

Problem 3: Consider the data given in problem 2 and 3 for the National Foods. The firm can hire the noted sport's pundit Jim Worden to give his opinion as to whether or not the Super Bowl game will be interesting. Suppose the following probabilities hold for Jim's predictions:

$P(\text{Jim predicts game will be interesting} \mid \text{game is dull}) = .15$

$P(\text{Jim predicts game will be interesting} \mid \text{game is average}) = .25$

$P(\text{Jim predicts game will be interesting} \mid \text{game is above average}) = .50$

$P(\text{Jim predicts game will be interesting} \mid \text{game is exciting}) = .80$

$P(\text{Jim predicts game will not be interesting} \mid \text{game is actually dull}) = .85$

$P(\text{Jim predicts game will not be interesting} \mid \text{game is average}) = .75$

$P(\text{Jim predicts game will not be interesting} \mid \text{game is above average}) = .50$

$P(\text{Jim predicts game will not be interesting} \mid \text{game is exciting}) = .20$

(You may graph a decision tree, in order to make the problem transparent)

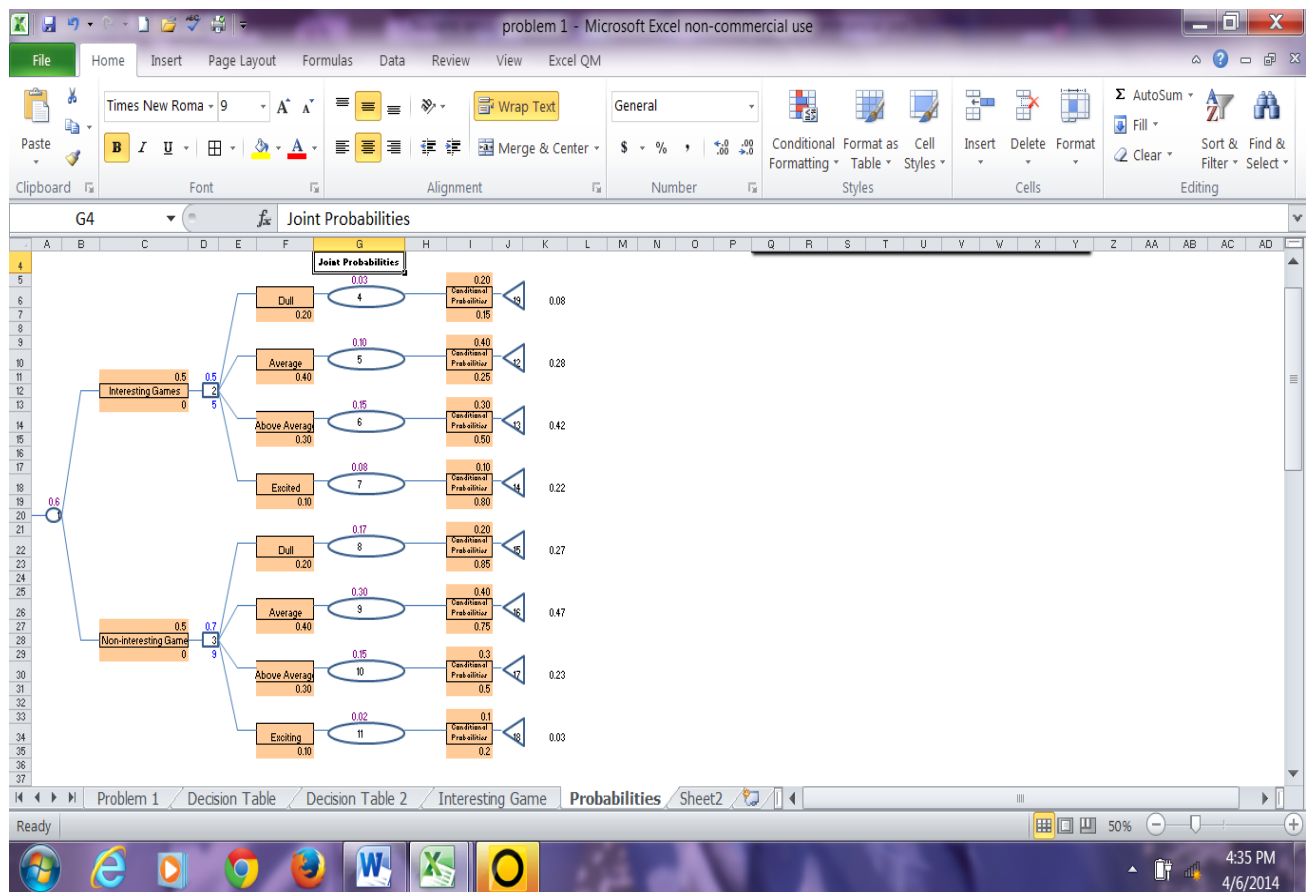
problem 1 - Microsoft Excel non-commercial use

| National Food's Decision Tables | | | | | | | | | |
|---|---------|---------|---------------|---------|-------------------------------|---|----------|---------|--|
| Data | | | | | Results | | | | |
| Number of 30-second Commercials Purchased | Dull | Average | Above Average | Excited | EMV | Minimum | Maximum | | |
| Probability | 0.15 | 0.25 | 0.50 | 0.80 | Probabilities do not sum to 1 | | | | |
| One | (\$2) | \$3 | \$7 | \$13 | \$14.35 | (\$2.00) | \$13.00 | | |
| Two | (\$5) | \$6 | \$12 | \$18 | \$21.15 | (\$5.00) | \$18.00 | | |
| Three | (\$9) | \$5 | \$13 | \$22 | \$24.00 | (\$9.00) | \$22.00 | | |
| | | | | | Maximum | \$24.00 | (\$2.00) | \$22.00 | |
| Expected Value of Perfect Information | | | | | | | | | |
| Column best | \$ (2) | \$ 6 | \$ 13 | \$ 22 | \$25.30 | c-Expected value WITH perfect information | | | |
| | | | | | \$24.00 | c-Best expected value | | | |
| | | | | | \$ 1.30 | c-Expected value OF perfect information | | | |
| Regret | | | | | | | | | |
| | Dull | Average | Above Ave | Excited | Expected | Maximum | | | |
| Probability | 0.15 | 0.25 | 0.5 | 0.8 | | | | | |
| One | \$ - | \$ 3.00 | \$ 6.00 | \$ 9.00 | \$ 10.95 | \$ 9.00 | | | |
| Two | \$ 3.00 | \$ - | \$ 1.00 | \$ 4.00 | \$ 4.15 | \$ 4.00 | | | |
| Three | \$ 7.00 | \$ 1.00 | \$ - | \$ - | \$ 1.30 | \$ 7.00 | | | |
| | | | | | Minimum | \$ 1.30 | \$ 4.00 | | |

Ready

Problem 1 / Decision Table / Decision Table 2 / Interesting Game / Sheet3 / Sheet2

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a. Jim predict the game will be interesting, what is the If probability the game will be dull?

If Jim predicted that game would be interesting, IF probability that the game will be dull 8.3%.

(Prior probability) $.20 * (\text{Conditional probability}) .15 = .03$

$.03 + .10 + .15 + .08 = .36$ (the sum of all of the prior probability * conditional probability)

$.03/.36 = .083$ converted into a percent is 8.3%

problem 1 - Microsoft Excel non-commercial use

| | A | B | C | D | E | F | G | H | I | J | K | L | M |
|----|--------------------|-------------------|---------------------------|---|-------------------------|--|---|---|---|---|---|---|---|
| | | Prior Probability | Conditional Probabilities | Prior Probability * Conditional Probabilities | Posterior Probabilities | Posterior Probabilities Converted to Percentages | | | | | | | |
| 1 | States of Nature | | | | | | | | | | | | |
| 2 | Dull Game | 0.20 | 0.15 | 0.03 | 0.083 | 8.3% | | | | | | | |
| 3 | Average Game | 0.40 | 0.25 | 0.10 | 0.278 | 27.8% | | | | | | | |
| 4 | Above Average Game | 0.30 | 0.50 | 0.15 | 0.417 | 41.7% | | | | | | | |
| 5 | Exciting Game | 0.10 | 0.80 | 0.08 | 0.222 | 22.2% | | | | | | | |
| 6 | | | P(p) = | 0.36 | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |

Decision Table Decision Table 2 Interesting Game Probabilities Posterior Probabilities

b. What is the national's strategy if Jim predicts the game will be (i) Interesting or (ii) not interesting?

problem 1 - Microsoft Excel non-commercial use

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q |
|----|--|-------------------|---------------------------|---|-------------------------|--|---|---|---|---|---|---|---|---|---|---|---|
| | | Prior Probability | Conditional Probabilities | Prior Probability * Conditional Probabilities | Posterior Probabilities | Posterior Probabilities Converted to Percentages | | | | | | | | | | | |
| 1 | Interesting Games States of Nature | | | | | | | | | | | | | | | | |
| 2 | Dull Game | 0.20 | 0.15 | 0.03 | 0.083 | 8.3% | | | | | | | | | | | |
| 3 | Average Game | 0.40 | 0.25 | 0.10 | 0.278 | 27.8% | | | | | | | | | | | |
| 4 | Above Average Game | 0.30 | 0.50 | 0.15 | 0.417 | 41.7% | | | | | | | | | | | |
| 5 | Exciting Game | 0.10 | 0.80 | 0.08 | 0.222 | 22.2% | | | | | | | | | | | |
| 6 | | | P(p) = | 0.36 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | |
| 9 | Non-interesting Games States of Nature | | | | | | | | | | | | | | | | |
| 10 | Dull Game | 0.20 | 0.85 | 0.17 | 0.266 | 0.27% | | | | | | | | | | | |
| 11 | Average Game | 0.40 | 0.75 | 0.30 | 0.469 | 0.47% | | | | | | | | | | | |
| 12 | Above Average Game | 0.30 | 0.50 | 0.15 | 0.234 | 0.23% | | | | | | | | | | | |
| 13 | Exciting Game | 0.10 | 0.20 | 0.02 | 0.031 | 0.03% | | | | | | | | | | | |
| 14 | | | P(n) = | 0.64 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | | | | | |

Decision Table 2 Interesting Game Probabilities Posterior Probabilities Sheet6

One interesting $\rightarrow .083 * (2) + 0.278 * 3 + 0.417 * 7 + 0.222 * 13 = \6.47

Two interesting $\rightarrow .083 * (5) + 0.278 * 6 + 0.417 * 12 + 0.222 * 18 = \10.25

Three interesting $\rightarrow .083 * (9) + 0.278 * 5 + 0.417 * 13 + 0.222 * 22 = \10.95

(i) If Jim predicts that the game will be interesting, then they should purchase three commercials.

One non-interesting $\rightarrow 0.266 * (2) + 0.469 * 3 + 0.234 * 7 + 0.031 * 13 = \2.92

Two non-interesting $\rightarrow 0.266 * (5) + 0.469 * 6 + 0.234 * 12 + 0.031 * 18 = \4.85

Three non-interesting $\rightarrow 0.266 * (9) + 0.469 * 5 + 0.234 * 13 + 0.031 * 22 = \3.68

(ii) If Jim predicts that the game will not be interesting, then they should purchase two commercials.

c. What is expected value of Jim's information?

EV(strategy per page 564 in the text)

$P(p) 0.36 * 10.95 + P(n) 0.64 * 4.85 = \7.05

EVSI = EV with information – EV without information (per page 566)

$EVSI = 7.05 - 6.80 \text{ (at 3 commercials in earlier analysis)} = \0.25
