Effort Discounting Task Scoring Procedure

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The "scoring" of the Monetary Price List task is borrowed from the economics literature. Following the notation of Andreoni and Sprenger [2012] and expository theory in Balakrishnan et al. [2015], let each participant's preferences over consumption $c$and effort e in a given time period t be defined by a constant relative risk aversion (CRRA) utility function:

$$u(c_t, e_t) = c_t^\sigma - e_t^\sigma$$

In this experimental design participants choose between completion of a real effort task, in the form of phone calls to the Busara Center in 10 minute intervals at particular hours, for payment on two separate dates – the first $t \geq 0$ days in the future and the later $t + k > 0$ days away. We refer to t as the front-end delay and k as the delay between completion of the real effort task. The participant receives utility from money and effort today and in the future, but utility from money and disutility from effort in the future is "discounted" relative to the present. This could arise because people are myopic, because they have uncertainty about the future, or because they expect to be richer and therefore less in need of money at a future date. We assume that the pattern of discounting over time follows the "quasi-hyperbolic" model [Laibson, 1997]:

$$u(c_t, e_t, c_{t+k}, e_{t+k}) = \begin{cases} u(c_t, e_t) + \beta\delta^k u(c_{t+k}, e_{t+k}) & t = 0 \\ u(c_t, e_t) + \delta^k u(c_{t+k}, e_{t+k}) & t > 0 \end{cases}$$

The purpose of the MPL task to elicit the parameters β and δ for each person. Forcing participants to choose between effort earlier and later imposes a "budget constraint." This can be express algebraically as

$$(e_t, \frac{e_{t+k}}{r}) \in \{(m, 0), (0, m)\}$$

Within a frame, t and k are unchanged while r varies with each decision. The early effort remains fixed at some amount $m = 2$. In Esopo et al. [2017], $r = \{.5, 1, 1.5, 2, 2.5, 3\}$, t is either 0 (so that the earlier payment is today) or 14 days (in two weeks), k can be equal to 14 or 28 days. Respondents were paid a fixed amount of KES 500 one month from the date of the session, conditional on completion of the task.

Consider a participant who, in a frame of fixed $t > 0$ and k, elects to real effort $(m, 0)$ at interest rate r' and $(0, m(1 + r''))$ at interest rate $r'' > r'$. Under standard economic assumptions, this implies that

$$u(m_{t+k}(1 + r'')) \geq u(m_t) \geq u(m_{t+k}(1 + r'))$$

In other words, the first choice implies that the utility of m at the earlier time in better than receiving $m \times (1 + r')$ at the later time $t + k$, and $m \times (1 + r'')$ is worth more at time $t + k$ than m at t. By substituting these values into the utility function above and using a bit of algebra, it is possible to produce an interval of δ which can rationalize these choices:

$$\left[\frac{1}{1 + r'}\right]^\sigma \geq \delta^k \geq \left[\frac{1}{1 + r''}\right]^\sigma$$

Now consider the case of $t = 0$ with k fixed. The switch between earlier and later payments in a participant's decisions implies inequalities of the form

$$\left[\frac{1}{1 + a}\right]^\sigma \geq \beta\delta^k \geq \left[\frac{1}{1 + b}\right]^\sigma$$