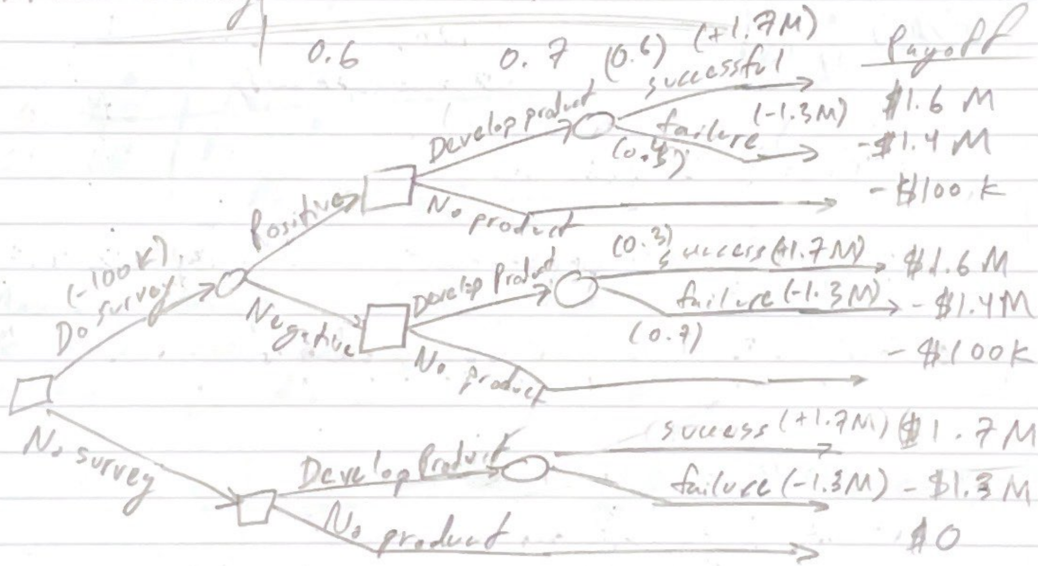
Agustin Espinoza SIE 321 - HW5 2/17/23

1. Telemore Company marketing a new product.

a) Find the optimal policy whether to conduct the market survey and whether to develop and market the new product.

- payoff matrix

	States of Nature	
Actions	successful	unsuccessful
Conduct Survey	1600000	-1400000
Don't Conduct Survey	1700000	-1300000
	0.6	0.7



$$E[Payoff(Success \mid Positive)] = 0.6(1600000) - 0.4(1400000) = \$400,000$$

$$E[Payoff(failure \mid Negative)] = 0.3(1,700,000) + 0.7(-1300000) = -\$400,000$$

Optimal decision is to conduct a market survey and develop the product if the survey feedback is positive.

b) EVPI = E[Payoff | Perfect Info] − E[Payoff | uncertainty, w/o exper.]

E[Payoff | Perfect Info] = 0.6(1600000) − 0.4(1400000)

EVPI = $400,000

Maximum cost of survey that makes it worth conducting is any number under $\boxed{\$400,000}$

c) What if the survey methods could be improved, what is the max cost of such an improved survey?

E(Profit | Improved Survey) = 0.7(1700000) + 0.3(1300000) − C

= 490,000 − C

E[Profit | Improved survey] ≥ E[profit | survey]

490000 − C ≥ 200000

C ≤ 290000

Max cost of improved survey is $\boxed{\$290,000}$

2. The Hit-and-Miss Company produces items that have a probability p of being defective.

a) Find the optimal policy that minimizes the expected cost of manufacturing.

D - randomly selected item is defective

G - quality of lot is good ($p = 0.05$)

B - quality of lot is bad ($p = 0.04$)

S - screen each item in the lot

N - No screening

I - Initial inspection on randomly selected item from lot.

$P(I|G) = 1 - P(D|G) = 1 - 0.05 = 0.95$

$P(I|B) = 1 - P(D|B) = 1 - 0.04 = 0.6$

$$P(G|I) = \frac{P(I|G)P(G)}{P(I|G)P(G) + P(I|B)P(B)} = \frac{0.95(0.9)}{0.95(0.9) + 0.6(0.1)} = 0.9692$$

$$P(B|I) = \frac{P(I|B)P(B)}{P(I|B)P(B) + P(I|G)(P(G)} = \frac{0.6(0.1)}{0.95(0.9) + 0.6(0.1)} = 0.0308$$

$E[P(G|I)] = 0(0.9692) + 500(0.0308) = \$15.40$

$E[P(B|I)] = 0.0308(1000 + 4000) + 0.9692(10000)$
$= \$10,971.21$

$E[P(I|D)] = 0.9(0.05)(20 + 1099) + 0.1(0.4)(20 + 1099) = \$2180$

∴ Optimal policy is to inspect the first item of each lot and screen the entire lot if found to be defective. Expected policy cost per lot is $\boxed{\$2180}$.

b) Compute EVPI:

$EVPI = E[Payoff | Perfect\ Info] - E[Payoff | Uncertainty]$

$= 2180 - [0.9(0.5)(20 + 10010) + 0.1(0.4)(1010090)]$

$= 2180 - 460$

$\boxed{EVPI = \$1720}$

c) Compute EVE:

$EVE = 2180 - 943.5 = 1236.5$

$\boxed{EVE = \$1236.5}$

3. Determine how NBS TV Network can max its expected profits by deciding whether a given show should be developed & aired, or cancelled. Also find the most the Network should pay the market research firm, and how much the network can afford to pay on any study of the show's potential popularity.

Hit = H, Flop = F, M = Hit by research firm, N = Flop by research firm

$P(H) = 0.25$

$P(F) = 0.75$

$P(M|H) = 0.9$

$P(N|H) = 0.1$

$P(N|F) = 0.8$

$P(M|F) = 0.2$

$P(M) = P(M|H)P(H) + P(M|F)P(F)$

$= 0.9(0.25) + 0.2(0.75)$

$P(M) = 0.325$

$P(H|M) = \frac{0.9(0.25)}{0.325} = 0.6923$

$P(F|M) = \frac{0.2(0.75)}{0.325} = 0.4615$

- The expected profit of developing and airing a show:

$400000(0.6923) + (-100000)(0.4615) = \boxed{\$169230}$

To maximize its expected profits, the network should develop and air a show.

The EVPI gives us how much money the network should pay to the research firm.

$EVPI = 400000(0.25) - 0.75(100000) \boxed{\$25000}$