Putting Risk Management Research into Practice

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Presentation Outline

• Historical Perspective
• Three Cognitive Systems
• Framing
• Anchors and Overconfidence
• Concluding Remarks
Historical Perspective

- The approach to risky choice that we follow is a conditionally normative and logical one, often termed Bernoullian or Bayesian decision theory but more usually just decision theory or decision analysis.

- We do strongly believe that familiarity with the decision analysis approach - even at its simplest level of merely asking, What choices? What consequences? What chances? - will certainly lead to better agricultural management.

  Anderson, Dillon, and Hardaker. Agricultural Decision Analysis.
Historical Perspective

• Managing a modern farm operation in today’s complex and risky world is no easy task. You face uncertainty as you plan for your future. Ever-changing conditions in your decision environment provide important challenges for you, the farm manager.

• The purpose of this guidebook is to suggest an approach to decision-making using techniques that allow you to deal deliberately and reasonably with this risk and uncertainty.


Historical Perspective

• The concepts and methods in Making Farm Decisions in a Risky World were rooted in research being conducted under Western Regional Research Project W-149, “An Economic Evaluation of Managing Market Risks in Agriculture.”

- Easy back-and-forth between research and educational program development
- Focus on decision support
Historical Perspective

- The matrix below presents annual net farm income distributions for two farm plans. Write down your preferred choice.

<table>
<thead>
<tr>
<th>State of Nature</th>
<th>Probability</th>
<th>Farm Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>1</td>
<td>1/6</td>
<td>-55,223</td>
</tr>
<tr>
<td>2</td>
<td>1/6</td>
<td>22,925</td>
</tr>
<tr>
<td>3</td>
<td>1/6</td>
<td>41,396</td>
</tr>
<tr>
<td>4</td>
<td>1/6</td>
<td>43,020</td>
</tr>
<tr>
<td>5</td>
<td>1/6</td>
<td>41,599</td>
</tr>
<tr>
<td>6</td>
<td>1/6</td>
<td>107,162</td>
</tr>
</tbody>
</table>

Historical Perspective

- Making Farm Decisions in a Risky World was firmly based on the expected utility hypothesis (EUH) paradigm.

- In March 1979 Kahneman and Tversky’s “Prospect Theory: An Analysis of Decision under Risk” appeared in Econometrica.
  - Theory more consistent with behavior observed in experiments
  - Spurred interest in behavioral foundations for decision theory and in alternatives to the EUH.
Historical Perspective

- Review articles and paper collections on behavioral foundations:
  - Kahneman, Slovic, and Tversky (1982)
  - Rabin (1998)
  - Camerer, Loewenstein, and Rabin (2004)
  - Camerer, Loewenstein, and Prelec (2005)

- Review articles on EUH and alternatives:
  - Schoemaker (1982)
  - Machina (1987)
  - Starmer (2000)

Historical Perspective

- How can this new knowledge affect what we teach and the information we provide to farm managers?

- Objectives for this presentation
  - stimulate discussion
  - encourage closer collaboration with research community
Three Cognitive Systems

- Perception and intuition are the norm ... they are fast, automatic, and effortless.
- When we reason, we slow down to carefully structure a problem, systematically gather information, and reflect on a wide range of consequences.
- Reasoning is hard work ... most of us avoid it whenever we can.

Source: Kahneman, p. 1451
Three Cognitive Systems

- Kahneman’s typology helps us think about what we are trying to accomplish with risk management education:
  - Help decision makers structure choice problems to facilitate the shift from intuition to reasoning.
  - Strengthen the quality of decisions based on intuitive reasoning.

Three Cognitive Systems

- The matrix below shows payoffs on a risk management investment that costs $4,500. Look at this quickly and write down your choice - “invest” or “do nothing.”

<table>
<thead>
<tr>
<th>State of Nature</th>
<th>Probability</th>
<th>Invest</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1/6</td>
<td>(4,500)</td>
</tr>
<tr>
<td>2</td>
<td>1/6</td>
<td>(4,500)</td>
</tr>
<tr>
<td>3</td>
<td>1/6</td>
<td>(4,500)</td>
</tr>
<tr>
<td>4</td>
<td>1/6</td>
<td>(4,500)</td>
</tr>
<tr>
<td>5</td>
<td>1/6</td>
<td>(4,500)</td>
</tr>
<tr>
<td>6</td>
<td>1/6</td>
<td>21,120</td>
</tr>
</tbody>
</table>
Framing

- Much of what we do in risk management education and decision support tool development is directed toward helping to frame problems.
  - Lower the psychic cost of shifting from intuition to reasoning.
  - Structure and guide data collection.
  - Automate complex calculations.

Framing

- The way a decision problem is stated and structured – the way it is framed – can have significant impacts on the choices that are made.

- Choice of a performance measure is often a key aspect in the framing of a choice problem.
Imagine that the United States is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the programs are as follows:

If Program A is adopted, 200 people will be saved.

If Program B is adopted, there is a one-third probability that 600 people will be saved and a two-thirds probability that no people will be saved.

Source: Kahneman, p. 1458
Framing

• Most people presented with the first formulation choose A, the less risky option.

• Most people presented with the second formulation choose B’, the riskier option.

• In the first formulation, outcomes are expressed as gains ... in the second, they are expressed as losses.

Framing

• The payoff matrix below presents return over direct expenses per acre distributions without and with multiperil crop insurance. Write down your preferred choice.

<table>
<thead>
<tr>
<th>State of Nature</th>
<th>Probability</th>
<th>Don’t Insure</th>
<th>Insure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1/6</td>
<td>98.21</td>
<td>90.71</td>
</tr>
<tr>
<td>2</td>
<td>1/6</td>
<td>-32.04</td>
<td>3.15</td>
</tr>
<tr>
<td>3</td>
<td>1/6</td>
<td>128.99</td>
<td>121.49</td>
</tr>
<tr>
<td>4</td>
<td>1/6</td>
<td>131.70</td>
<td>124.20</td>
</tr>
<tr>
<td>5</td>
<td>1/6</td>
<td>129.33</td>
<td>121.83</td>
</tr>
<tr>
<td>6</td>
<td>1/6</td>
<td>238.60</td>
<td>231.10</td>
</tr>
</tbody>
</table>
Framing

- Choice of a performance measure can be critical in framing decision problems.
  - per bushel ... per acre ... whole farm returns
  - gains/losses associated with insurance purchase or net income with and without insurance

Framing

- Decisions are often made in piecemeal fashion, but performance may be more properly evaluated from a portfolio perspective.
  - forward pricing and crop insurance
  - feed procurement and livestock marketing strategies
Anchors and Overconfidence

- Intuitive thinking is often prone to systematic errors.
- In *Irrational Exuberance* Robert Shiller emphasizes the influence of psychological anchors – simple but powerful impressions or assumptions that lead to overconfidence and have a strong influence on decisions.

Anchors and Overconfidence

- Shiller (pp. 148-152) distinguishes two types of anchors:
  - **Quantitative Anchors** – reference levels such as last year’s average price, a loan rate, or a round-number figure.
  - **Moral Anchors** – beliefs rooted in convincing stories.
Anchors and Overconfidence

- Our educational programs and decision support tools can help decision makers recognize the influence of quantitative anchors and avoid biases.
  - Calibration “diaries” in marketing clubs
  - Access to historical data, with flexibility to easily generate multiple views

Anchors and Overconfidence

![Calibration Functions](image_url)

**Calibration Functions**

- Stated Probability of Price Decline
- Percent of Price Declines

- Prefectly Calibrated
- Poorly Calibrated
Anchors and Overconfidence

- We also need to recognize that our educational programs can be the basis for moral anchors.
  - Outlook presentations
  - Description of key historical episodes
  - Celebrity strategies in WTG
- The anchors we create are often helpful ... but we need to be mindful that they may have a long life.

Anchors and Overconfidence

- Expertise is often based on a rich set of highly effective anchors. As Kahneman notes (pp. 1450-1451):

  ... intuitive thinking can also be powerful and accurate. High skill is acquired by prolonged practice, and the performance of skills is rapid and effortless. The proverbial chess player who walks past a game and declares “white mates in three” without slowing is performing intuitively (Simon and William G. Chase, 1973), as is the experienced nurse who detects subtle signs of impending heart failure (Gary Klein, 1998; Atul Gawande, 2002).
Concluding Remarks

• Our goal is to use research findings to foster more effective decision making.

• Improved decision making is not the underlying motivation for most decision research ... but the research can help with our goal.

• Risk management educators have a very valuable perspective to bring to decision research – a perspective that can be conveyed through collaboration.
References from “Putting Risk Management Research into Practice”


