

Bayesian Models CSE458
Exercise 1

Urn Problem

Consider the simple urn problem given in lectures on page 2 of the handout of Chapter 2 of “Decision Analysis: Introductory Lectures on Choices under Uncertainty”, by H. Raiffa. Suppose now that you **do not** know how many urns there are of each type. Let \mathbf{p} denote the proportion of urns of type θ_1 .

1. Draw a decision flow digram and show the EMV at each node.
2. Plot the final EMV for all values of \mathbf{p} , where $0 \leq \mathbf{p} \leq 1$, and clearly indicate what action should be made for each value of \mathbf{p} .

Sweet Company Problem

The following problem is based on a problem from “Data Analysis & Decision Making with Microsoft Excel”, by Albright et al.

A company requires 10 tonnes of sugar in 6 months time. The manager has three options. She can either (1) buy all the sugar at market price, when she needs it in 6 months, or (2) she can purchase a future contract for 10 tonnes of sugar now, or (3) she can purchase a future contract for 5 tonnes of sugar now and purchase 5 tonnes in 6 months. The future contract will guarantee delivery of the sugar in 6 months but the cost of purchase will be based on today’s price of sugar.

Suppose 5 tonne and 10 tonne futures contracts are \$20 and \$50 respectively, the price of sugar today is \$0.1702 per kilogram (1 tonne = 1000 kg), and the following table gives the probabilities for the price of sugar in 6 months.

Price (\$/kg)	0.156	0.166	0.174	0.182	0.192
Probability	0.05	0.25	0.35	0.20	0.15

1. Construct a decision flow diagram and determine what is the best course of action for the company.

A Hair Product Problem

The following problem is based on a problem from “Data Analysis & Decision Making with Microsoft Excel”, by Albright et al.

A company is developing a new product to promote hair growth. If the new product is successfully, the company will earn \$500,000 in profit. On the other hand if the product is unsuccessful, the company will lose \$350,000. In the past similar products have been successful %60 of the time. At a cost of \$50,000, the effectiveness of the product can be tested. If the results of the testing is favorable, then there is a 80% chance the marketing of the product will be successful. However, if the results are not favorable, then there is only a 30% chance the marketing efforts will be successful. The company believes that there is only a 60% chance the results will be favorable.

1. Construct a decision flow diagram and determine what is the best course of action for the company.
2. Compute and interpret the expected sample information (EVSI) for this decision problem.