Heuristics and Biases

(Tversky and Kahneman 1974)

Heuristics are used to reduce mental effort in decision making, but they may lead to systematic **biases** or errors in judgment.

1. Representativeness heuristic
2. Availability heuristic
3. Anchoring and adjustment
4. Decision framing
5. Prospect theory

1

Representativeness Heuristic

Used to judge membership in a class
Judge similarity to stereotypes

People are insensitive to prior probability of outcomes
They ignore preexisting distribution of categories or base rate frequencies

People are insensitive to sample size
They draw strong inferences from small number of cases

People have a misconception of Chance: Gambler's Fallacy
They see a 'normal' event and think it 'rare':
they think chance will 'correct' a series of 'rare' events

People have a misconception of Regression:
They see a 'rare' event and think it 'normal':
they deny chance as a factor causing extreme outcomes

2

Representativeness Examples (1)

Susan is very shy and withdrawn, invariably helpful, but with little interest in people, or in the world of reality.

A meek and tidy soul, she has a need for order and structure, and a passion for detail.

Is Susan a Librarian, a Teacher, or a Lawyer?

Tversky, Amos, and David Kahneman. 1974. Judgment Under Uncertainty: Heuristics and Biases. *Science* 185:1124-1131.

3

Representativeness Examples (2)

Linda is 31 years old, single, outspoken, and very bright.

She majored in philosophy.

As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in anti-nuclear demonstrations.

Is Linda a Bank Teller?

Is Linda a feminist Bank Teller?

Tversky, Amos, and David Kahneman. 1974. Judgment Under Uncertainty: Heuristics and Biases. *Science* 185:1124-1131.

4

Availability Heuristic

Used to judge likelihood or frequency of event, occurrence

People tend to be biased by information that is easier to recall: they are swayed by information that is vivid, well-publicized, or recent

People tend to be biased by examples that they can easily retrieve: they use these search examples to test hypotheses

People tend to correlate events that occur close together

5

Availability Examples

Consider these pairs of causes of death:

- **Lung Cancer vs Motor Vehicle Accidents**
- **Emphysema vs Homicide**
- **Tuberculosis vs Fire and Flames**

From each pair, choose the one you think causes more deaths in the US each year.

Causes of Death	People's Choice	Annual US Totals	Newspaper Reports/Year
Lung Cancer	43%	140,000	3
Vehicle Accidents	57%	46,000	127
Emphysema	45%	22,000	1
Homicides	55%	19,000	264
Tuberculosis	23%	4,000	0
Fire and Flames	77%	7,000	24

(Combs & Slovic 1979, see also Kristiansen 1983)

6

Anchoring and Adjustment

Used to estimate value or size of quantity
Start from initial value and adjust to final estimate

People are influenced by an initial anchor value
anchor may be unreliable, irrelevant
adjustment is often insufficient

People overestimate probability of conjunctive events
People underestimate probability of disjunctive events

Anchors may be qualitative:
people form initial impressions that persist and are hard to change

Tversky, Amos, and David Kahneman. 1974. Judgment Under Uncertainty: Heuristics and Biases. *Science* 185:1124-1131.

7

Anchoring Example

Real estate agents

All inspected house

Given 10-page information pack: features, footage, prices of other houses in area, …

Given asking price =	**$119,900**	**Given asking price =**	**$149,900**
Predicted		**Predicted**	
Appraisal value =	**$114,204**	**Appraisal value =**	**$128,754**
Listing price =	**$117,745**	**Listing price =**	**$130,981**
Purchase price =	**$111,454**	**Purchase price =**	**$127,318**
Lowest acceptable offer =	**$111,136**	**Lowest acceptable offer =**	**$123,818**

Changed asking prices swayed valuations 11-14%

Effects of asking price remarkably large,
given that so much other information on the house was given.

(Northcraft and Neale 1987)

8

Bayesian Example (1)

Probability of disease in population is 0.5%

10,000 tests are done each year

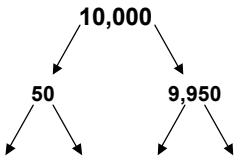
Test is 98% accurate

You tested positive

What is your chance of actually having the disease?

9

Bayesian Example (2)



10

Framing Example (1)

A rare disease has broken out, which is expected to kill 600 people. There are two possible programs to combat it, but they cannot both be used. The consequences of each are known:

A. 200 saved with certainty

B. 600 saved with a probability of .33

Which would you choose? Why?

A rare disease has broken out, which is expected to kill 600 people. There are two possible programs to combat it, but they cannot both be used. The consequences of each are known:

A. 400 die for certain

B. 600 die with a probability of .67

Which would you choose? Why?

11

Framing Example (2)

Which would you choose:

A. Sure gain of $10,000

B. 50% chance of getting $20,000

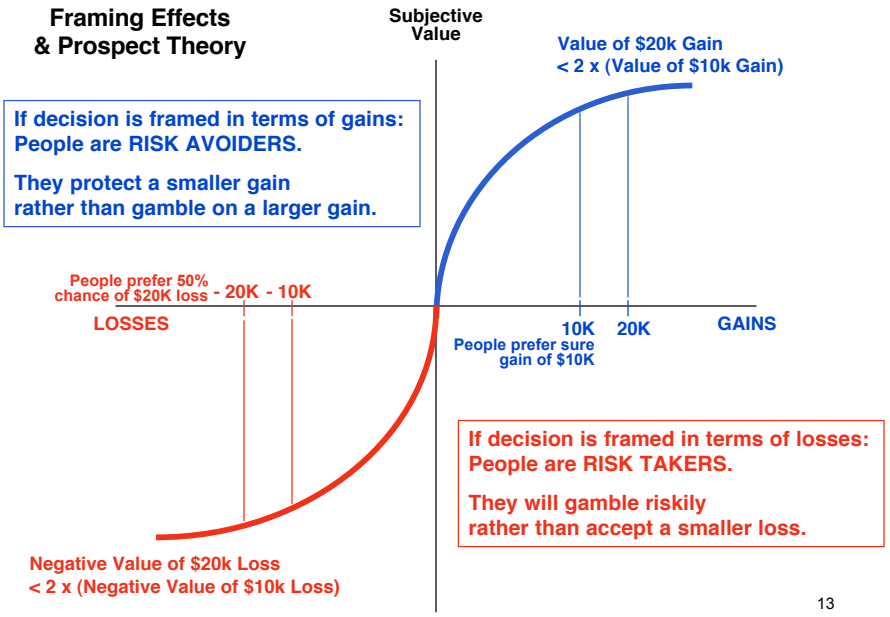
Which would you choose:

A. Sure loss of $10,000

B. 50% chance of losing $20,000

12

Framing Effects & Prospect Theory



13

Prospect Theory

Weighting Function

People regard extremely probable events as certain and extremely improbable events as impossible

Events that are very probable (but not extremely so) are given too little weight

Events that are very improbable (but not extremely so) are given too much weight

Value Function

For value levels above the reference point, the value function is concave downward
--> For gains, people are risk avoiders

For value levels below the reference point, the value function is concave upward
--> For losses, people are risk lovers

(Kahneman & Tversky 1979, 1992)

14

Custody Case (1)

Imagine that you are serving on the jury of an only-child custody case following a messy divorce. The facts of the case are complicated by ambiguous economic, social, and emotional considerations, and you choose to base your decision entirely on the following observations. To which parent would you AWARD custody of the child?

Parent A	Parent B
Average income	Above average income
Average health	Minor health problems
Average working hours	Lots of work-related travel
Stable social life	Extremely active social life
Reasonable rapport with child	Very close relationship with child

15

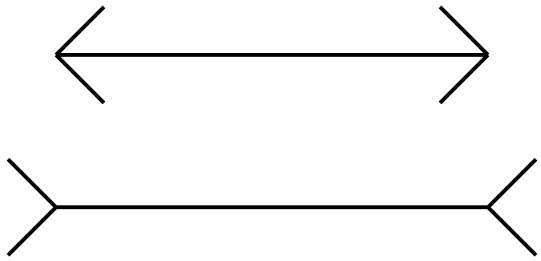
Custody Case (2)

Imagine that you are serving on the jury of an only-child custody case following a messy divorce. The facts of the case are complicated by ambiguous economic, social, and emotional considerations, and you choose to base your decision entirely on the following observations. To which parent would you DENY custody of the child?

Parent A	Parent B
Average income	Above average income
Average health	Minor health problems
Average working hours	Lots of work-related travel
Stable social life	Extremely active social life
Reasonable rapport with child	Very close relationship with child

16

The Value of a Good Frame



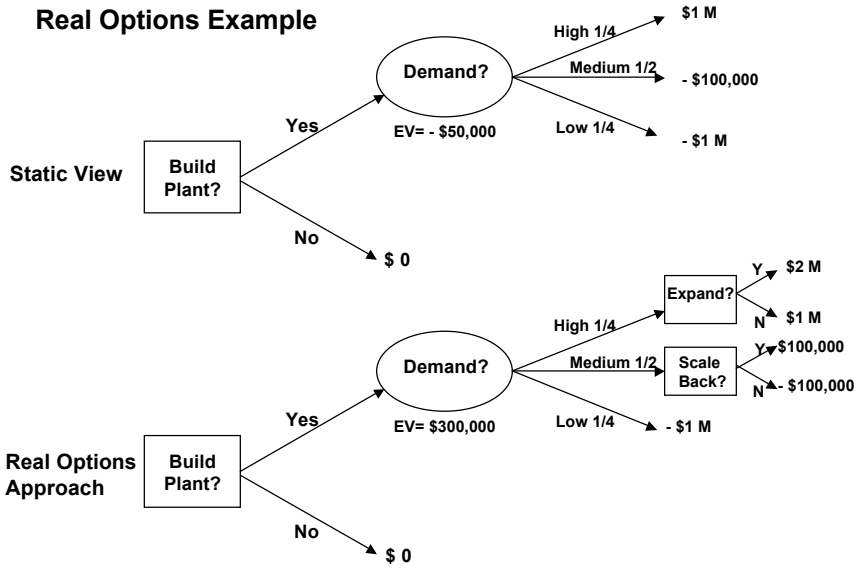
17

Guarding Against Biases

- **Be aware of cognitive biases**
- **Adopt multiple perspectives**
- **Act as Devil's Advocate**
  Question assumptions, check inferences
- **Consider the improbable or the unpopular**
- **Make incremental decisions**
  Collect feedback, use real options approach
- **Use probability and statistics**
- **Use frameworks and models**
  Derived from theory or developed by experts

18

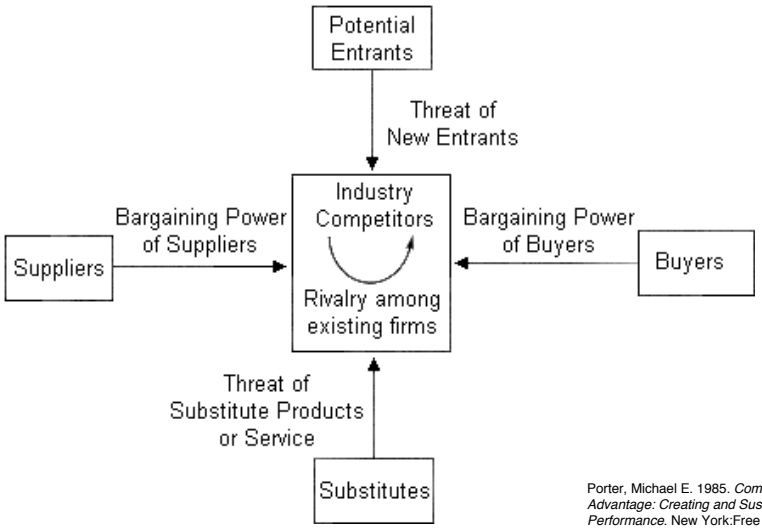
Real Options Example



Russo, J. Edward, and Paul J. H. Schoemaker. 2002. *Winning Decisions: Getting It Right the First Time.* New York: Doubleday.

19

Industry Competitiveness Model



Porter, Michael E. 1985. *Competitive Advantage: Creating and Sustaining Superior Performance.* New York:Free Press.

20