

Exercise Set #8

1. Suppose that Raiffa's oil wildcatter can hire a company to do a geological study of the site on which he has oil rights, in order to provide himself with somewhat better information about the site's characteristics. There are two possible outcomes of the study: the company may tell him that "the site looks good" or that "the site looks bad." Denote these possible "draws" by G and B, respectively. If the site is actually dry, there is a 50% chance the study will report that it is Good and a 50% chance the study will report that it is Bad. If the site actually has oil (whether it is soaked with oil or has only a more moderate amount of oil), there is a 75% chance the study will say the site is Good and only a 25% chance it will be reported to be Bad.

(a) If the wildcatter were to commission the geological study, determine the updated (i.e. revised) probabilities the wildcatter would assign to the three states D, W, and S after he obtains the results of the study.

(b) If the wildcatter were to commission the study, determine his optimal strategy for using the information it will provide.

(c) If the study will cost the wildcatter \$4000, determine whether he should commission the study.

2. A bookstore owner can purchase 20,000 of a publisher's unsold books for fifty cents per book. By advertising, he hopes to be able to sell the books for \$2 per book. Any books he does not sell at retail can be sold in bulk for twenty cents per book. Advertising will cost \$12,000 and it will cost 25 cents to ship each book that is sold. The bookstore owner estimates demand as follows: he believes there is a 10% chance he will sell 5,000 books; a 50% chance he will sell 10,000; and a 40% chance he will sell all 20,000 books.

(a) Should he purchase the books?

(b) What is the expected value of perfect information?

(c) Suppose that the variation in payoffs across the states were much larger – for example, the net payoff to buying the books is say \$100,000 if demand turns out to be 20,000; -\$500 if demand turns out to be 10,000; and -\$10,000 if demand turns out to be only 5,000. Determine the expected value of perfect information in this situation.

3. Miracle Pictures must decide whether to open its new movie in limited engagements or in a widespread release. For movies with the potential to be smash hits, a limited-engagement opening and its accompanying media blitz generally produce the kind of hype that often yields huge profits. Studio executives believe this movie is in a class of which about a quarter of the movies are smash hits (A movies), half are medium grossers (B movies), and a quarter are flops (C movies). Expected profits for such movies, depending on whether they're opened in limited engagements or in widespread releases, are as follows, in millions of dollars:

	Limited	Widespread
A: Smash	60	48
B: Medium	36	30
C: Flop	-24	-12

Miracle Pictures uses expected monetary value to make its decisions.

(a) Draw the decision tree for Miracle Pictures' decision problem. Determine the expected monetary value of each of its options.

The studio sometimes tests a movie's appeal by showing it in so-called "sneak previews" before deciding whether to open it in limited engagements or in widespread release. Unfortunately, sneak preview audiences often rate even eventual flops quite high, so the information obtained from a sneak preview is not very reliable. And since it will cost two million dollars to conduct a sneak preview campaign, some of the studio executives are against doing so. Recent experience with sneak previews is as follows: 40 movies have been sneak previewed, of which 30 were given "thumbs up" ratings by the audience (10 of these turned out to be smash hits, 15 turned out to be medium grossers, and 5 were flops) and 10 movies were given "thumbs down" by the preview audiences (five of these turned out to be medium grossers, and five were flops).

(b) Determine all six conditional probabilities $\Pr(s|d)$, where s denotes the true state of the world and d denotes the studio's informational "draw," the reaction of the sneak preview audience.

(c) Draw the "sneak preview" branch of the studio's decision tree. Determine Miracle Pictures' optimal strategy for using the information from a sneak preview, and the expected marginal value of the information a sneak preview will provide. Should Miracle Pictures conduct the preview? Show the studio's *complete* best strategy on the decision tree in (a) and (c) by placing an arrow on the best branch emanating from each of the studio's potential decision nodes.

(d) Eddie (Fast Eddie) Spiegelman, a junior producer, has proposed a plan for a much better sneak preview campaign, which will cost five million dollars per movie and will provide much more reliable information about a movie's likelihood of success. Would you promote Eddie or fire him? Explain, using the concept of perfect information.