9/23/09

Decision Analysis

Company GFB owns a plot of land.

Alternatives	Payoffs: Oil	Dry
Drill	700k	-100k
Sell Land	90k	90k
A priori probability	.25	.75

Decision Strategies:

(i) Choose the alternative that maximizes the minimum profit – Sell

(ii) Choose alternative that maximizes payoff under the most likely alternative – Sell

(iii) Choose alternative that maximizes expected profit:

Drill: $\frac{1}{4} \times 700 - \frac{3}{4} \times 100 = 100$

Sell: 90

Alternatives	Payoffs	
	Oil	Dry
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Introduce a 3rd alternative:

Do a Seismic Study (SS) and then make decision. Cost of survey = 30K

Outcome of test : FSS = Favorable
USS = Unfavorable.

$$P[FSS \mid Oil] = .6 \qquad P[USS \mid Oil] = .4$$

$$P[FSS \mid Dry] = .2 \qquad P[USS \mid Dry] = .8$$

$$P[FSS] = P[FSS \mid Oil]\,P[Oil] + P[FSS \mid Dry]\,P[Dry] = .6 \times .25 + .2 \times .75 = .3$$

Bayes Computation:

$$P[Old \mid FSS] = \frac{P[Old \wedge FSS]}{P[FSS]} =$$

$$\frac{P[FSS \mid Old] \cdot P[Old]}{P[FSS \mid Old]\,P[Old] + P[FSS \mid Dry]\,P[Dry]}$$

$.6 \times .25$ $\qquad$ $.2 \times .75$

$$= \frac{1}{2}$$

$$P[Owl \mid FSS] = \frac{1}{2}$$

$$P[Dog \mid FSS] = \frac{1}{2}$$

$$Pr[Owl \mid USS] = \frac{1}{7}$$

$$Pr[Dog \mid USS] = \frac{6}{7}$$

Decision Tree