

## ***STRATEGIC GAME THEORY FOR MANAGERS***

### ***Problem Set 1***

*Note: 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. Examine the cartoon on the final page of this Problem Set.
  - a. One of the characteristics of a Nash equilibrium is that it is self-reinforcing. What does this mean?
  - b. Explain why the cop might have some trouble in getting the folks to "break it up".
  - c. Can you think of any real-life situations analogous to this (with three or more parties)? Discuss.
  
2. Suppose the Intel Corporation and the Microsoft Corporation are considered engaging in a joint venture. Each will have to invest \$10 million in assets that are of no use or value outside this project. If both firms act in accord with their promises, the annual economic profit to each firm is \$2.5 million. If one or both do not act in this way, the annual economic profit to each is as shown below (Intel, Microsoft, in millions):

Possible strategies for Intel	Possible strategies for Microsoft	
	Act in accord with promises	Don't act in accord with promises
Act in accord with promises	\$2.5, \$2.5	-\$1, \$5
Don't act in accord with promises	\$5, -\$1	\$0, \$0

- a. In the absence of a contract, would the joint venture generally be a good idea? Explain.
- b. Suppose a contract can be formulated that will ensure that both firms will act in accord with their promises. Will either firm enter into the joint venture (assuming their lawyers' fees are nominal)? Why or why not?

- c. Explain why may it be very difficult to formulate an effective contract of this sort.
- d. Is this an ordinary Prisoner's Dilemma game? If not, why not?
3. There are three television stations in an American city, each affiliated with one of the three major networks, ABC, CBS, and NBC. (It is before Rupert's Fox.) All three stations have the option of running the evening network news program at either 6:30 pm (a "live feed") or at 7:00 pm (a "taped delayed broadcast"). Among network news viewers, 60% prefer to watch the news at 6:30 pm, and 40% prefer to watch it at 7:00 pm because of competition at 6:30 pm with "The Simpsons" on an independent station. Moreover, head-to-head, ABC's news program is the most popular, CBS's is the next most popular, and NBC's is the least popular. The share of evening news viewers captured by each station as a function of when the station shows its news in this simultaneous-play interaction is given in the Table. Each station's objective is to maximise its share of the viewing audience, because that determines the station's advertising revenue.
- a. What is the definition of a dominated strategy?
- b. Find all the dominated strategies. Explain.
- c. Eliminate the dominated strategies found in part (a) and find all the Nash equilibria *in pure strategies* of the simplified game. Explain.

**ABC News @ 6:30 pm**

		C B S N e w s	
		6:30 pm	7:00 pm
NBC News	6:30 pm	(42%, 34%, 24%)	(37%, 40%, 23%)
	7:00 pm	(34%, 26%, 40%)	(60%, 22%, 18%)

**ABC News @ 7:00 pm**

		C B S N e w s	
		6:30 pm	7:00 pm
NBC News	6:30 pm	(40%, 34%, 26%)	(34%, 26%, 40%)
	7:00 pm	(24%, 60%, 16%)	(42%, 34%, 24%)

Payoffs: (ABC, CBS, NBC)

4. Consider two firms, say, Holden and Toyota. Each of them is considering whether to expand its capacity to make cars or not. Whether or not each does depends on the payoffs, which depend on what the other player does. Assume, for simplicity's sake, that each faces three possibilities: Do Not Expand production capacity (DNE), a Small expansion, or a Large expansion.

Because of the long lead times, assume that the two players' actions are simultaneous, and the payoff matrix is given by:

		<i>Toyota</i>		
		DNE	Small	Large
<i>Holden</i>	DNE	\$36m, \$36m	\$30m, \$40m	\$18m, \$36m
	Small	\$40m, \$30m	\$32m, \$32m	\$16m, \$24m
	Large	\$36m, \$18m	\$24m, \$16m	\$0m, \$0m

**TABLE 1.** The payoff matrix (Holden, Toyota)

- What is the equilibrium strategy in this game?
- If one player, say Holden, preempts the other by moving first, plot the resulting game tree. What is the equilibrium strategy now?
- Does the equilibrium strategy change if Toyota instead moves first? Explain how.