

Game theory

- ① Signaling → Beer Quish game - Bully - weak (Principle agent)
 ↓ observed: what drink
 sequential unobserved: type
 incomplete info, since only main guy knows his type

⊕ Cost of Bulking & entering by other

- extensive form → normal form [on type]

Conditioning on observed action

$$\pi(\text{action/nature}) = \frac{\text{prob}(\text{nature}|\text{action}) \times \text{prob}(\text{action})}{p(\text{nature})}$$

dot line → information set ⇒ ☒ Subgame equil

Things don't know ← where you are → which table

$$\alpha p(\text{action}|\text{nature}) = \frac{p(\text{nature})}{p}$$

$$U(\text{enter}) = p(1) + (1-p)(q(-1) + (1-q)(1))$$

- ② auction: - not know private valuation (info asymmetry)
 - bid lower than valuation

$$U[P, E|X] = P \cdot (X - E) \begin{cases} \text{expected bid} \\ \text{your valuation} \\ \text{probability of winning} \end{cases}$$

- envelop theorem $U^*(x) = U_x[P^*(x), E^*(x)|x] = P^*(x)$
 - Revenue equivalence: no correl b/w what you do and what others do

2SLS reg exp

- ① Correctly specified model ② Equal error variance of all variable
 ③ normally distributed error term ④ removed outlier
 ⑤ independent observations

- Type selected by nature Common prior - Action - decision → Signal dynamic game

- ① Subgame equilibrium: move equil
 ② Nash equilibrium: best resp. rationality
 ③ Extensive form
 ④ repeated game
 ⑤ incomplete info: repeated (PBE)
 ⑥ perfect Bayesian equilibrium → time structure

- uncredible threat, implausible ⑦ Continuation (Subgame) where info set

- Don't know which subnode ⇒ form belief (located?) not see move

- update belief (posterior as result of action)

- sequential Rationality ① Complete/incomplete info

no common knowledge of all players ② perfect/imperfect info prior type

Game being played: payoff type, move's possible outcomes what opponent knows how

- off equilibrium strategies don't know which node

- perfect Bayesian equilibrium (s, p) → beliefs (prob. of reaching specific node)

- strategy profile: full contingent plan

- iterative, perturb (Trembling hand) → converge } Cooperation secret

- ① pooling equilibrium: two players select same action
 ② separating equilibrium: other action for different player
 ③ semi separate equilibrium: mixed strategy

- out of sample estimates - Social utility model
 - Fairness/Bargaining - Dynamic game with incomplete information
 - Cooperative game theory → assume everybody cooperates

- Action strategies payoff - Start: set of propositions
 - Bargaining game Nash demand game match → both gain

- sequential after bargaining ① ultimatum game

- discount → (time) shrink cake → Backward induction

δp - Subgame equilibrium - Counter offer - leverage
 3 three round: $\delta^3 p(1 - \delta^2)$ Patience

- Risk - chicken → Nach - different machineries

time → Rubenstein

- Regularity / First mover advantage
 pecuniary Equilibrium deviate (monies)

discount rate effect

- Social preference - robustness of model

$$u_i(v_i, c) = c(\sigma - \frac{b_i}{2}(\sigma - \frac{1}{2})^2) \text{ if } \sigma < \frac{1}{2}$$

$c \cdot \sigma$ if $\sigma \geq \frac{1}{2}$ weight of loss

→ asymmetric loss function

Care about fairness when it is against them

- share of cake that makes me indifferent

Fie = p's i will accept the offer of δ or more ultimatum game

- Learning → dispersion → Converge → shrink error term

- move → logistic function (Coefficient certainty)

learn from getting rejected - pull back

learn distribution then backward induction

- Fehr schmidt → linear loss func - easier fit

Care about dist. equilibrium in boundaries

- 3 person ultimatum → Third person review amount agreed by first two

- point of reference ERC → Care about fairness is self centered

Pricing

- value based pricing - Consistent price

- bullwhip effect

- deep discounting

- Competitor belief

- Game theory

→ response of Competitor (chicken & egg)

- simultaneous decision

- market entry

- Competition effect on pricing

elements: ① timing of actions

② number of periods (single action)

- a fleet of actions & rewards for late periods

- no private info = Common knowledge

- Rational → pricing decision for profit max (put in shoes)

- infinite hierarchy of beliefs about strategies of the game

- Best response: strategy (or "set") that maximizes payoff given the strategies of the other players

- dominant strategy: if optimal, no matter what strategy is used by the other player [no reason to unilaterally change mind]

Nash Equilibrium

↔ Best response

- playing repeatedly

- pure strategy

- mix strategy: probability dist. over set of pure strategy

→ advantage of writing parametric form rather than explicit specification: derivative & maximization without loss generality

payoff (Start monopoly & go down)

	Player		→ strategy
	S1	S2	
Player	Pay off	Pay off	
	Pay off	Pay off	

strategy profile:

→ Collection of Player strategy

↗ relationship

- info available for each player (e.g. avail. strategy for other player)

- Bayesian game incomplete info

uncertainty, probability, private info

- two choice < price high
price low

- unit Contribution margin

- same price split

- size of segment of } High P. purchase

- no discrim other price

- sufficient manufact. possible

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Entry, exit, deterrence

- Pure bundling - incumbent - slightly undercut
- two independent dimension (hotelling) - deter entry $\beta_1/\beta_2/p_e$
- 3 stage game: ① write contract with buyer ② entrant arrives observe cost c_e ③ entrant makes price offer to the buyer $\{p, p_0\}$
- Good comes with ① some quality ② some quantity \rightarrow widget
 - Contract Price \rightarrow penalty
- Benchmark: integrated structure (incumbent/buyer)
- probability of entry ϕ - accept it $\hat{p} + p_0 \leq p$
- non negative profit assumption $\rightarrow \phi = P(c_e \leq p - p_0)$
- Contract as entry deterrence (barrier to entry)

Pricing under asymmetric information

- ① $t=1$: info - differentiated duopoly
- ② $t=2$: pricing - incomplete info about cost of rival
- expected cost - ex ante - ex post $c_i \in \{c_i^L, c_i^H\}$
- of other firm - Reaction function (expected R.F.)
- firm's price - not allow signal
- structure - signal high cost or low cost through price
- deviation

Ozer, Zheng, Ren 2012

- heterogeneity - china, us - build trust
- credible information - cultural, institutional
- information sharing (credible)
- incentive to manipulate forecast
- overoptimistic forecast - pecuniary incentive
↓
repeated interaction
- Country of origin
- Experimental framework - inflate forecast twice
- Social preference
- cheap talk

Ozer, Zheng, Chen 2011

- cheap talk
- cooperate (trust & trustworthiness)
- trust → forecast info sharing
 - (i) how ^{will} affected by supply chain env
 - (ii) how will affect related operational decisions