Statistics and Prediction

Assignment 1

Due date: March 11, 2020 (Before class)

Submission method: Please submit your assignment to me via E-mail: sherryecon@qq.com.

Other requirements:

1. Please use English to answer the questions.

2. Your assignment should be in **pdf** format.

3. The title of your submission email should be "Assignment 1 - your student ID - your name", for example, "Assignment 1 - 201901010101 - Zhang, San"

Please answer the following questions in Chapter 6 of *Bounded Rationality and Industrial Organization* (Spiegler, 2011).

Exercise 6.1 (p.83) The basic model in Subsection 6.2

Let $n = 2$. Modify the model by letting the success rate of firm 2 be $\alpha_2 > \alpha = \alpha_1 = \alpha_0$.

1. Derive the firms' Nash equilibrium profits. Show that firm 1's profit is independent of α_2. (Hint: When the two firms have different success rates, their equilibrium pricing strategies have the same support, but firm 2's cdf has an atom on $p = 1$.)

2. Suppose that in a stage prior to the price competition game, firms choose their success rates simultaneously and at no cost. Which profiles of success rates are consistent with sub-game perfect equilibrium in this two-stage game?

Exercise 6.2 (p.86) Spurious Product Differentiation in Subsection 6.3

Construct an asymmetric mixed-strategy Nash equilibrium when $n > m$ and both n and m are even.

Exercise 6.3 (p.86) Spurious Product Differentiation in Subsection 6.3

Let $A = \{a_1, a_2\}$. Assume that with probability α (or $(1-\alpha)$) the action a_1 (or a_2) alone satisfies the consumer's need. Assume $\alpha > \frac{1}{2}$. Consider a symmetric Nash equilibrium

in which firms randomize over prices and recommendations independently. What is the equilibrium probability that the sub-optimal action a_2 is recommended? What happens to this probability as n tends to infinity?