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DYNAMIC GAME

STATIC GAME : ONE-SHOT GAME. PLAYERS MEET ONCE.
NO PLAYER CAN OBSERVE THE OTHERS' ACTIONS
B/F HE/SHE CHOOSES ACTION.

DYNAMIC GAME : MULTI-PERIOD GAME. PLAYERS MEET AND PLAY
MORE THAN ONE TIME. PLAYER CAN OBSERVE
WHAT OTHERS DO B/F HE/SHE CHOOSES ACTION

- FINITELY REPEATED GAME
- INFINITELY REPEATED GAME

FINITELY REPEATED GAMES

		FIRM 2 COOPERATE	FIRM 2 DEFECT
FIRM 1	COOPERATE	3, 3	0, 4
	DEFECT	4, 0	1, 1

PAYOFF (FIRM 1, FIRM 2)

SUPPOSE THEY PLAY THIS GAME FOR 10 PERIODS.

Q: CAN COOPERATION EMERGE ?

Q: WHAT WOULD BE EACH PLAYER'S OPTIMAL STRATEGY ?

BY USING BACKWARD INDUCTION, FINITELY REPEATED PLAY WILL NOT FACILITATE COOPERATION !

THEREFORE, THIS FEATURE OF FINITELY REPEATED GAME MAY NOT BE REALISTIC WHEN WE THINK ABOUT ~~REA~~ REALITY :

FIRMS SOMETIMES COOPERATE, SOMETIMES DEFECT.

INFINITELY REPEATED GAME (NO END PERIOD)

PREDICTION BY THIS SETTING : UNDER A CERTAIN CONDITION, FIRMS MAY COOPERATE (= COLLUDE)

GRIM STRATEGY :
- START BY "COOPERATE"
- CONTINUE TO COOPERATE UNLESS SOME PLAYERS HAS CHOSEN "DEFECT". IF "DEFECT" OCCURS AND DETECTED, CHOOSE "DEFECT" FOREVER !

TIT-FOR-TAT STRATEGY :
- START BY USING "COOPERATE"
- THEREAFTER, IN PERIOD t, CHOOSE THE ACTION THAT THE OTHER HAS CHOSEN IN PERIOD $t-1$.

SEQUENTIAL GAME : PLAYER 1 MOVES FIRST AND PLAYER 2 MOVES SECOND

WE USE "GAME TREE" TO REPRESENT
(EXTENSIVE FORM)

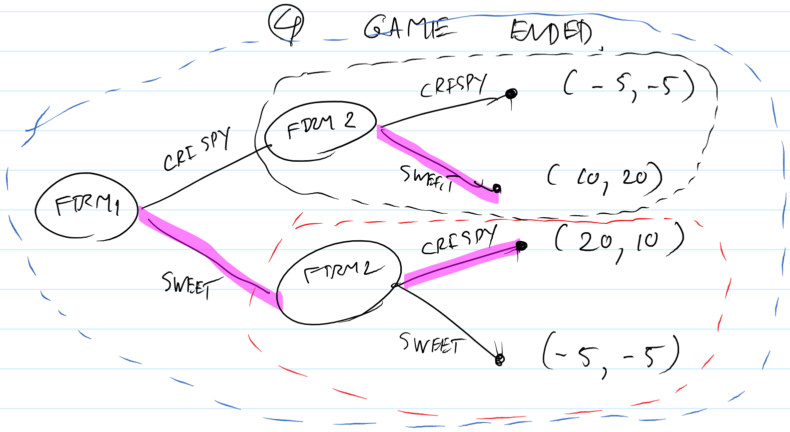
TIMING OF EVENTS

① FIRM 1 CHOOSES ITS ACTION FIRST

② FIRM 2 OBSERVES THE ACTION THAT FIRM 1 HAS CHOSEN.

③ PAYOFFS REALIZED

④ GAME ENDED.



WE USE "BACKWARD INDUCTION"

SPNE : SUBGAME PERFECT NASH EQUILIBRIUM

- EQUILIBRIUM : { SWEET, (SWEET, CRISPY) }
- FIRST-MOVER ADVANTAGE APPEARS IN THIS GAME SETTING
- THREATS
  - CREDIBLE (BURNING-THE-BRIDGE STRATEGY)
  - NON-CREDIBLE (EMPTY THREATS)

A MODEL OF REPEATED OLIGOPOLY

- REPEATED GAME IS ALSO CALLED "SUPERGAME."
- SUPPOSE FIRMS COMPETE INFINITELY.
- PRESENT VALUE (PV OR V) OF THE STREAM OF PROFITS FOR FIRM i IS

$$V_i = \pi_{i0} + \underbrace{\delta}_{\text{DISCOUNT FACTOR}} \pi_{i1} + \delta^2 \pi_{i2} + \dots \delta^{\infty} \pi_{i\infty}$$

$$= \sum_{t=0}^{\infty} \pi_{it} \cdot \delta^t$$

FIRM i CAN DO 3 OPTIONS :

(1) GIVEN OTHERS COLLUDE, FIRM i COLLUDES

SO, $\pi_i = \pi^*$

(2) GIVEN OTHERS COLLUDE, FIRM i CHEATS

SO, $\pi_i = \pi^{CH}$

(3) ALL FIRMS CANNOT COOPERATE AND THEY HAVE TO PRODUCE ACCORDING TO COURNOT EQUILIBRIUM.

SO, $\pi_i = \pi^{CN}$

OBSERVE THAT $\underset{\text{(CHEATING)}}{\pi^{CH}} > \underset{\text{(CARTEL)}}{\pi^*} > \underset{\text{(COURNOT)}}{\pi^{CN}}$

Q: UNDER WHICH CONDITION, COLLUSION IS SUSTAINED?

OF COURSE, IF $\pi^* > \pi^{CH}$, COLLUSION IS SUSTAINED!

<u>SUPPOSE</u> FIRMS PLAY A GRIM STRATEGY: COLLUDE UNTIL ONE FIRM CHEATS.

THEN, NOT COLLUDE

(= PLAY COURNOT QUANTITY FOREVER)

- PV OF COLLUSION THAT FIRM i WOULD OBTAIN

$$PV_i^* = \pi_i^* + \delta \pi_i^* + \delta^2 \pi_i^* + \dots + \delta^\infty \pi_i^*$$

$$= \frac{\pi_i^*}{(1-\delta)}$$

- PV WHEN FIRM i CHEATS:

$$PV_i^{CH} = \pi_i^{CH} + \delta \pi_i^{CN} + \delta^2 \pi_i^{CN} + \dots \delta^\infty \pi_i^{CN}$$

$$= \pi_i^{CH} +$$