

Advanced Operations Management

Solution to Homework 4

Let F denote a favorable recommendation
 Q1 Let G denote a good (non-default) loan

P. 72 #1

Given: $P\{F|G\} = \frac{77}{96} \Rightarrow P\{\bar{F}|G\} = \frac{19}{96} = 1 - \frac{77}{96}$

$P\{G\} = .96$ $P\{F|\bar{G}\} = \frac{1}{4} \Rightarrow P\{\bar{F}|\bar{G}\} = \frac{3}{4} = 1 - \frac{1}{4}$
 $\Rightarrow P\{\bar{G}\} = .04$

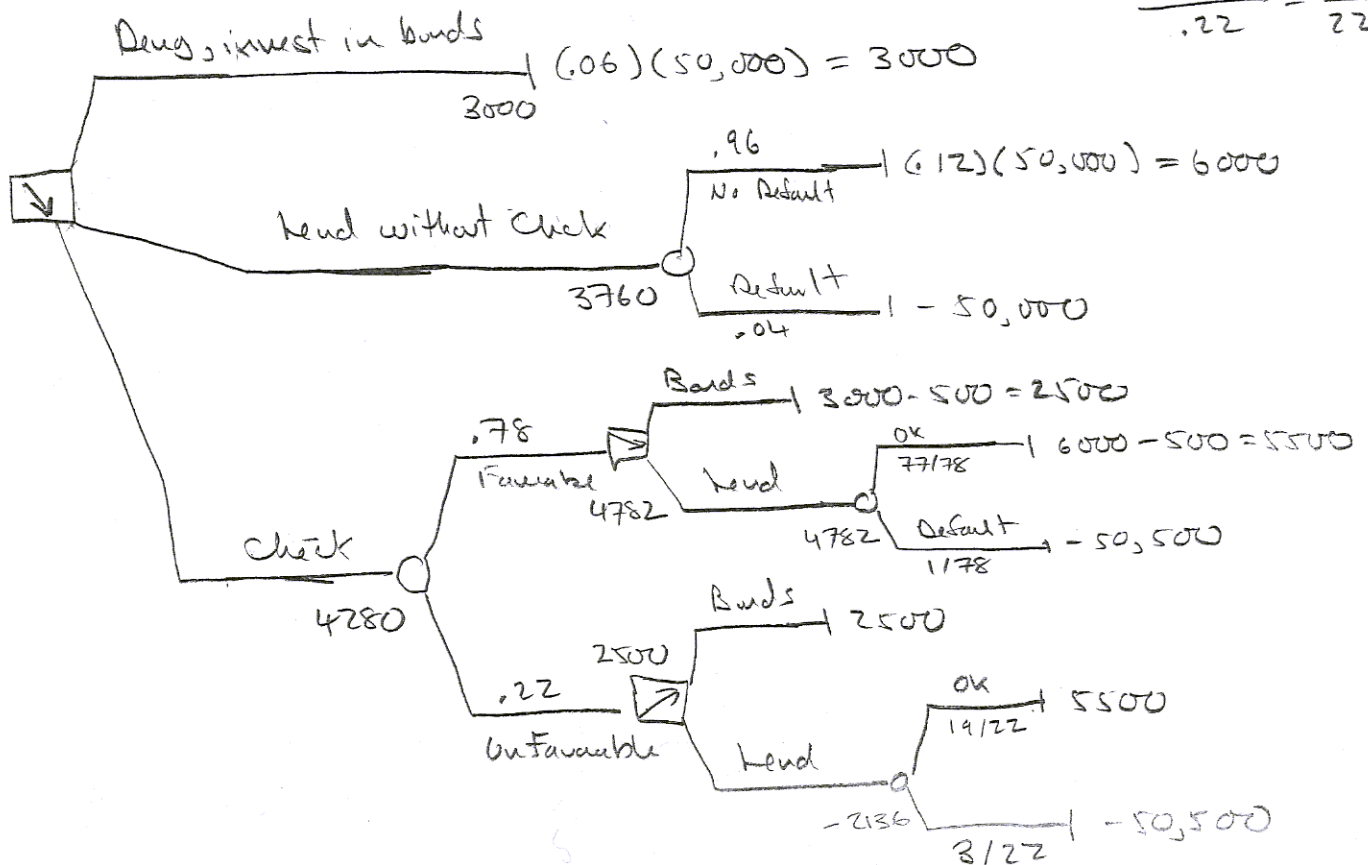
$$P\{F\} = P\{F|G\}P\{G\} + P\{F|\bar{G}\}P\{\bar{G}\}$$

$$= \frac{77}{96}(.96) + \frac{1}{4}(.04) = .77 + .01 = .78$$

So $P\{\bar{F}\} = .22 = 1 - .78$

$P\{G|F\} = \frac{.77}{.78} = \frac{77}{78}$

$P\{G|\bar{F}\} = \frac{P\{F|G\}P\{G\}}{P\{\bar{F}\}}$
 $= \frac{\frac{77}{96} \cdot .96}{.22} = \frac{19}{22}$



So...

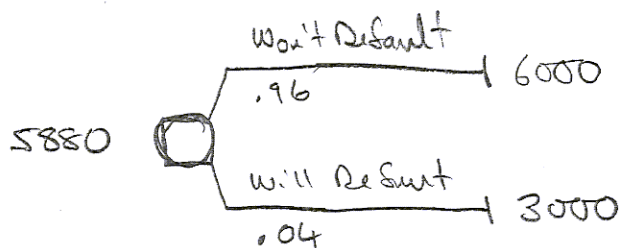
Perform the credit check.

If favorable, lend; otherwise, invest in bonds.

$$EVSI = (4280 + 500) - 3760 = 1020$$

↑
cost of check

EVPI: with a perfect test, we have



With no information, we would have an EV of 3760,
so

$$EVPI = 5880 - 3760 = \$2120.$$

Q2

P. 72 #5

Events: H = film is a hit
 U = "Thumbs up" from critic

Given:

$$P\{H\} = 0.1 \quad \Rightarrow \quad P\{\bar{H}\} = 0.9$$

$$P\{U|H\} = 0.6 \quad \Rightarrow \quad P\{\bar{U}|H\} = 0.4$$

$$P\{\bar{U}|\bar{H}\} = 0.9 \quad \Rightarrow \quad P\{U|\bar{H}\} = 0.1$$

Bayes computations:

$$\begin{aligned} P\{U\} &= P\{U|H\}P\{H\} + P\{U|\bar{H}\}P\{\bar{H}\} \\ &= (0.6)(0.1) + (0.1)(0.9) \\ &= .06 + .09 \\ &= .15 \end{aligned}$$

$$\Rightarrow P\{\bar{U}\} = .85$$

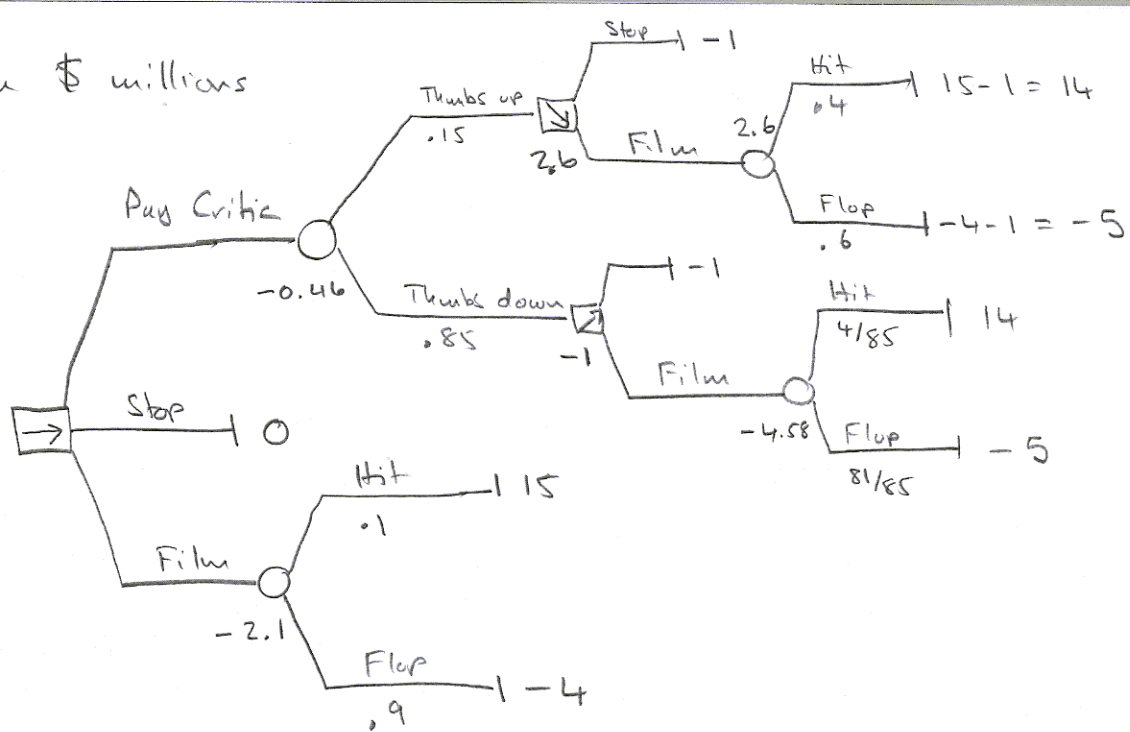
$$P\{H|U\} = \frac{P\{U|H\}P\{H\}}{P\{U\}} = \frac{.06}{.15} = \frac{2}{5} = 0.4$$

$$\Rightarrow P\{\bar{H}|U\} = 0.6$$

$$P\{H|\bar{U}\} = \frac{P\{\bar{U}|H\}P\{H\}}{P\{\bar{U}\}} = \frac{(0.4)(0.1)}{.85} = \frac{4}{85}$$

$$\Rightarrow P\{\bar{H}|\bar{U}\} = \frac{81}{85}$$

In \$ millions



Don't do anything!

$$\begin{aligned}
 EVSI &= (\text{Value with free test}) - (\text{Value without test option}) \\
 &= (-0.46 + 1) - 0 \\
 &= 0.54 \quad (\$ \text{ million})
 \end{aligned}$$

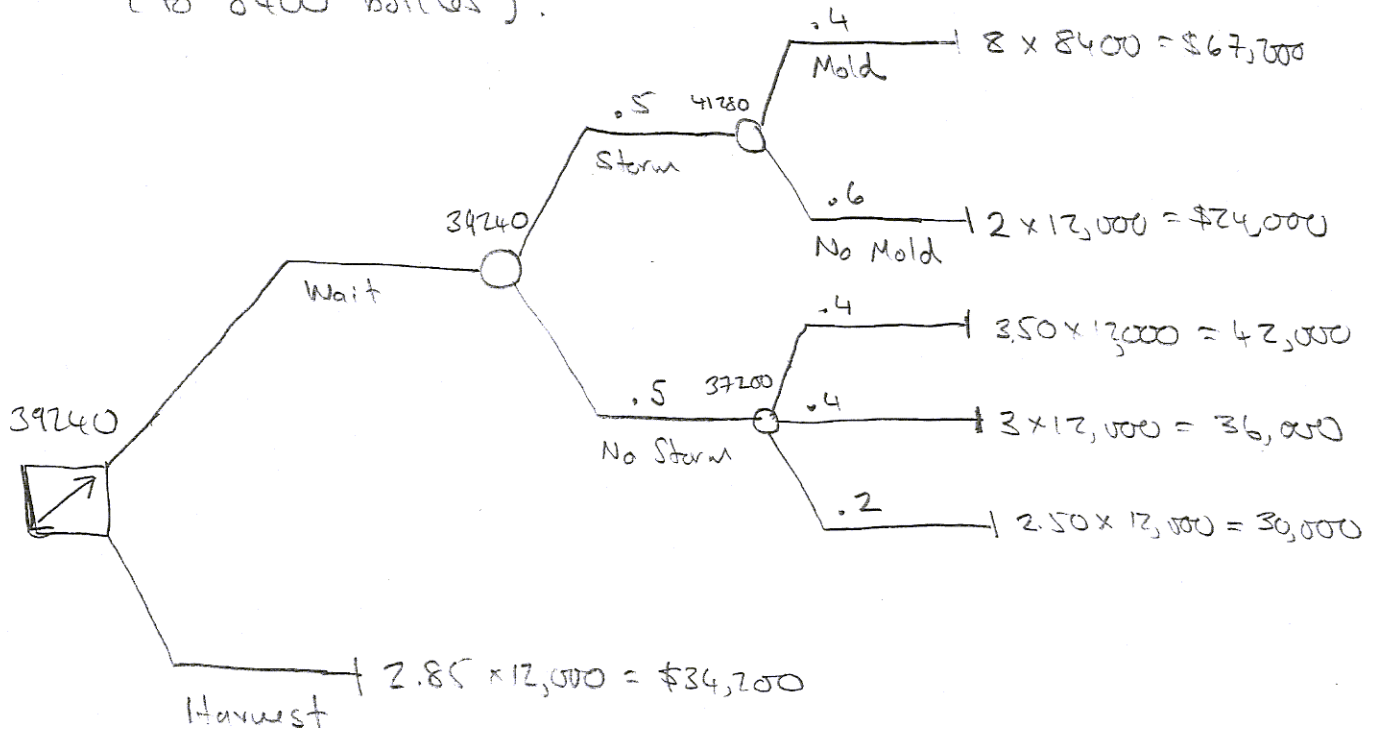
EVPI :

$$(\text{with free perfect test}) = \begin{array}{l} \text{Hit } 0.1 \rightarrow 15 \\ \text{Flop } 0.9 \rightarrow 0 \end{array} = 1.5$$

$$\begin{aligned}
 EVPI &= (\text{Value with perfect test}) - (\text{Value with no test}) \\
 &= 1.5 - 0 \\
 &= 1.5 \quad (\$ \text{ million})
 \end{aligned}$$

Q3 Freemank Abbey Case

(a) Freemank bottles 1,000 cases = 12,000 bottles of Riesling per year. Note that the tree below can be done per bottle too, if you simply adjust the Botrytis outcome by 0.7, since there is a 30% reduction in volume (to 8400 bottles).



We should wait and take our chances with the storm.

(b) Riesling constitutes only 1,000 cases out of the 25,000 cases Freemank bottles each year. There is no mention of the firm being in financial distress. Since this decision involves only about $\frac{1000}{25000} = 4\%$ of total production, an EMV approach is appropriate. If the decision involved a larger percentage of production and the firm was not well-established, a more risk-averse approach might make sense.