

ECON 321, Assignment 6: BP, Chapter 3: 3.4 and 3.5

1. Read 3.4.
2. Use Mathematica to set up the following very simple Bertrand model. Demand is

$$q_1(p_1, p_2) = 7 - 2p_1 + p_2 \quad q_2(p_1, p_2) = 7 - 2p_2 + p_1$$

Costs are $c_1 = c_2 = 1$ (symmetric, constant marginal cost equal to 1).

Make the profit functions. Take the first order conditions for both firms. (You can do this very quickly by editing the notebook for assignment 4.)

3. Now, take the cross-partial derivatives. You can do this by taking the derivative of the left-hand-side of firm 1's first order conditions with respect to p_2 and vice versa for firm 2. These evaluate to numbers.

4. Read 3.5.

5. Go back to the first order conditions from part 2. In the first order condition for firm 2, there should be a term $2(p_2 - 1)$. Change it manually to $(2 + \lambda)(p_2 - 1)$. (You can type a λ in Mathematica by hitting escape, then l, then escape.)

6. Find the Bertrand-Nash equilibrium using the original first order condition for firm 1 and the modified one for firm 2.

7. Plot the profits of firm 1 and of firm 2 for the cases of λ varying from -0.5 to $+0.5$.