EE481: Industrial Economics

Game Theory (Dynamic Game)

Dr. Wanwiphang Manachotphong

Department of Economics, Thammasat University

24 August 2012

Dynamic vs. Static

- Static Game = One-shot game. No player can observe the others' decisions.
- Dynamic Game = ...
  - Repeated Game
    - ....
    - ....
  - Sequential Game

Finitely Repeated Games

- Actions are taken and payoffs are received over and over again.
- Increase a possibility to enforce an agreement (firms compete in more than 1 period).

Example: Price-fixing Game

		Firm 2: Cooperate	Firm 2: Defect
Firm 1	Cooperate		
	Defect		

Payoff (Firm 1, Firm 2)

- Suppose this game is played repeatedly for 20 periods.
- What now would be each player's strategy?

Finitely Repeated Games

- Finite number of repetitions
  - ...
- Suppose firm1 and firm2 successfully cooperate until period 19, what would happen in period 20 (last period)?
  - ...
- If both would defect in the last period, what benefit there would be to cooperate in the next-to-last period?
  - ...
- Use the same rational back to the first period.
  - ...
  - Cooperate would never be choosen!

Infinitely Repeated Games ($T = \infty$)

- In the real world, we see that firms sometimes cooperate, sometimes defect.
  - Needs to find a better model to explain the situation.
- Infinitely repeated game
  - ...
- Infinitely repeated game allows us to predict that firms would cooperate.

Infinitely Repeated Games (Strategies)

Grim Strategy

1. Start by choosing "cooperate".
2. ..

Tit-for-Tat

1. Start by choosing "cooperate".
2. ..

Infinitely Repeated Games (In Practice)

Grim Strategy and Tit-for-Tat in Practice

- Could work in practice, although firms don't compete infinitely (there is an end at some point)
- This is because

1. There is uncertainty about when the game would end
2. _____. So, would not be able to work out that if they compete for a finite number of periods, it is rational to just cheat from the first period.

- But if there are too many firms, Grim Strategy and Tit-for-Tat would be _____ to enforce.

Infinitely Repeated Games (In Practice)

When do firms defect??

- Rotemberg and Saloner (1986) - during boom.
- Green and Porter (1984) - during recession.

Sequential Games

- Sequential games =

The **extensive form** representation of a sequential game identifies:

1. Identity of each player
2. ..
3. Choices and actions available to each player
4. Information (history of the game)
5. Payoffs (all possible outcomes)

A Simple Sequential Game

Non-Credible Threats (Empty Threats)

- A non-credible threat is a threat that would never happen if the firm is rational.

Decribing NE

- In a sequential game, NE is not strong enough to rule out unreasonable equilibria.
- Let's write down all the NE in this game.

Backward Induction and SPNE

- We can use "backward induction" to find only reasonable equilibrium (equilibria) of the game.
- The equilibrium found would be called a Subgame Perfect Nash Equilibrium (SPNE). For SPNE, the solution to every subgame is a Nash Equilibrium.

Decribing SPNE

Entry Deterrence Example

Reference and Further Reading I


Carlton, D.W. and J.M., Perloff.
Modern Industrial Organization. 4th Edition.
Pearson Addison Wesley Press, 2005.


Pindyck, R.S. and D.L., Rubinfeld.
Microeconomics. International Edition.
Pearson Education Press, 2001.


Rasmusen, E. Games and Information: An Introduction to Game Theory. 4th Edution. Blackwell Publishing, 2007.


Green, E.J., and R.H. Porter. Noncooperative Collusion Under Imperfect Price Information. Econometrica Vol.52, No.1, 1984.


Porter, R.H. A Study of Cartel Stability: The Joint Executive Committee, 1880-1886. The Bell Journal of Economics Vol.14, No.2, 1983.


Rotemberg, J. J., and G.Saloner. A Supergame-Theoretic Model of Price Wars During Booms. The American Economic Review Vol.70, No.3, 1986.