1. (30 points) “A new breed of investment firm is capitalising on the boom in litigiousness and taking a piece of the profits. [These firms] underwrite lawsuits in exchange for a share of proceeds.” (Financial Times, Dec 3, 2001.)

One example is Suits R Us. Potential plaintiffs come to them with cases. For each one, SRU decides whether or not to take it; if so, it offers a standard percentage rate contract. Given SRU’s experience with many previous cases, the firm has a better idea than most plaintiffs of the odds that the case will win in court.

(a) Suppose you have a potential case in hand (in which you would be the plaintiff). What considerations should you take into account when deciding whether to apply to Suits R Us?

(b) Name two other situations that lead to similar problems.

2. (35 points) The word is out: a revolutionary discovery by a faculty member at NYU’s Courant Institute for Mathematical Sciences will finally allow the practical implementation of parallel processing in personal computers. As holder of the patent, NYU has licensed the technology to two firms, to assure PC manufacturers of two sources of supply. One firm, located in the US, has already moved ahead with engineering plans for building a production facility. The question is whether to go for a plant of size 1, 2, or 3. The second firm is located in Brazil. It will also have to decide whether to build a plant of size 1, 2, or 3. However, it is a bit late with respect to the US firm, and won’t be able to move ahead before next year.

You have been hired as a consultant to the US firm. Your analysis shows that the profits from various combinations of plant sizes is:
Note that the matrix is symmetric, so that it doesn't matter which firm is which.

(a) Comment on the pattern of payoffs. At which combination(s) of plant sizes is total profit (the two firms together) highest? Lowest?

(b) As a consultant for the US firm, what size factory do you recommend? Describe the game played between the two firms and the optimal strategy by the US.

(c) When you meet with the Executive Committee of the US firm, one executive remarks: “There's no need for haste. Why don’t we wait until the Brazilian firm builds its plant and make a more informed decision?” How would you reply?

3. (35 points) Competition for 4th generation (4G) wireless telecommunications is under way. Two standards are in competition with each other. One standard is sponsored by firm Q, the other by firm N. Crucial to the competition is the decision of a third firm, E, whether to join N or Q. If E joins Q, then E’s profit would be 4, Q’s 6, and N’s 5. If E joins N, then it will make a profit of 3, N will get 8, and Q will get only 4. If E joins neither Q nor N, it gets 2, Q gets 4, and N gets 5.

(a) Firms N and Q are thus in competition over E. Suppose that they simultaneously decide how much to offer E to join their standard. Let p_i be the value offered by firm i, where i can be N or Q. How much would N and Q be willing to pay E? For a given value of p_Q, what is the optimal value of p_N (and vice-versa)?

(b) Describe the outcome of a “price war” between N and Q to gain E’s support.

(c) Suppose now that N and Q form the following agreement: While each firm will continue to use its own technology, they agree that neither will offer any payment to E. Is this agreement sustainable?

Suggested Answers

1. It’s an asymmetric information (or Groucho Marx) problem. Like many in the business world, it’s based on expertise rather than some innate information advantage. Nevertheless, SRU knows more about this business than the average plaintiff, which should make the plaintiff wary of giving away too much of a potential settlement.

(a) The problem is that SRU will only take the case only if it thinks it's a good one, in which case you’re probably better off taking it yourself. The key is that SRU probably has a better assessment of the odds of success than you do. (Note: In
answering this question, we are assuming that the rate charged by SRU is fixed. If that were not the case, then we might have a game of signaling. Also, if the plaintiff has the possibility of removing the case once SRU has decided to take it up, then we have a different game.)

(b) Examples of the “Groucho Marx” problem: used cars, bank loans, tickets from scalpers, paper clips, etc.

2. The idea is that moving first (“commitment”) is valuable in this context.
   (a) Total profit declines as total output falls from 6 (both produce 3) to 2 (both produce 1). You can imagine this comes from the two firms restricting output and driving the price up. For a given level of output (4, for example), different combinations of outputs for the two firms simply change the distribution of profit between the firms, with the higher output firm having the higher profit (profit is proportional to market share).
   (b) As indicated in the text, the US firm chooses output this year, whereas the Brazilian firm only chooses output next year. We thus consider a sequential game, with the US moving first. Suppose US chooses 1; then Brazil chooses 2 (which has the highest payoff) and the US payoff is 2.9. Similarly, if US chooses 2, Brazil chooses 2 and the US payoff is 3.8. And if US chooses 3, Brazil chooses 1 and the US payoff is 5.7. The last (3) generates the highest payoff, so the US should build a plant of size 3.
   (c) The situation described above gives the US a large advantage: by choosing/moving first, it can force Brazil to choose a low output level and keep most of the profit for itself. If the US firm waits, then it will either be choosing output at the same time as the Brazilian firm or after the Brazilian firm. If the two firms choose capacities at the same time, the Nash equilibrium is (2,2) and the US firm has a payoff of 3.8, substantially less than 5.7. If it lets the Brazilian firm choose capacity first, Brazil chooses 3 (they do the same calculation US did in (b)) and the US does even worse: 1.9. Thus waiting to collect more information reduces their profit from 5.7 to 1.9. The appropriate advice: Don’t do it!

3. This is a bidding war between the Q and N for E’s cooperation. The way this is set up, E has most of the leverage. We might summarize the payoffs like this

<table>
<thead>
<tr>
<th>E’s Payoff</th>
<th>Q’s Payoff</th>
<th>N’s Payoff</th>
</tr>
</thead>
<tbody>
<tr>
<td>E joins Q</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>E joins N</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>E joins neither</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

   (The text says nothing about Q and N’s payoff in case E chooses no firm. We assume they get the same as they would if E were to join the rival firm. So long as these values are low, it will make no difference for the solution of the game.)
(a) E’s cooperation has a value of 2 (=6–4) to Q, 4 (=9–5) to N. Thus Q is willing to bid up to 2 and N up to 3 for having E join in. Bidding between Q and N is analogous to the Bertrand price game when the firms have different marginal costs. In this case E would go to Q for any value of \( p_Q \) that differs from \( p_N \) by less than 1. For example \( p_N = 1.5 \) and \( p_Q = .8 \), then E will go to Q, for 4+.8 is greater than 3+1.5. It follows that, for a \( p_N \) less than 3, \( p_Q \)’s optimal price is \( p_N \) minus 1 plus a small amount (the least price necessary to bring E on board). If \( p_N \) is greater than 3, then \( p_Q = 2 \). Regarding N, for any \( p_Q \) less than 3 the optimal price is \( p_N \) equal to \( p_Q \) plus 1 plus a small amount (again, the least price necessary to bring E on board). If \( p_Q \) is greater than 1, then \( p_N = 4 \): N won’t bid more than the value of having Q on its side.

Alternatively to the above solution, we could also write a matrix with a series of possible values of \( p_N \) and \( p_Q \) and find the reaction curve is the usual way.

(b) Notice that the calculations in the previous question are analogous to the reaction curves under Bertrand competition. Continuing with this analogy, we can see that the intersection of the reaction curves is at \( p_Q = 2 \) and \( p_N = 3 \) plus a small amount. At these price levels, firm E chooses to join N and gets a payoff of 6 (=3+3). Firm N gets a payoff of 6 (=9–3) and firm Q gets a payoff of 4.

(c) In this situation, E would choose Q and get a payoff of 4. Q gets a payoff of 6 and N gets a payoff of 5. This is not an equilibrium. By offering \( p_N = 1 \) (plus a small amount), N could convince E to join its standard and increase N’s payoff from 5 to 8. There’s no reason why N would prefer to pay nothing and have a lower payoff.

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