Homework 2

Suggested Solutions

Problem 1

1. positive
2. normative
3. positive
4. normative

Problem 2

1. Yes
2. $3 million

Problem 3

1. 60,000 + 50,000 + 10,000 = 120,000
2. 100,000 - 50,000 - 10,000 = 40,000
3. Tom's enjoyment of studying law $\geq$ 10,000

Problem 4

1. $2u_2 - c$
2. $u_1 + c$
3. For those who chose to eat immediately, $u_1 > 2u_2 - c$, i.e., they valued the enjoyment of eating now much more than enjoyment in the future, or they really hate waiting.

Problem 5

Risk averse: $u(50) > u(100) \times 0.5 + u(0) \times 0.5$

Risk neutral: $u(50) = u(100) \times 0.5 + u(0) \times 0.5$

Risk loving: $u(50) < u(100) \times 0.5 + u(0) \times 0.5$

More generally, if a choice generates outcomes $x_1, ..., x_N$ with probabilities $p_1, ..., p_N$, then being risk averse means:

$$u\left(\sum_{i=1}^{N} p_i x_i\right) > \sum_{i=1}^{N} p_i u(x_i)$$

Problem 6

1. Xiaoming's marginal utility is $u'(x) = \frac{1}{2}x^{-\frac{1}{2}}$. This marginal utility is *decreasing* in x because the larger the x, the smaller $u'(x)$ is, i.e., $u''(x) = -\frac{1}{4}x^{-\frac{3}{2}} < 0$.

2. Risk-averse. Suppose Xiaoming is given a choice between A: $25 for sure, and B: $100 with 25% probability and $0 with 75% probability, then Xiaoming will choose A, because $u(25) = \sqrt{25} = 5 > u(100) \times 0.25 + u(0) \times 0.75 = 2.5$

Problem 8

1. Opportunity cost: direct cost of raising a child (food,clothing,education,etc.) + indirect cost (lost wages due to time spent raising the child); Benefit: emotional fulfillment[1]

3. higher opportunity costs, better welfare system (so less reliance on family and children for old age support), etc.

Problem 9

1. marginal benefit: increase in economic production for each additional ton of carbon emission; marignal cost: increase in atmospheric greenhouse gas concentration for each additional ton of carbon emission
2. Global warming can potentially result in catastrophic consequences, but only in the future. How much do we care about the earth 100 years from now or 200 years from now? Are we willing to sacrifice our wealth and enjoyment today in order to save the earth 100 years from now? That is the value judgment implicit in these calculations. In fact, the DICE model relies on what is called the "discount rate" to measure our preference to save the future vs. our preference for enjoying today. Different values of this discount rate will lead to very different recommendations of the optimal carbon tax rate. Hence, what discount rate to use in the DICE model has been hugely controversial.

---

[1]or any benefits you can think of, e.g. savings for old age