1.5.6 The Ultimatum Game

- Your daughter, Maggie, asks for your sage advice.
- She has agreed to participate in a lab experiment.
- The experiment is two-player bargaining, with Maggie as Player 1.
- She is to be given $10, and will be asked to divide it between herself and Player 2, whose identity is unknown to her.
- Maggie must make Player 2 an offer,
- Then Player 2 can either:
  - — accept the offer, in which case he will receive whatever Maggie offered him, or
  - — he can reject, in which case neither player receives anything.
- How much should she offer?
- Distinguish ① *the rationalist's answer* from ② *the likely agreement* in practice from ③ *the just agreement.*

The rationalist:

- Player 1 should offer Player 2 5¢ (the smallest coin).
- Player 2 will accept, since 5¢ is better than nothing.

- But offering only 5¢ seems risky, since, if Player 2 is insulted, it would cost him only 5¢ to reject it.
- Maybe Maggie should offer more. But how much more?

A real-world example:

- At a local motel in a small town, a few times a year (graduations, local festivals etc.) there is enormous demand for rooms.
- (On graduation weekends, for instance, some parents stay in hotels as much as 80 km away.)
- The usual price for a room in his motel is $95 a night. Normal practice in town is to retain the usual rates, but insist on a three-night minimum stay.
- The motel owner estimates he could easily fill the motel for graduation weekends at a rate of $280 a night, while retaining the three-night minimum stay.
- But there is a risk of being labelled a “gouger”, which could damage regular business.
- What should he do?

1.5.7 Negotiating with a Deadline

Players and game:

Mortimer and Hotspur are to divide $100 between themselves. Each knows that the game has the following structure:

Stage 1:

- Mortimer proposes how much of the $100 he gets. Then
- *either* Hotspur accepts it, and the game ends and Hotspur receives the remainder of the $100;
- *or* Hotspur rejects it, and the game continues to . . .

Stage 2:

- The sum to be divided has now shrunk to $90.
- Hotspur makes a proposal for his share of the $90. Then
- *either* Mortimer accepts it and gets the remainder;
- *or* he rejects it, and each receives nothing and the game ends.

What will Mortimer demand at the first stage?

What is the least Mortimer can induce Hotspur to accept?

Mortimer puts himself in Hotspur's shoes, and imagines that the game has reached the second period. Hotspur is now in a strong position. Why? What will Hotspur propose for division of the $90?

Thus, from the perspective of the first stage, Mortimer can predict what Hotspur will do.

Mortimer knows that Hotspur knows that Hotspur can assure himself of (close to) $90 if he, Hotspur, rejects Mortimer's first-stage offer.

Hence Mortimer knows that the least Hotspur will accept in the first round is $90; the best Mortimer can do is demand $10 for himself.

When both players have gone through this line of reasoning, the actual play of the game is straightforward.

Shows the power of a *deadline.*

In reality the rules of the game rarely specify the order of offers (think of the dollar auction). If you get your offer in just before the deadline, then your bargaining partner may have no choice but to accept.

Good bargainers:

- look several moves ahead, by putting themselves in the other's shoes.
- Each bargainer thinks through the other's rational responses to all possible contingencies. (See Thaler, Ch. 3, in *The Winner's Curse*.)

Negotiation with a Deadline

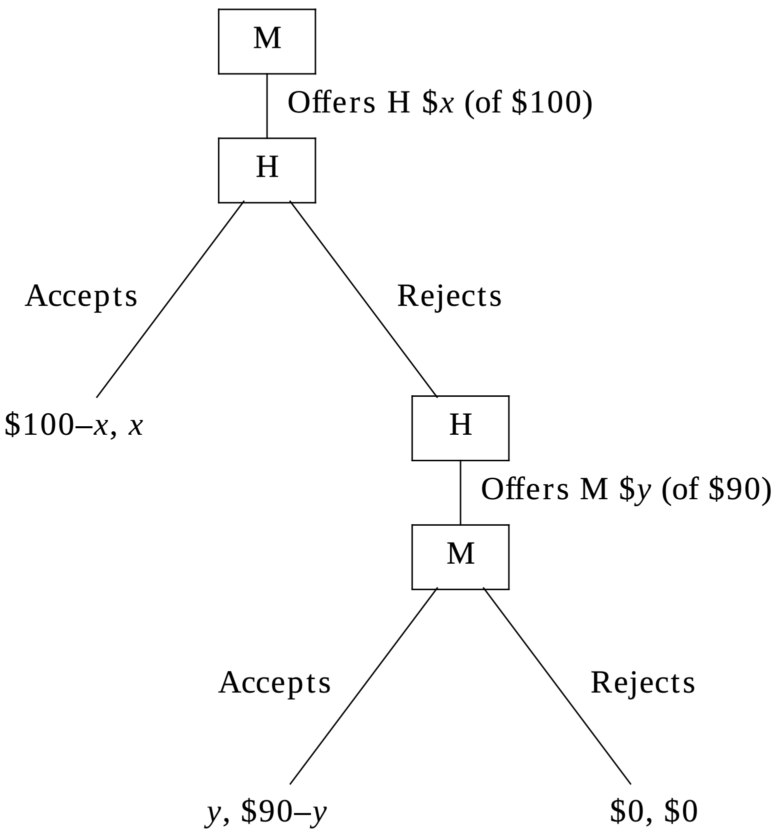


Figure 1. An extensive-form, sequential game (M, H).

What does M. believe?

Introduce: putting oneself in the other's shoes, second-mover advantage, reputation.

1.5.8 The Inheritance Game

The players:

- Elizabeth, an aged mother, wishes to give an heirloom to one of
- her several daughters.

The game:

- E. wants to benefit the daughter who values it most.
- But the daughters may be dishonest: each has an incentive to exaggerate its worth to her.
- so E. devises the following scheme:
  - — asks the daughters to tell her confidentially (i.e. a sealed bid) their values, and
  - — promises to give it to the one who reports the highest value
  - — the highest bidder gets the heirloom, but only pays the second-highest reported valuation.

Will Elizabeth's scheme (a Vickrey[1] auction, or *second-price* auction) make honesty the best policy?

1. The late Bill Vickrey shared the Nobel prize in economics in 1996.

Yes.

Consider your reasoning as one of the daughters:

- three options:

  truthfulness, exaggeration, or understatement.

- The amount you pay is independent of what you say it's worth,
- so the only effect of your report is to determine whether or not you win the heirloom, and hence what you must pay.
- *Exaggeration*: the possibility that you make the highest report when you would not otherwise have, had you been honest.

  i.e., that the second-highest report, the one you now exceed, is higher than your true valuation.

  But → that what you must pay (the second-highest report) is more than what you think the heirloom is worth.

  Exaggeration not in your interest.

- *Understating* changes the outcome only when you would have won with an honest report;

  but now you report a value lower than that of one of your sisters, so you do not win the heirloom.

  Not in your interest either.

So the mother's scheme works, and the truth is obtained—but at a price, to Elizabeth, the Mum.

E. receives a payment less than the successful daughter's valuation,

so this daughter earns a profit:

= her valuation – the 2nd-highest valuation.

= the premium the mother forgoes to induce honesty

Market Analogue ?

Think: how can the neighbours who propose building a park overcome each household's temptation to *free-ride* on the others' efforts by claiming not to care about the park, when contributions should reflect the household's valuation of the park?

How can the users of a satellite be induced to reveal their profits so that the operating cost of the satellite can be divided according to the profit each user earns?

	You're highest	You're not highest	Probability of winning
Exaggerate	>< 0	0	highest
Honest	≥ 0	0	medium
Understated	> 0	0	lowest

The expected value

= the payoff if you win × probability of winning

= (the value to you of winning – the amount you pay) × the probability of winning.

1.5.9 Chicken!

The notorious game of Chicken!, as played by young men in fast cars.

Here "Bomber" and "Alien" are matched.

Chicken!

		Bomber Veer	*Bomber* Straight
Alien	Veer	Blah, Blah	Chicken!, Winner
Alien	Straight	Winner, Chicken!	Death? Death?

TABLE 1. The payoff matrix (Alien, Bomber)

1.6 Concepts Used:

Best response means the player's best action when faced with a particular action of his or her rival

Nash[2] equilibrium is the outcome that results when all players are simultaneously using their best responses to the others' actions;

thus at an equilibrium all players are doing the best they can, given the others' decisions; that is, all are playing their best responses.

If, conversely, the game is *not* at an equilibrium, then at least one of the players could have done better by acting differently.

∴ A Nash equilibrium is self-reinforcing: given that the others don't deviate, no player has any incentive to change his or her strategy.

An **efficient** outcome is an outcome when there exists no other outcome that all players prefer. A Pareto-efficient outcome.

2. John Nash received the Nobel prize in Economics in 1994 for his work done in the early '50s.

1.7 What Have We Learnt?

Rule 1: Look ahead and reason back.

Rule 2: If you have a dominant strategy, then use it.

Rule 3: Eliminate any dominated strategies from consideration, and go on doing so successively.

Rule 4: Look for an equilibrium, a pair of strategies in which each player's action is the best response to the other's.

1.8 Several Simple Interactions

(See Dixit & Nalebuff.)

1.8.1 Basketball (or tennis?) and weak hands

— Does the "hot hand" exist?

— What if Larry was known to have a "hot hand"?

— Then other side's behaviour?

— But Larry's teammates?

— so that Larry's hot hand leads to better *team* performance, although his own performance falls.

— Which of Larry's hands do the other side focus on?

— So Larry's hot hand may warm up his other

— Paradoxically, a better left-handed shot may result in a more effective right-handed shot.

1.8.2 To lead or not to lead

Sailing:

— a reversal of "follow the leader": instead, follow the follower, even if it is clearly pursuing a poor strategy.

— Or play monkey see, monkey do.

— Keynes' comments on the stock market as a "beauty contest": the winner is not whoever chooses the most beautiful contestant, but whoever chooses the contestant chosen by most analysts.

Leading stock-market analysts and economic forecasters have a similar incentive to follow the pack, lest they lose their reputations.

— Newcomers may follow riskier strategies, and occasionally are proven correct.

Consider computers: most innovations have come from small, start-up companies. Also true with stainless-steel razor blades (Wilkinson Sword), and disposable nappies.

How to imitate? Immediately (as in sailing) or later to see how successful the approach is (as in computers)? In business the game is not zero-sum (winner take all) and so the wait is more worthwhile.

1.8.3 Here I stand: I can do no other

— To be known to obstinate or intransigent can be powerful: Martin Luther against the Catholic Church, Charles de Gaulle during the War and after, in influencing the evolution of the EEC.

— One player taking a truly irrevocable position leaves the other parties with just two options: take it or leave it.

— Others denied the opportunity to come back with a counteroffer acceptable.

— But usually the possibility of future negotiations — today's intransigence may be repaid in kind.

— Or others may walk away from the past intransigent.

— A compromise in the short term may prove a better strategy in the long run.

— To achieve the necessary degree of intransigence may be costly: an inflexible personality cannot be turned on and off at will.

— How to achieve selective flexibility? or how to achieve and sustain commitment?

1.8.4 Belling the cat — Who will risk his life to bell the cat?

Whistleblowing:

— How do relatively small armies of occupying powers or tyrants control very large populations for long periods?

— Why is a planeload of people powerless before a single hijacker with a gun?

— Apart from problems of communication and coordination, who will act first? (Khrushchev in 1956)

— The hostages' dilemma?

— The frequent superiority of punishment over reward. (The taxi dispatcher. The eviction of tenants. The sequential bargaining of Japanese electricity companies with Australian coal mines.) The "accordion" effect.

1.8.5 Thin end of the wedge

How is it that gains to the few always seem to get priority over much larger aggregate losses to the many?

— in use of tariffs, quotas, and other protective measures, which raise prices and reduce exports.

— Answer: one case at a time. Myopic decision-makers fail to look ahead and see the whole picture.

— How to develop a system for better long-range strategic vision?

1.8.6 Look before you leap

Many situations are expensive to get out of: a job in a distant city, a computer and its operating system, switching from your frequent-flier airline to another, a marriage.

Once you make a commitment, your bargaining power is weakened.

Strategists who foresee this will use their bargaining power while it exists, before they get into the commitment, typically to gain an up-front payment.

Indeed, such foresight may prevent some people becoming addicted: to heroin, to gambling, to tobacco.

1.8.7 Mix your plays

The value of unpredictability, in sport, in business. How to use the idea of randomised or mixed strategies.

1.8.8 Never give a sucker an even bet

Other people's actions tell us something about what they know, and we should use such information to guide our own action. Of course, if they realised that, they might try to mislead us. (Rothschild.)

1.8.9 Is game theory a danger?

Rationality on the part of the other player may be dominated by pride and irrationality. (Israeli taxi-driver D&N p.26.)

1.9 Gains from Trade

A voluntary exchange creates gains for both parties. The gains from trade arise from differences between buyer and seller:

- in their endowments (possess)
- in their preferences (like)
- in their productive capacities (do)
- in their expectations (believe)
- in their information (know)

Important in negotiation to explore the possibilities for mutual gain. ("win–win")

In the Prisoner's Dilemma and some other games:
the outcome of the game is not efficient—
if both players cooperated, they would both be better off; the Nash equilibrium is not Pareto-optimal or efficient.

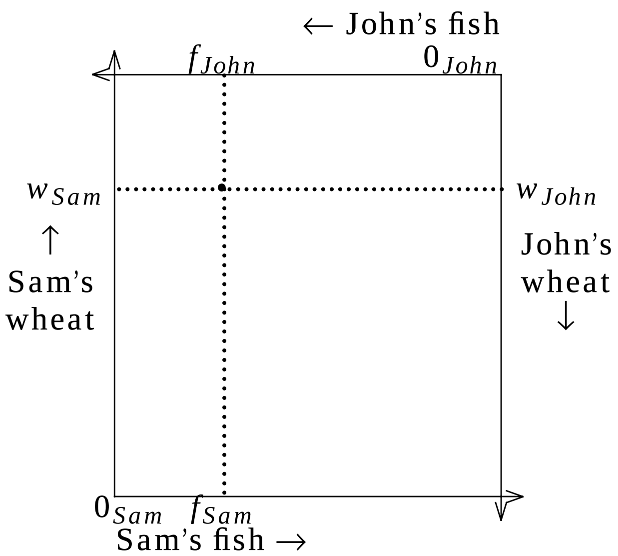
To realise the gains from trade, the players must overcome the game logic. How?

- *contracting* may support cooperation
- *repetition* and the possibility of retaliation may support cooperation, so long as
  - — the discount rate is not so high that future prospects of retaliation are harmless, and
  - — any player's deviation can be observed

But meeting these conditions does not *guarantee* cooperation.

If there is more than one (efficient) equilibrium,
there is still a role for *bargaining* to determine which of these equilibria to achieve,
as in the Battle of the Sexes.

Gains to trade is synonymous with *positive-sum games*,
since at efficient strategy combinations (or Pareto-optimal outcomes) no other combination can make players better off without making at least one player worse off.



An Edgeworth Box

In a strategic interaction, what do we mean by an "equilibrium"?

Where Are We?

1. Strategic interactions.
2. Look forward and reason backwards.
3. Simple games.
4. Pay-off matrix. (strategic or normal form)
5. Dominant strategy;
   iterated dominant strategy.
6. Nash equilibrium.
7. Pure v. mixed strategies.
8. Extensive-form game tree for sequential games.
   (information sets)
9. Bidding in a second-price auction.
10. Efficient (Pareto optimal) outcomes.