

# Psychology and Economics Problem Set 2

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Due March 8, 2007

1. Many families with low incomes qualify for the Earned Income Tax Credit (EITC). The EITC is essentially a work subsidy: for any \$1 the family makes working, the government adds some prespecified amount depending on the number of children, other income, and so on. Many families eligible for EITC get a substantial payment from the government; for example, a payment of \$2,000 on a family income of \$15,000 is not atypical. Two facts about how EITC is paid out are interesting to note. First, families can receive EITC either in smaller installments added to the household head's paycheck each month, or as a big lump sum in the form of a tax refund the next year. Most families choose the latter option. Second, once families get their paperwork to file taxes, most rush to a tax preparer such as H&R Block in an effort to get the EITC refund as early as possible. If they file for taxes normally, they get the refund in a few weeks. H&R Block offers a very expensive "refund anticipation loan" so that families can get the refund even earlier, in a day or two. The implied interest rate is often well over 100%. Nevertheless, many families take the refund anticipation loan.
  - (a) Argue that these facts are inconsistent with dynamically consistent decisionmaking (exponential discounting).
  - (b) Provide an explanation for these facts using hyperbolic discounting.
  - (c) Another interesting fact is that many households use the EITC refund to pay off piles of accumulated bills and debt. Is this consistent with your explanation? (It does not have to be consistent for you to get full credit on all parts of the question.)

- (d) Many families use the refund to buy expensive durable goods (e.g. a car). Is this consistent with your explanation? (It does not have to be consistent for you to get full credit on all parts of the question.)
2. (Based on last year's midterm.) A consumer lives for three periods,  $t = 0, 1, 2$ . In each of the periods  $t = 0$  and  $t = 1$ , she decides whether to hit or not hit. Hitting in period 0 or 1 gives the consumer some instantaneous pleasure in that period (to be explained below), but leads her to experience instantaneous displeasure of 9 in the next period. That is, if she hits in period 0, this decreases her instantaneous utility in period 1 by 9, and if she hits in period 1, this decreases her instantaneous utility in period 2 by 9. The consumer is a hyperbolic discounter with  $\beta = 1/2$  and  $\delta = 1$ .
- (a) Suppose that the instantaneous pleasure from hitting in either period 0 or 1 is 4. What does a naive consumer do? What does a sophisticated consumer do?
- (b) Now suppose that the instantaneous pleasure from hitting in period 0 or 1 is 5. What does each type of consumer do?
- (c) Show that all selves are worse off when the pleasure from hitting is 5 rather than 4. Explain intuitively how it is possible that an increase in the pleasure from hitting (unaccompanied by an increase in the future cost of hitting) can make the person worse off.
- (d) Now suppose that the instantaneous pleasure from hitting in period 0 is 5, but the instantaneous pleasure from hitting in period 1 depends on whether the consumer resisted the drug in period 0. Specifically, if she hit in period 0, the instantaneous utility from hitting in period 1 is 5, and if she did not hit in period 0, the instantaneous utility from hitting in period 1 is 4. What does each type of consumer do? Explain the intuition.
- (e) Now suppose that the instantaneous pleasure from hitting in period 0 is 4, and the instantaneous pleasure from hitting in period 1 depends on whether the consumer resisted the drug in period 0 in the following way. If she hit in period 0, the instantaneous

pleasure is 7, whereas if she did not hit in period 0, it is 5. What does each type of consumer do? Explain the intuition.

3. This question is motivated by the observation that a scary proportion of patients do not visit their doctor when they notice a serious symptom of cancer on themselves.

Let  $s \in \{0, 1\}$  denote whether a person actually has cancer, where  $s = 0$  means that the person does not have cancer, and  $s = 1$  means that she has cancer. The person's initial belief is that the probability of cancer is  $1/10$ . Let  $a \in \{0, 1\}$  denote two possible actions: to aggressively treat the cancer ( $a = 1$ ), or not to do anything ( $a = 0$ ).

The decisionmaker derives utility from two sources. First, she would like to take the appropriate action. If she has cancer, it is best to aggressively treat it, and otherwise that is not necessary. Formally, the person's "instrumental utility" is  $v > 0$  if  $a = s$ , and 0 if  $a \neq s$ . Second, the person also derives utility from her beliefs: she "wants to" believe that she does not have cancer. Formally, if she believes that the probability of  $s = 1$  is  $p$ , then her "anxiety" is  $w(1 - p)$ , where  $w > 0$ . Her total utility is the sum of instrumental utility and anxiety:

$$v(1 - |a - s|) + w(1 - p).$$

The decisionmaker has the option of visiting a doctor to get diagnosed. The doctor will tell her for certain whether she has cancer (i.e. the doctor reveals  $s$  to the patient).

- (a) Derive the patient's expected utility if she goes to the doctor and her expected utility if she does not go. Would she go?
- (b) Now suppose that before deciding whether to visit the doctor, the decisionmaker acquires a symptom of cancer that objectively means that her probability of having cancer is now  $1/2$ . Suppose she rationally interprets both the symptom and the doctor's diagnosis. Derive her expected utility if she goes to the doctor and if she does not. Would she go?
- (c) Now suppose the patient is irrational in the following way. Although the symptom is objectively serious—it means a probability of cancer of  $1/2$ —she can "convince herself" that it is not serious,

believing that the probability of having cancer is still the original one. But she cannot convince herself that the doctor's diagnosis is not serious, so if she goes to the doctor she will find out the true objective  $s$ . Derive the patient's expected utility from going to the doctor, and her expected utility from not going. When does going to the doctor yield higher expected utility?