Managerial Decision Making: Session 7

Classic Cognitive Heuristics: Availability and Anchoring and Adjustment

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Review of Week 4

- Availability:
  5. Which is the more likely cause of death? Choose one from the following pair:
     - Diabetes
     - Heart Disease
     - 63% chose this
  6. Which is the more likely cause of death is the US? Choose one from the following pair:
     - Car Accident
     - Stomach Cancer
     - 74% chose this

Contrary to the relative slight media coverage they receive, Diabetes and Stomach Cancer kill roughly twice as many Americans annually.

Unbiased “Guesses”

- Our formation of a guess comes from the accumulation of bits and pieces of information . . .

Availability Bias

- Ease of Storage, Vividness, etc. refocuses our attention on parts of the data that may be unrepresentative of all the data

Bias

Recognition

- Cognitive Fact: We are very good at knowing what we have encountered before, even when we cannot recall more information
  - Recognition and Recall Memory are NOT the same
  - Shepard (1967) asked subjects to look through 612 pictures, then tested with pairs of pictures which ones the subjects had seen before
    - 98.5% success rate in identifying previous pics!
  - Neophobia—eating habits of wild rats. Won’t eat foods they don’t recognize. Why?
    - haven’t smelled it or breath of other rats. Adaptive behavior.

Recognition Heuristic

- When used?: when we need to infer which of two objects have the higher value
  - (eg. which is bigger, higher, faster, etc.)
- Heuristic: If one of two objects is recognized and the other not, then infer that the recognized object has the higher value.
- Idea: We have a spectrum of knowledge about decision objects . . . but recognition is binary . . . either we recognize or we don’t
Recognition Examples

- Which German city has the larger population?
  - Hamburg?
  - Dortmund?
- Which U.S university has the larger endowment?
  - Dartmouth?
  - RPI?
- When does Recognition work best?
  When we have limited knowledge?
  - San Francisco vs. Los Angeles? (I know the answer!) Does not work!

Availability and Memory

- Seems obvious that what makes up our probability distribution for guesses is only what we can/do remember
- A GREAT book on this subject.

Memory Transience

- First, the bad news...
  - Ebbinghaus curve of forgetting...

Memory Misattribution & Suggestibility

- Third, more bad good news...
  - What we remember may not be what really happened...
  - Example
Absence-mindedness

- Fourth, more bad news.
  - Especially when multi-talking (and also especially when getting older, ask me!), we may not initially encode the memories we want to keep
    - Where is the car? Where are the keys?
  - Tatiana Cooley, 1999 National Memory champion
    - “I’m incredibly absent minded, I live by Post-Its.”

Memory and Concentration:
Can you count?

http://viscog.beckman.uiuc.edu/grafs/demos/15.shtml

Selective Perception--Bias

- Princeton vs. Dartmouth, 1951
- “It seems clear that the game actually was many different games”
- “We do not first see, then define, we define first and then see.”
  --Walter Lippmann

We construct our beliefs/opinions

- Two Questions are asked of subjects in random order:
  - How happy are you?
  - How often are you dating?
- If “Happy” first: correlation = .12
- If “Dating” first: correlation = .66
- “The Dating Heuristic”
**Willingness to contribute**

- "Would you favor a $XX tax increase to support good cause Y?"
  - "YES"
- Next: "Would you favor $50 more than that?"
  - "NO"

<table>
<thead>
<tr>
<th>Starting value</th>
<th>% not favoring additional $50 increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>$25</td>
<td>78%</td>
</tr>
<tr>
<td>$50</td>
<td>57%</td>
</tr>
<tr>
<td>$100</td>
<td>41%</td>
</tr>
<tr>
<td>$200</td>
<td>47%</td>
</tr>
<tr>
<td>$300</td>
<td>46%</td>
</tr>
</tbody>
</table>

**how willing to pay?**

- "How much are you willing to pay . . .
  - to clean up the Connecticut River?"
  - to clean up all New England rivers?"
  - to clean up all U.S. rivers?"
- We have little sense of PROPORTIONAL value?

**Quiz 1**

- Quiz: Suppose the DJIA is trading at 8,230 (it was earlier today)
- Questions I asked you (not telling you that you were put in two groups)
  - for Group A:
    - What is the chance that the DJIA will close above 10,000 on any day before Dec 31st, 2003? _____ %
    - Estimate its close on Dec. 31st, 2003 _____
  - for Group B:
    - What is the chance that the DJIA will close above 12,000 on any day before Dec 31st, 2003? _____ %
    - Estimate its close on Dec. 31st, 2003 _____

**Classic Heuristic #3: Anchoring and Adjustment**

- Definition of A&A: Estimate a quantity by taking a convenient starting point, and then adjusting in the appropriate direction.
- Example: What year did George Washington become President?
  - I don’t really know, so how do I go about constructing a guess?

**Anchoring, continued**

- Anchoring: a simple retrieval heuristic but easily prone to bias
  - Anchoring is a pervasive problem: we tend to have a narrow focus on what is easy to conjure up
- It is easy to (improperly) anchor and then, insufficiently adjust when given available but unimportant facts.
- It is hard (almost impossible?) to ignore even extraneous information.
Survey: a history quiz

- Given to you, the subjects:
  - To choose a target "DATE", take the last three digits of your student ID number and add 400. Insert below where it reads "DATE"
  - Question 1: The Huns under Attila invaded Europe and penetrated deep into what is now France where they were defeated and forced to return eastward. Did these events occur before or after "___DATE___" A.D. ?
    - Answer not that important . . .
  - Question 2: In what year did Attila’s defeat occur? ________

Survey Tuck ‘03 - answers to history quiz

<table>
<thead>
<tr>
<th>ID Quartile</th>
<th>Median ID Number “DATE”</th>
<th>Your Avg. Year Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>462</td>
<td>653</td>
</tr>
<tr>
<td>2nd</td>
<td>614</td>
<td>695</td>
</tr>
<tr>
<td>3rd</td>
<td>714</td>
<td>714</td>
</tr>
<tr>
<td>4th</td>
<td>1188</td>
<td>810</td>
</tr>
</tbody>
</table>

- Correct Answer: 451 A.D.
- Anchor is:
  - completely meaningless
  - completely transparent

Tuck ‘02 - answers to history quiz

<table>
<thead>
<tr>
<th>ID Quartile</th>
<th>Median ID Number “DATE”</th>
<th>Median Year Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>527</td>
<td>489</td>
</tr>
<tr>
<td>2nd</td>
<td>865</td>
<td>543</td>
</tr>
<tr>
<td>3rd</td>
<td>1010</td>
<td>800</td>
</tr>
<tr>
<td>4th</td>
<td>1251</td>
<td>800</td>
</tr>
</tbody>
</table>

- Correct Answer: 451 A.D.
  - Anchor is completely meaningless
  - Completely transparent

From Quiz?: anchoring on the first: primacy

- Anchoring is pernicious
  - Ordering of questions can change responses
  - Similar to violations of frame invariance
- Two Questions:
  - What is the population of San Francisco?
  - What is the population of New York?
- Answers:
  - When S.F was asked first, answer for NY was lower than it should have been
  - When NY was asked first, answer for SF was higher than it should have been

Murphy’s Law

- A prototype machine has 500 parts, each of which will work with probability .99. To operate, every part must work properly.
- What is the chance that the machine will work?
- Answers from a research project:
  - 91 Responses: One-third guessed > 90%
  - True Answer: 0.99^500 = 0.0065 i.e. very unlikely!
  - Punch Line: An extrapolation problem . . .
- Moral/Fix: Build redundancy into systems

Survey-The Birthday Problem

- With 365 days in a year, it takes 366 people to be 100% sure that there is a match of some birth-day in the group.
- How many people does it take to be 50% sure there is a match?
- Your answers: Average = 88, with a lot of people (20%) saying ~180
Tuck cell phone ownership

- **Survey:** Do you own a cell phone?
  - Answered "YES" or "NO"

- **Let \( ? \) = "What is the percentage of Tuck students who own cellular phones?"
  - Actual Ownership: \( N = 51 \) 53% of Tuckies

- **Those who answered "NO"**:
  - \( N = 24 \) \( \text{Prob}(?) \mid \text{"NO"}) = 28.7\%

- **Those who answered "YES"**:
  - \( N = 24 \) \( \text{Prob}(?) \mid \text{"YES"}) = 47.1\%

- Yes, this is a statistically significant difference

Memory—Persistence

- **Anchoring on the past . . .**
  - Persistence \( \Rightarrow \) remembering things you’d like to forget . . .

- **Donnie Moore . . .**
  - Angels ahead 5 to 2, needed to win game to go to ALCS
  - Red Sox rallied, 5 to 4
  - Brought in Donnie
    - Threw 2 quick strikes, fans began to celebrate

Real Estate Transactions

- It is observed that when prices are declining in real estate, the volume of transactions dries up quickly

  - **Why?**

but, do experts have this problem?

- **Question to CPAs:** Based on your audit experience, is the incidence of significant executive level management fraud more than [10] or (200) in each 1000 firms audited by Big Eight accounting firms?
  - Answered the question . . . then asked . . .

  - **What is your estimate of the number?**
    - With High anchor (200): mean 43
    - With Low anchor [10]: mean 16.5

  - **Experts are not immune to the anchoring bias**

Anchoring and Adjustment in IPOs: Underwriters underadjust

<table>
<thead>
<tr>
<th>Underwriter sets “Price Talk” then Investors give indications of interest</th>
<th>Underwriter sets</th>
<th>First Day Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>$18</td>
<td><strong>if strong interest:</strong> $20</td>
<td><strong>$28</strong></td>
</tr>
<tr>
<td>$16</td>
<td><strong>if weak interest:</strong> $16</td>
<td><strong>$15</strong></td>
</tr>
</tbody>
</table>

Note: This table is adapted from a study by Gregory Norbark and Margaret各区 (2000)

Table 12.1
THE EFFECTS OF ANCHORING ON REAL ESTATE PRICES

<table>
<thead>
<tr>
<th>Apparent Value, $</th>
<th>Recommended Value, $</th>
<th>Reasonable Value, $</th>
<th>Lowest Value, $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selling Price, $</td>
<td>Selling Price, $</td>
<td>Purchase Price, $</td>
<td>Offer, $</td>
</tr>
<tr>
<td>119,900</td>
<td>114,254</td>
<td>117,742</td>
<td>111,454</td>
</tr>
<tr>
<td>129,900</td>
<td>126,773</td>
<td>127,836</td>
<td>123,769</td>
</tr>
<tr>
<td>139,900</td>
<td>125,041</td>
<td>128,530</td>
<td>124,633</td>
</tr>
<tr>
<td>149,900</td>
<td>128,254</td>
<td>130,981</td>
<td>127,318</td>
</tr>
</tbody>
</table>

Note: This table is adapted from a study by Gregory Norbark and Margaret各区 (2000)
Our result: Investors underadjust, too

<table>
<thead>
<tr>
<th>Underwriter sets “Price Talk”</th>
<th>Underwriter sets Offering Price</th>
<th>First Day Price</th>
<th>Next Year’s Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>$18</td>
<td>priced @ $20</td>
<td>$28</td>
<td>$35</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$16</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>priced @ $16</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The first day return and flipping predict the first year return!

Anchoring on “Cost Basis”

- Wrong Question #1: How am I doing relative to where I bought (or, recommended) this stock?
  - Sunk Cost Fallacy
- Wrong Question #2: Is my entire portfolio up or down versus cost?
  - Money illusion Fallacy
- Right Questions
  - Would I still buy the stock today?
  - Does this stock with its risk and diversification characteristics belong in the current portfolio?
  - Is this portfolio properly balanced given recent market changes? (example)

Anchoring Bias

- When we are VERY uncertain of a good answer, “Look in this vicinity” will influence most of us . . .

"Dow 36,000?"

"OK, 15,000"

Where else do you see this?

- Does this have broad applicability for managers? If so, in what ways?

Negotiating . . .

- **How** to start the negotiation?
- **When** to start the negotiation?
  - When to let the other party start?

Next Monday: Decision Trees

- The next tool in the MDM toolkit is Decision Trees
- Next Monday, homework is six case problems
  - Will take 2-4 hours, really! Plan ahead!
- What you may want to use:
  - There is a HANDOUT on web-site explaining use of TreePlan, which is an Excel Add-in.
  - Download TreePlan.xla from Course Site
**Basic Idea**

- Two types of nodes
  - Decisions
  - Uncertainties

![Decision Tree Diagram](image)

**Tricky Problems**

- Which comes first, decisions or uncertainty?
  - Not always very obvious . . .

- What are Decision Trees’ limitations?