

EXERCISE 9: GAME THEORY AND OLIGOPOLY

Timing of Tutorial This chapter reinforces the material in chapters 30 and 31 of the text.

Purpose of Tutorial To learn through experience - by allowing you to play a game (and its economic application) and hence understand the power (and limitations) of the theory.

Prior Preparation Your tutor should divide the tutorial group into two Teams; it is recommended that each team meets before this tutorial to discuss its strategy: if you come prepared you should do better. At this prior meeting you will find it helpful to prepare a formula for calculating your profit for each output combination.

Written Work after Tutorial A critical appraisal of the predictions of game theory should be written and handed in to your tutor before the beginning of Tutorial 10.

Relevance to Examination The examination will ask you to give examples of, and analyse, different kinds of economic games, in particular duopoly games. This tutorial examines a particularly important class of games, referred to as prisoner's dilemma games. You should understand the basic structure of this type of game and the relevance to the economic theory of duopoly.

In this tutorial, like Tutorial 2, the tutorial group will be divided into two sub-groups, or Teams. These Teams will play each other in two contests - one a straightforward Game, the second a Duopoly Problem. Your tutor will act as the Umpire.

Game Theory

Here is a payoff matrix. The amounts are in (hypothetical) pounds. The first number is the payoff to Team 1; the second number is the payoff to Team 2. So, for example, if Team 1 plays 2 and Team 2 plays 1, then Team 1 will get a payoff of -£2 (yes, will *lose* £2) and Team 2 will get a payoff of £20.

Team 2's choice

Team 1's choice

Payoffs	1	2
1	£1,£1	£20,-£2
2	-£2,£20	£6,£6

You are to play this simple game 8 times. The first 4 times *no communication will be allowed* between the two Teams; for the last 4 times, *communication will be allowed* - but no physical threats.

YOU SHOULD TRY AND MAXIMISE YOUR PAYOFF FROM PLAYING THIS GAME.

Duopoly

Each Team is Duopolist. Each Duopolist has constant marginal and average costs of 10p per unit. The aggregate demand curve for the duopolists' product is

$$P = 100 - (Q_1 + Q_2)$$

where P is the market price (in pence) and Q_1 and Q_2 are the outputs of Teams 1 and 2 respectively. Teams must decide on their Q 's; the Umpire works out P using the formula above.

So, for example, if $Q_1 = 20$ and $Q_2 = 30$ then $P = 50$ and revenues to Teams 1 and 2 are respectively $50 \times 20 = 1000$ (= £10) and $50 \times 30 = 1500$ (= £15). Costs are respectively $10 \times 20 = 200$ (= £2) and $10 \times 30 = 300$ (= £3), so profits are £8 and £12 respectively.

You are to play this simple duopoly problem 8 times. The first 4 times, *no communication will be allowed* between the two Teams; for the last 4 times, *communication will be allowed* - but no physical threats.

YOUR TEAM SHOULD TRY TO MAXIMISE ITS AGGREGATE PROFITS OVER THE 8 PLAYS.

Comments as to what you should take away from this tutorial. You should begin to understand the strategic problems or playing a game with an opponent – in which you do not know for certain what the opponent will do and in which you have to anticipate what the opponent may or may not do. You should also understand the important concept of a Nash equilibrium in such a game and to appreciate the strengths and weakness of this concept. You should also understand why, although some kind of implicit co-operation between the players may be mutually beneficial, such co-operation may fail to emerge. You should also begin to develop some feeling as to why regulation of duopolists (and oligopolists) might be necessary in the real world.