

Answers for Problems Assigned Lecture 11

I. Review Problems

A. Create a Stackelberg signaling model in a PD game where one prisoner can attempt to persuade the other that he will cooperate. Use an abstract learning function and assume signals are costly, and that both players maximize expected utility.

- First note that the only signal worth sending is that "I will cooperate." The other signal is unnecessary because that is what the "message receiver" would expect based on the basic PD structure of the game. That is to say, both players know that the privately optimal strategy is to "defect."
- So, we can focus on the probability that the message sender will actually cooperate and the extent to which the message receiver can be convinced. The message receiver would maximize the expected payoff from the game which is partly a matter of what the sender does and partly of what he (the receiver) does.
- Cooperation returns: $U_e = (P_c) C + (1-P_c) S$
- Defection returns $U_e = P_c (T) + (1-P_c) D$
- where $T > C > D > S$ and $P_c = m(S)$ and S is the number of times that a cooperative signal is sent.
- Note that no matter what the signaler does in this respect, the receiver still has an optimal strategy of defection!
- In this case, the Stackelburg equilibrium is $S = 0$ (since signals are costly and do not change the "receiver's" behavior) and mutual defection.
- (In order for the message to have any effect, it must change the relative ordering the cooperative and defection strategies, by for example threatening retribution after the game is over, or suggesting a credible ability to read the "receiver" mind--and to do what ever "he" does.)

B. Is a costly signal necessarily a credible signal? Analyze and Discuss.

- Clearly, a costly signal is not always credible in the sense that the benefits from lying (sending a false or misleading signal) may be sufficient to warrant sending a message if there is some probability that the receiver will be persuaded by the signal.
- Whether this can happen depends in part on the nature of the game. A sender who knows that a costly signal will be ignored will send no costly messages--as above.
 - So in a game where the basic structure is "common knowledge" costly signals are only sent when they can influence behavior.

- Moreover, in a case where the receiver knows the incentives of the sender, they only have effects when they are credible, at least in an expected value sense.

- On the other hand, if it is possible to fool the receiver, costly signals will be sent. [E.g. consider the myth of the social security lock box.]

C. How might a game be designed to make "truth telling" an optimal strategy? (Discuss a couple of examples from ordinary markets regarding quality or price.)

- The easiest way to induce truth telling is to offer a prize for the truth. That is to say, pay the message sender among V if he sends a truthful message and amount 0 (or negative F) if he does not.
- In the above PD game, if the sender has promised to among $(T+1)$ if he sends a truthful message, he will.
- Any case where the truth can eventually be verified, the promise of a sufficient prize for truth telling or a sufficient fine for lying can assure truth telling by those who are rational and know what the truth is.
- (However this will not work for fanatics or others whose utility levels are not affected by prizes or fines at the margin of interest.)
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- In cases where the truth can not be verified, one can contrive games where it is in the interest of the message sender to tell the truth because of his own self interest. (See, for example, Tideman and Tullock's paper on the demand revealing process.)