

COMP34612: Computational Game Theory

- Group project (Coursework)

Overview

Your task is to make a program which plays repeated 2-person Stackelberg pricing games as the leader under imperfect information.

Specifications about the leader:

Suppose that the leader's strategy (i.e., price) is u_L and the follower's strategy (i.e., price) is u_F , then the detailed specifications about the leader are given as follows:

- Unit cost: $c_L = £1.00$
- Strategy space: $U_L = [1.00, +\infty)$
- Demand Model (i.e., price-sale relationship): $S_L(u_L, u_F) = 2 - u_L + 0.3u_F$
- Daily Profit: $(u_L - c_L)S_L(u_L, u_F)$
- The leader has no information about the follower's strategy space and payoff function but there are a set of historical data (100 days) being provided by the game platform
- The leader's objective of playing is to maximise his accumulated profit for the next 30 days
- For the simplicity, it is assumed that the leader's unit cost, the strategy space, and the demand model are unchanged during the whole period (130 days).

Rules of playing:

At day t , the leader will announce his price $u_L(t)$ first; Knowing the leader's price, the follower will choose his responding price $u_F(t)$, where $t = 1, 2, \dots, 130$, in which $t = 1, 2, \dots, 100$ are for historical data, whereas $t = 101, 102, \dots, 130$ are the days when the game is going to play repeatedly.

Game playing scenarios:

The leader (i.e., your program) is going to play three separated games in which a different competitor (i.e., the follower) is to be faced. The three different followers are called MK1, MK2, and MK3 respectively. In each of the repeated game, the leader chooses his learning method and strategy to play

based on the provided set of historical data. Then each day during the playing period (i.e., the next 30 days or $t = 101, 102, \dots, 130$), the leader will send his price $u_L(t)$ to the game platform, and the follower will give his response $u_F(t)$. After receiving the follower's responding price $u_F(t)$ from the game platform, the leader can use this piece of information to update his knowledge and decide his price of the next day. In the other words, the leader (i.e., your program) should be able to take the follower's price of the previous day from the game platform for updating, and then decide and send his price of the next day to the game platform.

It should be emphasised that the follower's strategy and payoff function is subject to the changing and time varying environment (that is, the parameters in the follower's payoff function are not the same every day).

Schedule

- **Week 7 (from 21 March):** Start to work on your project and project planning
- **Week 11 (9 May – 13 May):** Group presentations telling us what you have done.
- **6:00pm on 13th May:** Deadline to submit codes and support document.

Getting help

Project support sessions are at every Thursday 4:00-5:00pm between weeks 7-10 in Simon Theatre A, when you can come to ask any question and support you need for the project. But you do not have to come if you do not have questions.

You are also welcomed to ask any questions by email.

Assessment

This project counts 50% of your final mark and the final examination counts another 50%. The distribution of the project mark is as follows:

1. 50% comes from the content of the approach (40% based on your presentation in week 11 and 10% based on the written materials you put in your group journal in Blackboard). The content of the approach includes how good was the idea, how well-informed by the content of the course, outside literature, etc.
2. 50% comes from the performance of the approach – how well does it play (i.e., the accumulated profit by running your submitted codes)
3. The group mark will be distributed to the members of the group using: self-assessment and demonstration of knowledge during the presentation.

The presentation

During the presentation week of Semester 2, all groups will make a presentation to the lecturers. It is important that every member of the group speak and answer questions, so we can gauge the contributions of the members of the group. None of the marking will be based on presentation skills, so you need not make a polished presentation. The assessment is entirely on content: what your group did and what you learned from doing it.

Submission

Submission will be through Blackboard and the details will be sent to you later.

Game Platform and Resources

The game platform and detailed explanation (Readme.txt) can be found on Blackboard

../COMP34612/CourseContent/Project/ProjectSourceCode