception) of lottery outcomes on lottery valuation. The experiments will be conducted using an Internet-based platform, which was designed for the purpose of the former grant. About 100 to 200 subjects are expected to take part in each experiment; the Internet platform enables conducting research with a larger number of participants than in typical laboratory conditions. The author hopes that a part of subjects will represent universities from outside of Poland (as it was the case in the former grant, in which students from Caifornia State University, Fullerton, CA participated in one of the experiments).

The data collected during the experiments should help proposing a model that describes people's behavior in a more precise way. A great deal of theoretical work is required to propose such a model or models. However, some proposals are already ready. One possibility is to implement a weighted model following Parducci's approach, in which the frequency principle partially determines prospect valuation. The second possibility is to assume an adaptive utility function following ideas presented by evolutionary economists (e.g. Robson, 2002). According to this approach the utility function is not constant but adapts to the stimuli distribution; such utility is claimed to be biologically and evolutionary advantageous. Which approach prevails will, however, be clear only after a detailed analysis of experimental data is performed.