Experimental Economics I: Behavioral Game Theory Homework (18S)

For BGT4

1. **Unstructured bargaining game** (Roth and Malouf, Psych Rev 1979): Two players bargain over 100 lottery tickets, each representing 1% chance of winning a prize. In one treatment, the prize is \$1 for both players, while player 1 and 2 earn \$1.25 and \$3.75, respectively, in the other treatment.
   a. Show that in both case, 50-50 satisfies the four axioms of the Nash bargaining solution: Pareto Optimality, Symmetry, Independence of Irrelevant Alternatives (IIA), and Independence from affine utility transformation.
   b. Explain how players' risk attitude would affect their behavior (assuming they can reduce compound lotteries.
   c. Would showing players their opponent's prize affect the experimental results? Why or why not?
2. **Nash demand game**: Two players each state their demand x_1, x_2 (between 0 and 100), and are paid accordingly if $x_1 + x_2 \leq 100$. Otherwise, they both earn 0.
   a. What is the Nash equilibrium of this game?
   b. Suppose players can instead only state either $(x_1, x_2) = (50, 50)$ or $(x_1, x_2) = (h, 100 - h)$. What is the mixed-strategy equilibrium of this game? What is the equilibrium disagreement rate?
3. **2-period bargaining game**: Player 1 offers how to split a pie of \$100 with player 2; player 2 can accept the offer (and split accordingly), or reject it. If player 2 rejects, the pie shrinks to \$25 and player 2 gets to offer how to split it with player 1. Player 1 can accept the offer (split accordingly), or reject it (both earn zero).
   a. What is the Nash equilibrium of the subgame after player 2 rejects?
   b. What is the subgame perfect Nash equilibrium of this game?
4. **Random termination bargaining game**: Player 1 and player 2 alternative between making offers to split \$30, which the other player can either accept (split accordingly) or reject (go to the next round).
   a. First assume that there is a chance $(1 - p)$ that the game ends if an offer is rejected, so the continuation probability is p. Show that the subgame perfect Nash equilibrium for $p = 0.90$, 2/3, and 1/6 involves accepting first-round offers of 14.21, 12, and 4.29, respectively.
   b. Now assume that there is a fixed cost of \$0.20 and \$3 for player 1 and 2, respectively. What is the subgame perfect Nash equilibrium of this game?