Course Summary

Summer 2003

Where Have We Been?

- Course Philosophy and Approach
- Decision Trees
- Probability – Discrete and Continuous
- Simulation
- Regression
- Decision Making Examples and Exercises
- Communicating with Data

What Have We Learned?

- Concepts
  - Uncertainty, distributions
  - Populations, samples, estimates, confidence intervals
  - Central Limit Theorem, correlation, diversification
  - Simulation, estimation, validation
  - Decision heuristics (informal rules)
- Analytical Tools
  - Trees, laws of probability, regression, Crystal Ball, ...
- Thinking Skills
  - “Seeing as”

Decision Analysis Procedure

- List the GOOP
- Construct a decision tree
- Evaluate the endpoints (outcomes)
- Assess probabilities for the branches
- “Expect out and fold back” – Backwards induction
- Sensitivity Analysis
- Interpretation – what does it mean? What decisions should we make?

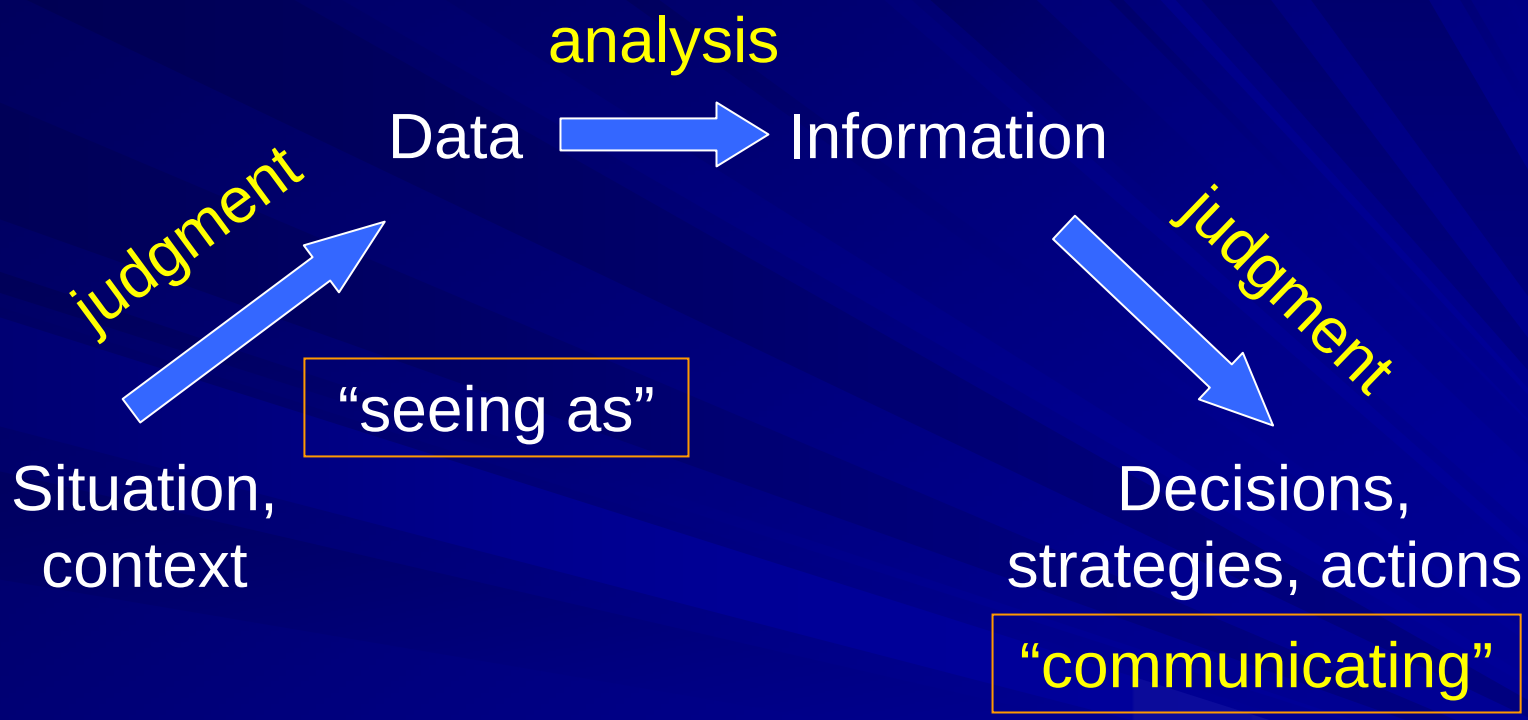
The Need for Simulation

- If we know data with *certainty* (as we supposedly do when preparing analyses based on historical data), calculating EMV (etc.) is trivial…
- However, when the data are uncertain, as they are when estimating *future* results or generalizing from a *sample* to a *population*, the *uncertainties* associated with random variables result in a large number of scenarios…
- Just looking at a *single* profit figure based on expected values totally ignores the fact that actual results may deviate significantly from the expected value

“Seeing As…”

- Don Schon, MIT Professor for many years, wrote about how professionals learn to see a real-life situation from a new and useful viewpoint. He called this mapping process “seeing as.”
- In this course, we were trying to help you take business problems and see them in new ways: transformed in ways that can be analyzed with our tools.
- But you must also step back and ask the larger questions about validity, appropriateness, usefulness, and effectiveness.
- Communication is a part of every business problem. Statistical analyses do not convince most people! You don’t want to be the “Cassandra” of your company.

Analysis and Judgment



- Analysis informs judgment, builds intuition
- Analysis is not a substitute for judgment

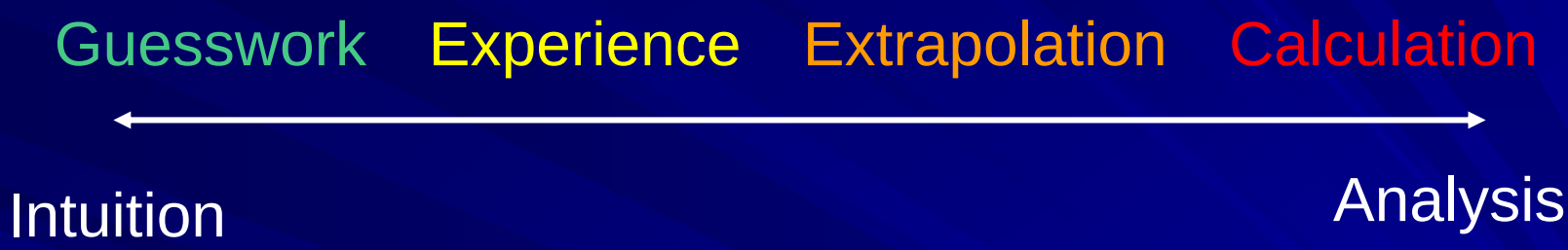
The “As If” Game

- “Seeing as” means thinking “as if”
  - Discrete distributions may be treated as continuous
  - Averages are distributed normally
  - Nonfinancial issues can be given $ value
  - Situations are a sample from some population, so unique problems can be handled in generic ways
- But, don’t forget that “as if” is only a hypothesis
  - Use the models for insights, not just answers
  - Check the validity of the models
  - Step back and think about the big picture
  - Keep developing your judgment and thinking skills

Implications for Communicating

- Know your audience! Try to understand what they want, what they know, how they think, and their attitude toward you and your message
- Most people frame decisions and make estimates in very intuitive ways that are concrete and based on simple heuristics
- You can choose to educate the audience to other ways of framing and analyzing a problem, or to “start where they are at” and give them information in ways that will be persuasive

How Do People Decide?



- Framing (structuring of problems): reference points, etc.
- Anchoring and adjustment
- Availability and confirmation biases
- Similarity and concreteness
- Communicating about risk

Experts and Models

- What do experts do best?
- What do computers do best?
- How can they be combined?
- Should we give the model to the expert or give the expert to the model?

Batterymarch Example

- Stock portfolio company
- Manage $12 Billion with 37 employees
- Experts identify variables, suggest rules, design tests, deal with clients
- Computer keeps databases, runs tests of rules, buys and sells stocks
- 10-12 rules identify attractive stocks

The Necklace Problem

A woman buys a $78 necklace at a jewelry store. She gives the jeweler a check for $100. Because he does not have the $22 change on hand, he goes to another merchant next door. There he exchanges the woman's check for $100 in cash. He returns and gives the woman the necklace and her change. Later the check bounces and he must repay the other merchant. He originally paid $39 for the necklace. What is his net cash (out-of-pocket) loss?

Lessons From the Necklace Problem

- There are easier and harder ways to frame the necklace problem
- We like confirming evidence (agreement)
- We often find ourselves with others who agree with us (availability)
- But, not everyone agrees with us
- It's important to seek out disconfirming information from those with different viewpoints
- Just like in diversification and multiple regression, having some quasi-independent inputs helps!

Where To From Here?

- Leadership, Strategy, Innovation, Marketing courses
- Advanced statistics courses (e.g., Barnett)
- Simulation and modeling courses, including System Dynamics (e.g., 15.871, 15.874 Sterman)
- Advanced Communications courses (15.281)
- Decision Making/Negotiation courses (e.g., 15.067, 15.665 Kaufman, Curhan)
- Organizations courses (e.g., 15.569 Orlikowski/Senge, 15.394 Leading Entrepreneurial Organizations)
- Do an interesting thesis!
- Have a great life!

Final Thoughts

- This has been a challenging course!
- It is only the beginning
- It is up to you to continue practicing ways to "see" differently, and ways to integrate what you are learning from different courses into your business (and personal) decisions