14.24
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Fall 2000

Problem Set 5 Answers

Question 1

(1a) Solve the following problem:

$$\begin{aligned} & \max_t \{p(t)D - c(t)\} \\ = & \max_t \left\{ tD - \frac{t^2}{2} \right\}. \end{aligned}$$

The first-order condition is $D - t = 0$, implying $t^J = D$.

(1b) The lawyer solves

$$\begin{aligned} & \max_t \{p(t)\gamma D - c(t)\} \\ = & \max_t \left\{ t\gamma D - \frac{t^2}{2} \right\}. \end{aligned}$$

The first-order condition is $\gamma D - t = 0$, implying $t^* = \gamma D$. Only if the contingency fee is 100 percent (illegal in the U.S.) will $t^* = t^J$.

Question 2

(2a) Refer to earlier class notes for the Nash bargaining algorithm adopted below. Plaintiff's payoffs given first, defendant's second, in the following ordered pairs:

Step 1: $(100 - 20, -100 - 10)$

Step 2: 0

Step 3: 30

Step 4: 15

Step 5: $(95, -95)$

The settlement offer is 95.

(2b)

Step 1: $(.001, -.001 - 20)$

Step 2: 0

Step 3: 20

Step 4: 10

Step 5: $(10.001, -10.001)$

The settlement offer is about 10. The plaintiff files a suit that is basically baseless in order to expropriate the defendant's surplus from avoiding costly litigation.

Question 3

(3a) The defendant rationally offers either 180 or 80. If it offers 180, the plaintiff always accepts. If it offers 80, the plaintiff accepts if it is the low-harm type, which occurs with probability 1/2. With probability 1/2, the plaintiff is the high-harm type, in which case they go to trial and the defendant's costs are $200 + 20 = 220$. The total expected cost from an offer of 80 is

$$\frac{1}{2}(80) + \frac{1}{2}(220) = 150.$$

Since 150 is less than 180, the defendant offers the low settlement amount, 80, in equilibrium. The probability of settlement in equilibrium is 1/2 and the expected social cost is $(20 + 20)/2 = 20$; that is, with probability 1/2, the case goes to trial which costs each party 20.

(3b) If the plaintiff is the high-harm type, it earns $200 - 20 = 180$ in the above equilibrium. If it could reveal its injury to the defendant, it would also earn 180. This is the settlement payment arising from Nash bargaining under symmetric information with $A = 200$, $c_P = c_D = 20$, and $\gamma = 1$, where γ is the share of the gains from Nash bargaining that are captured by the defendant.

As an aside, it may seem strange to you to look at the case of $\gamma = 1$ since you are used to solving the game with equal bargaining power on both sides, i.e., $\gamma = 1/2$. The reason for doing so is to make the game more comparable to the uncertainty game with take-it-or-leave-it offers. Setting $\gamma = 1$ effectively keeps the bargaining power constant across cases and allows us to focus on only one change, the movement from uncertainty to full information. If we assumed $\gamma = 1/2$, two factors would be changing and it would be difficult to attribute the difference in equilibrium to one factor or the other.

Returning to the problem, if we proceed as suggested above, the plaintiff turns out to be indifferent between revealing its private information and not. If the defendant could make an additional payment to the plaintiff for verifiable information revelation, the plaintiff could be made to strictly prefer information revelation.

If you supposed $\gamma = 1/2$ rather than $\gamma = 1$, you solved the Nash bargaining problem and found the plaintiff earns 200 and thus strictly prefers information revelation. In a sense, your result came about because of your implicit assumption that full information somehow increased the bargaining strength of the plaintiff from none to equal.

Question 4

At the appeal stage, $CA = 20$, $ERA = 10$, and thus $EVA = -10$. The plaintiff would not appeal

At the trial stage, $CT = 40$, $ERT = 50$, and thus $EVA = 10$. The plaintiff would proceed with the trial.

At the bargaining stage,

$$\begin{aligned} EVB &= (.7)(49) + (.3)(\max\{EVT, 0\}) - 3.30 \\ &= (.7)(49) + (.3)(10) - 3.30 \\ &= 34. \end{aligned}$$

At the information exchange phase,

$$\begin{aligned} EVE &= (.7)(49) + (.3)(EVB) \\ &= (.7)(49) + (.3)(34) \\ &= 44.50. \end{aligned}$$

Thus, at the filing stage,

$$\begin{aligned} EVF &= ERF - CF \\ &= EVE - CF \\ &= 44.50 - 10 \\ &= 34.50 \\ &> 0. \end{aligned}$$

The plaintiff files in equilibrium and proceeds with the trial, but not the appeal, if the game gets to those later stages.