Problems for the third seminar
ECON4260 Behavioral Economics — Fall semester 2014
Solutions to the problems will be presented Tue 30 Sep and Wed 1 Oct 2014.

Please direct any questions concerning this problem set to Geir B. Asheim
(Room ES1152, Tel: 228 55498 / 455 05 136, e-mail: g.b.asheim@econ.uio.no)

Problem 1

Suppose that Alice has the following indifference points:

\[ \begin{align*}
$70 \text{ now} & \sim \$100 \text{ in one month} \\
$40 \text{ now} & \sim \$100 \text{ in two months}
\end{align*} \]

a) Is this evidence consistent with exponential discounting?

b) Is this evidence consistent with hyperbolic discounting?

Problem 2

Bob must do an activity on one of Monday, Tuesday, Wednesday, or Thursday. Bob is a hyperbolic discounter. Depending on the perspective, he ranks the alternatives as follows: On Sunday (and at earlier times) Bob ranks the alternatives as follows: On Sunday (and at earlier times) Bob ranks the alternatives as follows:

\[(\text{Thursday}) \succ (\text{Wednesday}) \succ (\text{Monday}) \succ (\text{Tuesday})\]

On Monday, Bob ranks the alternatives as follows:

\[(\text{Thursday}) \succ (\text{Wednesday}) \succ (\text{Monday}) \succ (\text{Tuesday})\]

On Tuesday, Bob ranks the alternatives as follows:

\[(\text{Tuesday}) \succ (\text{Thursday}) \succ (\text{Wednesday})\]

On Wednesday, Bob ranks the alternatives as follows:

\[(\text{Wednesday}) \succ (\text{Thursday})\]
a) Is this activity a burdensome activity or a pleasurable activity? Briefly explain.

b) If Bob is naive, when will he do the activity? Briefly explain.

c) If Bob is sophisticated, when will he do the activity? Briefly explain.

d) In this instance, which generates a larger welfare loss, sophistication or naiveté? Briefly explain.

Problem 3 (Adapted from a problem due to Ted O’Donoghue.)

Suppose that a person will live for 3 periods. In periods 1 and 2, she chooses whether to engage in some indulgent activity, and then in period 3 she incurs costs from this indulgence. In addition, the person’s desire to indulge in period 2 depends on whether she indulges in period 1. More precisely:

In period 1, the person chooses \( a_1 \in \{0, 1\} \), and her period-1 instantaneous utility \( u_1 \) is:

\[
\begin{array}{c|c}
\text{If } a_1 = 0 & u_1 = 0 \\
\text{If } a_1 = 1 & u_1 = 10 \\
\end{array}
\]

In period 2, the person chooses \( a_2 \in \{0, 1\} \), and her period-2 instantaneous utility \( u_2 \) is:

\[
\begin{array}{c|c|c}
\text{Given } a_1 = 0 : & \text{Given } a_1 = 1 : \\
\text{If } a_2 = 0 & u_2 = 0 & u_2 = 0 \\
\text{If } a_2 = 1 & u_2 = 10 & u_2 = 12 \\
\end{array}
\]

In period 3, her period-3 instantaneous utility \( u_3 \) is:

\[
\begin{array}{c|c|c}
\text{Given } a_1 = 0 : & \text{Given } a_1 = 1 : \\
\text{Given } a_2 = 0 : & u_3 = 0 & u_3 = -21 \\
\text{Given } a_2 = 1 : & u_3 = -14 & u_3 = -35 \\
\end{array}
\]

Suppose that the person has \((\beta, \delta)\)-intertemporal preferences, and assume for simplicity that \( \delta = 1 \).

(a) Suppose \( \beta = 1 \). Solve for \( a_1 \) and \( a_2 \).
(b) Suppose $\beta = \frac{1}{2}$, and assume that the person is completely sophisticated. Solve for $a_1$ and $a_2$.

(c) Suppose $\beta = \frac{1}{2}$, and assume that the person is completely na"ive. Solve for $a_1$ and $a_2$.

(d) Given $\beta = \frac{1}{2}$, compare the welfare of sophisticates to naifs in terms of period-1 utility. Suppose now that there is a prior period 0 at which no decision made, and compare the welfare of sophisticates to naifs in terms of period-0 utility. Does sophistication make a person better off or worse off?

[(e) (A harder question which is voluntary.) Consider the model of partial naivete from O’Donoghue and Rabin (QJE 2001). Given $\beta = \frac{1}{2}$, solve for $a_1$ and $a_2$ as a function of $\hat{\beta}$.

Problem 4 (Adapted from a problem due to Ted O’Donoghue.)

This problem explores the relationship between hyperbolic discounting and health-club usage.

Suppose there are 30 days in a month, and that on each of these days you consider going to the health club.

Each visit to the health club generates a future benefit of 30.

Each visit to the health also carries an immediate cost (because exercise requires effort). However, because your motivation varies from day to day, this immediate cost will vary from day to day. Specifically, assume that for 10 days each month you will have a cost of 12, for 10 days each month you will have a cost of 18, and for the remaining 10 days each month you will have a cost of 24.

The health club offers two contracts:

(1) No monthly fee, but you pay $10 per visit.

(2) Monthly fee of $X$, but then you pay nothing per visit.

You must choose your contract in advance (prior to the first day of the month).

Finally, suppose you treat any money spent as a future cost (linear in the amount of money spent). For instance, under contract (1), if you visit the club
on a low-cost day, then you incur an immediate cost of 12 (effort), you incur a future cost of 10 (price paid), and you receive a future benefit of 30 (health benefits).

(a) If you are a standard exponential discounter with $\delta = 1$, for what values of $X$ will you choose contract (2)? If you choose contract (2), what will be your average price per visit as a function of $X$? How does this compare to $10$?

(b) If you are a naïve hyperbolic discounter with $\beta = \frac{1}{2}$ and $\delta = 1$, for what values of $X$ will you choose contract (2)? If you choose contract (2), what will be your average price per visit as a function of $X$? How does this compare to $10$?

(c) If you are a sophisticated hyperbolic discounter with $\beta = \frac{1}{2}$ and $\delta = 1$, for what values of $X$ will you choose contract (2)? If you choose contract (2), what will be your average price per visit as a function of $X$? How does this compare to $10$?