

Revision on Game Theory, Question 1

In class we are going to play the following game. Pair up with a person, and you will be given 8 cards, 2 sets of 4. Shuffle them up and draw four each. For the purposes of this game there is a “high” number and a “low number” Record the proportion of cards you have in your hand.

A match is both you and your opponent playing a card. Points will be scored in the following manner:

- 1 point if both of you tie on the high card.
- 4 points if you have the high card, your opponent the low card.
- 0 points if you have the low card, your opponent the high card.
- 2 points if you tie on the low card.

Play this a multiple number of times (at least 20). Then, redeal out the cards to play another set. I want you to play the following combinations:

- 3 of a kind in a hand.
- 2 of a kind in a hand.
- 4 of kind in a hand.

Since you and your opponent have kept track of points, you have effectively played all the possible mixed and pure strategies available.

We can write the points of the game in a payoff matrix:

$$A = \begin{bmatrix} 1 & 4 \\ 0 & 2 \end{bmatrix},$$

Your strategy vector is the proportion of cards in your hand. If you have 4 cards, 2 of which are higher than the other, then your strategy vector is $[1/2 \ 1/2]^T$. To make the obvious analogy to the hawk-dove game, let the high number proportion be the first entry to the strategy vector.

Write down all the possible pure and mixed strategies available to you (there should be 5). It might be helpful to organize this in a table. From the record of points you have kept, find the average payoff per play. Now figure out the expected payoff per play using the formula $q^T A p$, where q is your strategy vector, p your opponent's. Does the expected payoff match that of your average payoff? What is the optimal strategy from the general result we derived in class? Does this optimal strategy concur with your results?