Answers to Exam 1, Econ. 3250, Spring 2012

(1)

Answers will vary. In class, the example I gave concerned income taxes:

income	taxes	average tax rate = $\frac{\text{income taxes}}{\text{income}}$
\$100,000	\$20,000.00	$\frac{20,000.00}{100,000} = 20\%$
\$100,001	\$20,000.28	$\frac{20,000.28}{100,000} = 20.000\,00799\ldots\%$

$$\text{Marginal Tax Rate} = \frac{\Delta \text{tax}}{\Delta \text{income}} = \frac{20,000.28 - 20,000}{100,001 - 100,000} = \frac{0.28}{1} = 28\%$$

where "Δ" denotes the change in a quantity.

So in this example, the average tax rate is about 20% but the marginal tax rate is 28%.

In general, for any function $f(x)$, the average is $\frac{f(x)}{x}$ and the marginal is $\frac{f(x_2) - f(x_1)}{x_2 - x_1}$, or $\frac{df(x)}{dx}$ using calculus. (Note that this definition of "average" is different from the definition used in statistics.)

↑ which involves addition, not just division

(2)

This example shows that in some cases, pairwise democratic voting is a poor way to make social decisions – because it can be "indecisive," which means it might not result in a decision. So if society has more than two alternatives, democratic voting is an imperfect way to make social decisions.

In this class, we typically use cost-benefit analysis instead of democratic voting to make social decisions. We would not do this if democratic voting were perfect. (Although cost-benefit analysis is not perfect either.)

(3)

Examples will vary, but the basic point is that the way an environmental amenity (or disamenity) affects house prices can be inferred by comparing the sales prices of two houses that are identical in every way except that one has the environmental amenity and the other doesn't.

It's usually impossible to find such a pair of houses, so data on house prices and house characteristics are used to econometrically estimate an equation for house prices, such as the hypothetical

$$\begin{pmatrix}\text{House}\\ \text{Price}\end{pmatrix} = \$50{,}000 + \begin{pmatrix}2 * \text{number of}\\ \text{bedrooms}\end{pmatrix} + \begin{pmatrix}3 * \text{number}\\ \text{of bathrooms}\end{pmatrix}$$

$$- \begin{pmatrix}10 * \text{crime rate}\end{pmatrix} + \begin{pmatrix}6 * \text{environmental}\\ \text{amenity}\end{pmatrix}.$$

The value of the environmental amenity can then be estimated by seeing how it affects all the relevant houses.

(4)

a) Although the expected value of this lottery is $+\infty$, people would usually pay very much less than this for the right to play in this lottery. Often people are willing to pay less than \$10 to play this lottery.

So people value it much less than its expected value.

b) It shows that expected value can be rather unimportant in describing typical human behavior.

c) No. If the utility function is $u(x)$, the expected utility of the St. Petersburg lottery is

$$\frac{1}{2}u(\$2) + \frac{1}{4}u(\$4) + \frac{1}{8}u(\$8) + \frac{1}{16}u(\$16) + \cdots .$$

Depending on what $u(x)$ is, this could well be finite.

Optimal: For example, if $u(x)=\sqrt{x}$, then the expected utility is

$$\frac{1}{2}\sqrt{2} + \frac{1}{4}\sqrt{4} + \frac{1}{8}\sqrt{8} + \frac{1}{16}\sqrt{16} + \cdots$$

$$= \frac{1}{2^1}(2^1)^{1/2} + \frac{1}{2^2}(2^2)^{1/2} + \frac{1}{2^3}(2^3)^{1/2} + \frac{1}{2^4}(2^4)^{1/2} + \cdots$$

$$= 2^{-1}2^{1/2} + 2^{-2}2^{2/2} + 2^{-3}2^{3/2} + 2^{-4}2^{4/2} + \cdots$$

$$= 2^{-1/2} + 2^{-2/2} + 2^{-3/2} + 2^{-4/2} + \cdots$$ - and if we call this "EU", then

$2^{-1/2}EU = \quad 2^{-2/2} + 2^{-3/2} + 2^{-4/2} + \cdots$ so

$EU - 2^{-1/2}EU = 2^{-1/2}$ and $EU = \frac{2^{-1/2}}{1-2^{-1/2}} = \frac{1}{2^{1/2}-1} = \frac{1}{\sqrt{2}-1} = \frac{1}{\sqrt{2}-1}\frac{\sqrt{2}+1}{\sqrt{2}+1} = \sqrt{2}+1$

$\approx 2.414.$

(5)

a) If there are bargaining costs, the social optimum might not be achieved. In the real world, there are likely to be bargaining costs, potentially very high ones if there are many pollution victims, as is often the case. So in the real world, the bargaining often does not take place.

Optional: Assertions that this is optimal ignore the possibility that government might impose the optimum at minimal cost.

b) Even in the absence of bargaining costs, bargaining between two parties is a type of economic "game," which involves strategic interactions of the participants and may well not lead to the social optimum. (One example: misrepresenting the location of the Marginal Net Private Benefit curve.)

(6) Supporting positions:

Efficiency: Economic Incentive Instruments ("EII's") are designed to achieve efficiency. Command and Control ("C&C") is not. We've shown that pollution taxes (an EII) and tradeable pollution permits (another EII) are Pareto improvements over C&C (over standards, in particular), allowing cheaper abaters to abate more than expensive abaters.

Equity & Political Acceptability: Pollution standards (C&C), by treating all firms equally, are often seen as being better than EII's in these aspects. With EEI's, rich companies can afford to pollute more than poor companies, which looks unfair to some people.

Administrative Efficiency: Standards (C&C) only require determining if the rule has been violated or not. EII's require precise measurement of pollution. So standards are easier to administer. They also involve no money flows, making them simpler too.

For the last two rows, opposing positions could also be correct. For example, for the last row, you could argue that both systems require pollution measurement, and standards might require court intervention if the standard is violated, so EII's are easier to administer.