# Stats 115 Homework 4

1. $E[V|F] = \sum_V V \cdot p(V|F) = -7 \cdot 0.5 + 5 \cdot 0.3 + 20 \cdot 0.2 = 2$

   $E[V|\neg F] = \sum_V V \cdot p(V|\neg F) = 0$

   Based on the expected value, you should found the company.

2. $P(M|S=s) = \dfrac{p(m) \, p(S=s|m)}{p(S=s)}$   $p(S=s) = \sum_m p(S=s|m) p(m)$

   $S_0: \ 0.5 \cdot 0.6 + 0.3 \cdot 0.3 + 0.2 \cdot 0.1 = 0.41$

   $S_1: \ 0.5 \cdot 0.3 + 0.3 \cdot 0.4 + 0.2 \cdot 0.4 = 0.35$

   $S_2: \ 0.5 \cdot 0.1 + 0.3 \cdot 0.3 + 0.2 \cdot 0.5 = 0.24$

   $P(M|S) = $

   | | $m_0$ | $m_1$ | $m_2$ |
   |---|---|---|---|
   | $S_0$ | $\dfrac{0.5 \cdot 0.6}{0.41} = 0.732$ | $\dfrac{0.3 \cdot 0.3}{0.41} = 0.220$ | $\dfrac{0.2 \cdot 0.1}{0.41} = 0.049$ |
   | $S_1$ | $\dfrac{0.5 \cdot 0.3}{0.35} = 0.429$ | $\dfrac{0.3 \cdot 0.4}{0.35} = 0.343$ | $\dfrac{0.2 \cdot 0.4}{0.35} = 0.229$ |
   | $S_2$ | $\dfrac{0.5 \cdot 0.1}{0.24} = 0.208$ | $\dfrac{0.3 \cdot 0.3}{0.24} = 0.375$ | $\dfrac{0.2 \cdot 0.5}{0.24} = 0.417$ |

   $E[V|F, S_0] = -3.044$

   $E[V|F, S_0] = 3.292$

   $E[V|\neg F, S_i] = 0$

   $E[V|F, S_2] = 8.759$

   By inspection, we can quickly see that you should not found when $S = S_0$ and you should found when $S = S_1$ or $S = S_2$.

3. As calculated above, $P(S) = $

   | $S_0$ | $S_1$ | $S_2$ |
   |---|---|---|
   | 0.41 | 0.35 | 0.24 |

   $E[V|Q] = \max(E[V|F, Q], E[V|\neg F, Q])$

4. $VPI(S) = \left( \sum_i P(S=s_i) E[V|s_i] \right) - E[V]$

   $= 0.41 \cdot 0 + 0.35 \cdot 3.292 + 0.24 \cdot 8.759 - 2 = 3.254 - 2 = 1.254$

   You should pay at most 1.254