

PS 2703 Practice Problems
October 26, 2007

Bayes' Rule

Suppose that the state of the world is $\omega \in \{A, B\}$ and that the probability of $\omega = A$ is $3/4$. There are two types of politicians. *Skilled* politicians correctly choose a policy corresponding to the state of the world. *Unskilled* politicians are not as competent and choose the correct policy with probability $2/3$. Assume that $3/5$ of all politicians are skilled. If, as a voter, you observe that the true state is A and the policy choice is B, what is the (posterior) probability that the politician is skilled? What if the true state is A and the policy choice is A?

Bayesian Nash Equilibrium (Two Voter Jury)

Assume:

$$\begin{aligned} N &= \{1, 2\} \\ p &= 3/4 \\ \pi &= 2/3 \end{aligned}$$

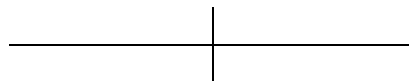
Jury votes by unanimity rule

$$u_i(a, s_{-i}, \theta_i) = \begin{cases} 0 & \text{if } \textit{correct} \\ -z & \text{if } \textit{innocent convicted} \\ z-1 & \text{if } \textit{guilty acquitted} \end{cases}$$

Find conditions for z such that there is a sincere Bayesian Nash equilibrium.

Extensive Form Games (Simple Tic-Tac-Toe)

Consider a very simplified version of tic-tac-toe played with a 2x2 grid instead of a 3x3 grid:



Suppose that Player 1 (X) moves first and that Player 2 (O) moves second. Use a valid game tree to represent this game (including payoffs).

Extensive Form Game of Imperfect Information

Suppose that there are two countries, U and S. Suppose that country S first decides whether to secretly build a nuclear submarine. Later, country U chooses one of three possible actions: threaten while secretly positioning its own nuclear submarine, threaten without positioning the submarine, and not threatening. In either case where U threatens, S can respond with a pre-emptive strike or not. Formulate appropriate payoffs for U and S and represent this situation as an extensive form game.