

STRATEGIC GAME THEORY FOR MANAGERS

Problem Set 2

Note: this is individual work. Make any economic assumptions you think necessary, but make them explicitly. You may talk to fellow students about this, but do not copy others' work.

1. A sports figure tests positive for a banned substance. Suppose that the test is wrong 10% of the time and that you believe that 40% of athletes in this sport use the substance. Consider the following table of society's payoffs:

	Banned	Not banned
Drug User	10	-10
Non-User	-50	0

- a. Should the sports figure be banned? What is the expected payoff? Explain. (Hint: see Lecture 6, pp. 29–31 to calculate the conditional probabilities.)
 - b. What if the payoff from banning a non-user is -150? Explain.
2. The Food Products Company has decided to introduce a new brand of breakfast cereals, and is contemplating building either a \$10 million or a \$6 million plant to produce the new breakfast cereals. If FPC builds the \$10 million plant, there is a 70% chance that competitors will respond with a large increase in their advertising and a 30% probability that competitors will respond with a small increase in their advertising. On the other hand, if FPC builds the \$6 million plant, there is a 40% probability that competitors will respond with a large increase in their advertising and 60% probability that competitors will respond with a small increase in their advertising.
Whether or not the company builds the \$10 million or the \$6 million plant and whether or not competitors respond with a large or a small increase in their advertising, FPC believes that with probability 40% general demand conditions will be high,

with probability 40% general demand conditions will be normal, and with probability 20% general demand conditions will be low.

The net cash flows that FPC faces under each plant it can build and competitors' responses are indicated in the table below, as a function of the possible conditions of demand. Since the variability of the net cash flows is higher with the \$10 million plant, FPC uses a risk-adjusted discount rate of 20% p.a. to calculate the present value (P.V.) of the net cash flows. On the other hand, FPC uses a risk-adjusted discount rate of 14% p.a. to calculate the P.V. of the net cash flows of the \$6 million plant.

Plant	Competitors' Advertising Reaction	Conditions of Demand	Net Cash Flows for Year (millions)		
			1	2	3
\$10 million	Large	High	\$6	\$6	\$5
		Normal	4	5	6
		Low	3	4	2
	Small	High	\$7	\$7	\$7
		Normal	5	5	5
		Low	4	4	4
\$6 million	Large	High	\$3	\$4	\$3
		Normal	3	3	2
		Low	2	2	2
	Small	High	\$5	\$4	\$4
		Normal	4	3	3
		Low	3	3	2

- Construct a decision tree for FPC.
- Assuming risk neutrality, determine whether FPC should build the \$10 million or the \$6 million plant. (Ignore cash flows beyond Year 3, for simplicity. Remember to subtract the capital costs (\$10m or \$6m) from the Net Cash Flows.) Explain.
- What is the maximum that FPC should pay to reduce the uncertainty associated with the Conditions of Demand (by gaining perfect information)? Explain.

3. *Pick a Box*: Eddie and the contestant face off: Eddie knows which one of the three boxes contains the cheque for \$100k (the other two are empty). Stephany the contestant chooses a box and announces it, but, before Eddie reveals the contents of the chosen box to her (and to us), he reveals with a flourish that one of the two unchosen boxes is empty. He leaves it open.
- What is the distinction between cheap-talk equilibrium and babbling equilibrium?
 - Eddie gives Steph a chance to change her choice to the other box before she “locks in” and he opens her chosen box. Should she change her choice? Explain. (Hint: put yourself in Eddie’s shoes; a tree might also help.)
4. A committee is examining an internal investment opportunity for the firm. All members are agreed that if the drought breaks by December 31, then Project A will NPV \$600k in 2007 and that Project B will NPV \$300k, but that if the drought has not broken by that date then Project A will NPV -\$540k and Project B -\$60k; there is also the option of doing nothing (an NPV of \$0, come what may).
- They have heard of a clairvoyant weather forecaster in far north Queensland, with an excellent record of foretelling when droughts will break. Jack argues that a clairvoyant’s value is no more than \$204k, while Rose says that her calculations indicate \$180k is the maximum, while Fred says the firm should pay nothing for perfect information about the drought.
- Using the Java applet on the “Expected Value of Perfect Information on-line” link under Lecture 6 on the SGTm web page (or do it by hand, if you must), explain these disagreements. (All members accept the logic behind the EVPI calculations; all are risk-neutral decision makers.)