Decision Making and Behavioral Economics

Purdue Executive MBA Programs’ Visiting Associate Professor of Management
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Krannert Executive Education Programs’ Continuing Education Webinar Series
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My Background

• Diploma (M.A.) in Psychology, University of Mannheim
• Ph.D. in Mathematical Psychology, University of Southern California
• Continuing Lecturer, Paul Merage School of Business, UC Irvine
• Visiting Associate Professor at Krannert
Overview

• Introduction
• Decision Analysis
• Psychology of Decision Making
• Behavioral Economics
• Wrap-Up
Ubiquity of Decision Making

• We make decisions all the time

• Do we know how to make them WELL????
“... decision-making that has been the critical core of my professional life, both on Wall Street and in government. ... life is about making choices ...

...most people give very little serious consideration to how to make decisions.”

(Robert Rubin)
Decision Making

• Decisions are **opportunities** not problems

• Some decisions are very **difficult** and have significant consequences

• Decision making is a **skill**

• Actually, it’s a very important skill that should be an integral part of **education**
What Makes Decisions Difficult?

- Complexity
- Multiple conflicting objectives
- Uncertainties and risks
- Multiple stakeholders
- Psychology, egos, emotions, politics, ...
Rational Decision Making
(Economics, Probability Theory)

Smart Decision Making
(Decision Analysis)

Actual Decision Making
(Psychology)
What makes a **GOOD** decision???
What Makes a Good Decision?

• Most common answers emphasize the quality of the outcome
• But the question was about the quality of the decision and the quality of the process of how it was made
• These are separate issues
• Good decisions can lead to bad outcomes, bad decisions can lead to good outcomes
• Luck can reinforce bad decision making habits
Good Decision Making Habits

• Recognize the difference between the quality of a decision and the quality of the outcome

• Are based on a **systematic process** to analyze a decision situation

• View **not making a decision** as a decision (which has consequences)

• Are based on a vocabulary, models and tools
The Elements of a Decision

- Decision Maker
- Context

Decisions (Alternatives) → Uncertainties (Events) → Outcomes (Consequences) → Values and Objectives
Modeling Preferences
<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
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Multi-Attribute Utility Models

• Multi-attribute value/utility theory provides **quantitative models** of preferences over multiple objectives (attributes)

• These models are usually scaled between 0 and 100 or 0 and 1:

\[ 0 \leq u(x) \leq 100 \]

• The most commonly used model is based on a weighted average:

\[ u(x) = w_1 u(x_1) + w_2 u(x_2) + \ldots + w_n u(x_n) \]
# House Purchase: Final Scores

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House Purchase: Final Scores (cont.)
House Purchase: Sensitivity Analysis
Sensitivity Analysis Using Excel

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Modeling Uncertainties and Risks
Decision Making Under Uncertainty

• Many decisions involve substantial uncertainties and risks

• Extreme **risk aversion** can paralyze

• Other decisions are linked to this issue:
  • Research, information gathering
  • Risk mitigation measures
  • Buying insurance
  • ...

• We use **judgments** about uncertainty all the time (e.g., “It is very unlikely that ...”)


Decision Tree: Simple Example

- **Market Up**: $1,800
- **Market Same**: $200
- **Market Down**: -$1,000

**Stock A**
- Market Up: $1,200
- Market Down: -$200

**Chance Nodes**
- **Stock B**
- Market Up: $1,200
- Market Same: $300
- Market Down: -$200

**Decision Node**
- Play Safe: $300
A Real Decision Tree
Expected Value

- Determining the best alternative/strategy in decisions with uncertainties involves calculating **expected values**

- Expected values represent the weighted average of possible consequences (where the weights are the probabilities for the various outcomes)

\[
EV(X) = \sum_{i=1}^{n} x_i P(X = x_i)
\]

- Expected values ignore a decision maker’s attitude towards risk; such attitudes can be modeled with **utility functions**
Would You Take This Deal?

Deal

$1,000

0.5

No Deal

-$1,000

0.5

0
Risk Aversion

- People tend to prefer a sure amount over a gamble with an equivalent expected value.
- In fact, they are willing to pay a risk premium to avoid risk.
- This can be explained with Bernoulli's utility function.
Psychology of Decision Making
Psychological Traps

• We developed routines (largely unconscious) to cope with the complexity of the world

• These rules of thumb (heuristics) serve us well in many situations

• Sometimes, however, following these heuristics leads us into traps (biases)
MICHAEL LEWIS

THE UNDOING PROJECT

A Friendship that Changed Our Minds
It's frightening to think that you might not know something, but more frightening to think that, by and large, the world is run by people who have faith that they know exactly what is going on.

— Amos Tversky —
THINKING, FAST AND SLOW

DANIEL KAHNEMAN

WINNER OF THE NOBEL PRIZE IN ECONOMICS
A Form of Summary

- Two **systems**: System 1 vs. System 2
- Two **species**: Econs vs. humans
- Two **selves**: experiencing self vs. remembering self
174 \times 234 = ???
Plausibility versus Probability

• Which is more likely?
  • A massive flood somewhere in North America next year, in which more than 1,000 people drown
  • An earthquake in California sometime next year, causing a flood in which more than 1,000 people drown
Risk Aversion

• People tend to prefer a sure amount over a gamble with an equivalent expected value
• In fact, they are willing to pay a risk premium to avoid risk
• This can be explained with Bernoulli's utility function
Jack and Jill

• Today Jack and Jill each have a wealth of $5 million.
• Yesterday, Jack had $1 million and Jill had $9 million.
• Are they equally happy?
Anthony and Betty

- Anthony's current wealth is $1 million
- Betty's current wealth is $4 million
- They are both offered a choice between a gamble and a sure thing:
  - Gamble: Equal chances to end up owning $1 million or $4 million
  - Sure thing: own $2 million for sure
Prospect Theory

• We react to **changes in wealth**
• There is a **diminishing sensitivity** to these changes
• **Losses** and **Gains** are treated very differently

“Losses loom larger than gains.”
The Asian Disease Experiment

The United States is preparing for an unusual strain of influenza. Experts expect 600 people to die from the disease. Two programs are available that could be used to combat the disease, but because of limited resources only one can be implemented.
The Asian Disease Experiment (cont.)

• Program A: 400 people will be saved
• Program B: there is an 80% chance that 600 people will be saved and a 20% chance that no one will be saved
• Which of these two programs do you prefer?
The Asian Disease Experiment (cont.)

• Program C: 200 people will die
• **Program D:** there is a 20% chance that 600 people will die and an 80% chance that nobody will die.

• Which of these two programs do you prefer?
Predictably Irrationally
The Hidden Forces That Shape Our Decisions

Dan Ariely
A Typo?

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<th>Economist.com</th>
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<tbody>
<tr>
<td>SUBSCRIPTIONS</td>
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<td>Welcome to The Economist Subscription Centre Pick the type of subscription you want to buy or renew.</td>
</tr>
<tr>
<td>☐ Economist.com subscription - US $59.00 One-year subscription to Economist.com. Includes online access to all articles from The Economist since 1997.</td>
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<td>☐ Print &amp; web subscription - US $125.00 One-year subscription to the print edition of The Economist and online access to all articles from The Economist since 1997.</td>
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Anchoring

• Our judgments are often influenced by (sometimes arbitrary) anchors

• Experiment:
  • Subjects were asked to write down the last two digits of their SSN
  • They then had to bid on a number of products, including a bottle of wine
Results

Average prices paid for the various products for each of the five groups of final digits in Social Security numbers, and the correlations between these digits and the bids submitted in the auction.

<table>
<thead>
<tr>
<th>Products</th>
<th>Range of last two digits of SS number</th>
<th>Correlations*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>00–19</td>
<td>20–39</td>
</tr>
<tr>
<td>Cordless trackball</td>
<td>$8.64</td>
<td>$11.82</td>
</tr>
<tr>
<td>Cordless keyboard</td>
<td>$16.09</td>
<td>$26.82</td>
</tr>
<tr>
<td>Design book</td>
<td>$12.82</td>
<td>$16.18</td>
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<tr>
<td>Neuhaus chocolates</td>
<td>$9.55</td>
<td>$10.64</td>
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<tr>
<td>1998 Côtes du Rhône</td>
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<td>$14.45</td>
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<tr>
<td>1996 Hermitage</td>
<td>$11.73</td>
<td>$22.45</td>
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</tbody>
</table>

*Correlation is a statistical measure of how much the movement of two variables is related. The range of possible correlations is between -1 and +1, where a correlation of 0 means that the change in value of one variable has no bearing on the change in value of the other variable.

From “Predictably Irrational” by Ariely
It Happens to Everyone

Version A
Do you think you need more or less than $100,000 per year (in today’s dollars, after taxes) to comfortably retire on?

Version B
Do you think you need more or less than $300,000 per year (in today’s dollars, after taxes) to comfortably retire on?

Average Income Needed for Retirement

- Version A (100K): $148,182
- Version B (300K): $280,769
Example: Two decisions

• Decision 1: Choose between
  A. Sure gain of $240
  B. 25% chance to gain $1,000 and 75% chance to gain nothing

• Decision 2: Choose between
  C. Sure loss of $750
  D. 75% chance to lose $1,000 and 25% chance to lose nothing
Example: Two Decisions (cont.)

• Most people prefer A over B and D over C
• This is psychologically compelling when the situations are evaluated separately (narrow frame)
• However, in a broad frame, B-C actually dominates A-D
• We tend to evaluate decisions as they arise and rarely put them in the more appropriate broad frame
• This can lead to logical inconsistencies
Example: Two decisions

• Decision 1: Choose between
  A. Sure gain of $240
  B. 25% chance to gain $1,000 and 75% chance to gain nothing

• Decision 2: Choose between
  C. Sure loss of $750
  D. 75% chance to lose $1,000 and 25% chance to lose nothing

• Outcome (A & D): 25% chance of gaining $240 and 75% chance of losing $760

• Outcome (B & C): 25% chance of gaining $250 and 75% chance of losing $750
Narrow vs. Broad Framing

- Thaler asked 23 executives whether they would be willing to invest in an opportunity with an equal chance of making $2 Million or losing $1 Million.
- Only 3 executives were willing to make that investment.
- Thaler then asked the CEO how many of the 23 projects he would like to undertake (assuming their outcomes are independent).
- The CEO considered the question a no-brainer: take all of them!!!
Timid Choices

“In many companies, creating a large gain will lead to modest rewards, while creating an equal-sized loss will get you fired. Under those terms, even a manager who starts out risk neutral, willing to take any bet that will make money on average, will become highly risk averse.” (p. 187)
Behavioral Economics

“The foundation of political 

economy and, in general, of every social science, is evidently psychology. A day may come when we shall be able to deduce the laws of social science from the principles of psychology.”

(Vilfredo Pareto, 1906)
Nudge
Improving Decisions About Health, Wealth, and Happiness

Richard H. Thaler
Cass R. Sunstein
Design

• We are constantly surrounded by products of design.

• Some designs are good, some designs are not.

• Choice architecture is the design of decision situations that promote libertarian paternalism.
Saving for Retirement

• For **Econs**, this is a simple task:
  – Calculate how much you are going to earn over the rest of your life-time
  – Figure out how much retirement income you need
  – Save up just enough

• For **Humans**, this is much more difficult
Enrollment Options

• Right now, you have to opt in

• A default opt out will increase enrollment (few people “drop out”)
A Risk Literacy Curriculum

• Topics:
  • Health literacy
  • Financial literacy
  • Digital risk competence

• Skills:
  • Statistical thinking (understanding)
  • Rules of thumb (decision-making)
  • Psychology of risk (emotions)
SUMMARY
Summary

• Decision analysis provides a systematic and well-established framework (and lots of practical tools) to help decision makers.

• Some key issues center around making tradeoffs among multiple conflicting objectives and how to manage uncertainties and risks.
Summary

• Research about the psychology of decision making revealed systematic heuristics and biases.

• This research led to a revolution in economic thinking (behavioral economics) that acknowledges the importance of how humans behave (and often misbehave).
Thank you for joining us today.

For more information about this presentation or Krannert Executive Education Programs, contact us at krannertexec@purdue.edu.

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