Affective modulation of weighting function

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1 Description

Prospect Theory (Kahneman & Tversky, 2013; Tversky & Kahneman, 1992) (PT) is arguably the main model of human decision making. It postulates a value function v for transforming objective value to subjective utility, a probability weighting function w to transform probability into a subjective weight, and an operation to combine these (Gonzalez & Wu, 1999). There is evidence to support the notion that the affect of outcomes modulates the parameters of w (Hsee & Rottenstreich, 2004; Rottenstreich & Hsee, 2001) but a thorough investigation of this effect is lacking. This study consits of two sub-studies. In the first study subjects will evaluate 10 items on a scale of affect. In the second study subjects will indicate their certainty equivalence (CE) as to gambles involving these questions. Based on this, the parameters of the weighting function

$$w(p) = \frac{\delta \cdot p^{\gamma}}{\delta \cdot p^{\gamma} + (1-p)^{\gamma}}$$

are estimated for each of the 10 items, and it is calculated whether level of affect (obtained in study 1) modulates the parameters of the weighting function. Note that the above is the two-parameter weighting function suggested in (Gonzalez & Wu, 1999).

2 Hypotheses

H_1: It is expected that the 10 questions in study 1 will - on average - obtain significantly different ratings as to affective quality. This is necessary for the follow-up study to make sense.

H_2 It is hypothesized that the γ parameter will be higher for items that are rated as being higher in affect. (estimate of size of effect).

H_3: It is expected that the δ parameter will not be systematically modulated by the level of affect of items.

3 Design Plan

Study type: Observational Study.

Blinding: No blinding is involved in this study.

3.1 Study Design

Study 1: All subjects will rate all items (see Appendix 1) as to the level of affect they feel with regards to them.

Study 2: All participants indicate their certainty equivalence (CE) for all combinations of items (10) and certainty levels (1%, 5%, 15%, 30%, 50%, 70%, 85%, 95%, 99%). This results in 90 observations per participant.

4 Sampling Plan

Existing Data: Registration prior to creation of data.

Data collection procedures: Participants will be recruited through online channels (e.g. facebook, student groups, etc.). Participants must be at least 18 years old to participate. In the first experiments subjects will be payed 30 DKK for agreeing to participate in an approx. 10 minute online survey. In the second experiment subjects will be payed 150 DKK for agreeing to participate in an approx. 60 minute online survey.

Sample size:

Study 1: 30 participants.

Study 2: 50 participants.

Sample size rationale:

Power analysis? Credibility/Density interval 95% assuming data generating process?

5 Variables

5.1 Manipulated variables

Study 1: No manipulated variables.

Study 2: Levels of uncertainty are manipulated, and are given as $0.01, 0.05, 0.15, 0.3, 0.5, 0.7, 0.85, 0.95, 0.9$
Levels of affect differ for each item (obtained in Study 1).

5.2 Measured variables

Study 1: The single outcome variable will be the rating of affect level. This will be measured on a scale of $0-100$ using a slider.
Study 2: The single outcome variable is the price that subjects indicate that they are willing to pay for a ticket in a lottery (combination of probability of outcome). This will indicate their certainty equivalence (CE). This will be measured on a scale of $0-500$ dollars using a slider. The max is 500 dollars since the lottery tickets by definition cannot be worth more than this (see Appendix 2).

5.3 Indices

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6 Analysis Plan

All analysis is performed in the programming language R (R Core Team, 2020) using $Rstudio$ (RStudio Team, 2020).

Study 1: The affect ratings will be ordered based on group-level means?

Study 2: A bayesian generalized nonlinear mixed effects model is fit to the data using the R package $brms$ (Bürkner, 2018). This is done to estimate the unobserved parameters δ and γ from the independent variable probability/uncertainty and the dependent variable $w(p)$ which is the observed certainty equivalence (CE). Weakly informative priors are specified for both γ and δ (see Github).

7 Discussion

References

Bürkner, P.-C. (2018). Advanced Bayesian multilevel modeling with the R package brms. *The R Journal*, *10*(1), 395–411. https://doi.org/10.32614/RJ-2018-017

Gonzalez, R., & Wu, G. (1999). On the shape of the probability weighting function. *Cognitive psychology*, *38*(1), 129–166.

Hsee, C. K., & Rottenstreich, Y. (2004). Music, pandas, and muggers: On the affective psychology of value. *Journal of Experimental Psychology: General*, *133*(1), 23.

Kahneman, D., & Tversky, A. (2013). Prospect theory: An analysis of decision under risk. *Handbook of the fundamentals of financial decision making: Part i* (pp. 99–127). World Scientific.

R Core Team. (2020). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. Vienna, Austria. https://www.R-project.org/

Rottenstreich, Y., & Hsee, C. K. (2001). Money, kisses, and electric shocks: On the affective psychology of risk. *Psychological science*, *12*(3), 185–190.

RStudio Team. (2020). *Rstudio: Integrated development environment for r*. RStudio, PBC. Boston, MA. http://www.rstudio.com/

Tversky, A., & Kahneman, D. (1992). Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and uncertainty*, *5*(4), 297–323.