

15.063: Communicating with Data

Summer 2003



Recitation 1: Decision Analysis

Recitations

- **Develop** an understanding of students' abilities and expectations
- **Review** key concepts of the current week's materials
- **Practice** class material
- **Answer** questions that students have

Goals for Today

- A few things about the class (organization, ...)
- Decision Trees with Treeplan
 - Lottery
 - Bill Sampras' Decision Tree
- Decision Analysis Examples
- Sensitivity Analysis: Buying a House (page 38)

Some Information

- 2 Homeworks and 2 Cases to be handed in before lectures (see syllabus). First next week.
- *Treeplan* can be found on server.

Lottery

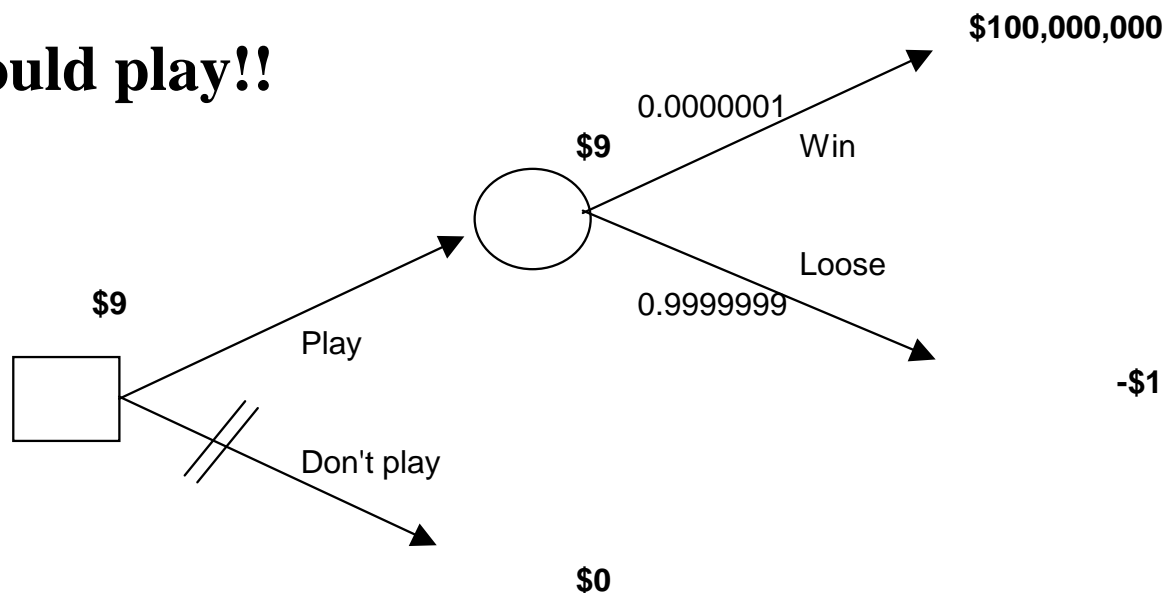
- A lottery ticket costs **\$1**, and there is a chance of **1** in **10,000,000** of winning **\$100,000,000**.
 - What is the recommended strategy?
 - What does the EMV mean?

Building Decision Tree

- Steps:
 - Set up time line
 - Identify nodes as
 - *Decision* nodes (choices)
 - *Event* nodes (uncertainties)
 - Assign numeric values to nodes (revenues, costs, etc.)
 - Assess probabilities to branches of event nodes
 - Compute the decision tree
 - Sensitivity analysis (which vars can change results?)

Lottery Solution

– **Should play!!**



- Means that if we play for a LONG time we can expect to win 9 times as much as what we spend!!!
- But we are likely to play all our life and never win!

Bill Sampras' Decision Tree

Page 2 in textbook
and Lecture 1

Decision Analysis Examples

- Oil Drilling
 - *Decision*: To drill or not to drill at a given spot before option expires
 - *Uncertainties*: Cost of drilling, extent of oil or gas deposits, cost of raising the oil
 - *Available information*: Records of similar and non-similar drillings, opinions of geologist, geophysicist, and land agent
 - *Gain additional (imperfect & costly) information*: underlying geophysical structure – decision to get this information or not...

Decision Analysis Examples

- Introduction of a new drug
 - *Decision*: To market or not to market a newly developed drug for a skin allergy?
 - *Uncertainties*: % of patients who will be cured, % of patients who will have negative side effects, demand for drug at given price
 - *Available information*: Scientific reports of technical stuff, judgments of marketing group, results of pilot experiment
 - *Gain additional (imperfect & costly) information*: Conduct experimental trials – decision to get this information or not...

Decision Analysis Examples

- New product
 - *Decision*: To manufacture a new long lasting house-paint, what size plant to build, or outsource/license to another firm?
 - *Uncertainties*: ...
 - *Available information*: ...
 - *Gain additional* (imperfect & costly) *information*: ...

Buying a House

- For this example, see page 38 in the course textbook:

Data, Models, and Decisions: The Fundamentals of Management Science by Dimitris Bertsimas and Robert M. Freund, Southwestern College Publishing, 2000.

Sensitivity Analysis

- Can help determine how robust the solution of our model is.
- Can help determine if it is important to estimate the parameters of the model with more accuracy.
- Usually done changing one variable at a time, at most two.

The end.