

# ME426 HW16

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## 1

Define events:

$$S_1 = \{\text{Price increase}\}$$

$$S_2 = \{\text{Price remain the same}\}$$

$$S_3 = \{\text{Price decrease}\}$$

$$A_1 = \{\text{Agent favorite}\}$$

$$A_2 = \{\text{Agent does not favorite}\}$$

Given:

$$P(S_1) = 0.25$$

$$P(S_2) = 0.3$$

$$P(S_3) = 0.45$$

$$P(A_1|S_1) = 0.85$$

$$P(A_1|S_2) = 0.50$$

$$P(A_1|S_3) = 0.15$$

$$P(A_2|S_1) = 0.15$$

$$P(A_2|S_2) = 0.50$$

$$P(A_2|S_3) = 0.85$$

We have:

$$P(A_1S_1) = P(A_1|S_1)P(S_1) = 0.2125$$

$$P(A_1S_2) = P(A_1|S_2)P(S_2) = 0.15$$

$$P(A_1S_3) = P(A_1|S_3)P(S_3) = 0.0675$$

$$P(A_1) = P(A_1S_1) + P(A_1S_2) + P(A_1S_3) = 0.43$$

and

$$P(A_2S_1) = P(A_2|S_1)P(S_1) = 0.0375$$

$$P(A_2S_2) = P(A_2|S_2)P(S_2) = 0.15$$

$$P(A_2S_3) = P(A_2|S_3)P(S_3) = 0.3825$$

$$P(A_2) = P(A_2S_1) + P(A_2S_2) + P(A_2S_3) = 0.57$$

Thus

$$P(S_1|A_1) = \frac{P(S_1A_1)}{P(A_1)} = 0.4942$$

$$P(S_2|A_1) = \frac{P(S_2A_1)}{P(A_1)} = 0.3488$$

$$P(S_3|A_1) = \frac{P(S_3A_1)}{P(A_1)} = 0.1570$$

$$P(S_1|A_2) = \frac{P(S_1A_2)}{P(A_2)} = 0.0658$$

$$P(S_2|A_2) = \frac{P(S_2A_2)}{P(A_2)} = 0.2634$$

$$P(S_3|A_2) = \frac{P(S_3A_2)}{P(A_2)} = 0.6711$$

The expectations are

$$E_{corn}(S|A_1) = 0.4942 * 30000 + 0.157 * -35000 = 9331.0$$

$$E_{bean}(S|A_1) = 0.4942 * 10000 + 0.157 * -5000 = 4157.0$$

$$E_{corn}(S|A_2) = 0.0658 * 30000 + 0.6711 * -35000 = -21514.5$$

$$E_{bean}(S|A_2) = 0.0658 * 10000 + 0.6711 * -5000 = -2697.5$$

In a word, if the agent favorite the plan, planting corn can make the best expectational profits 9331 dollars. Otherwise, using the land as pasture is better to have 7500 dollars profits.