

The University of New South Wales

GSOE 9830 – Economic Decision Analysis in Engineering

Sample questions:

The number of the questions in the final exam can be more.

This is only for practice and the questions are going to be different from these.

- 1. Time allowed – 2 Hours.**
 - 2. Use your own words and calculations entirely.**
 - 3. If you use excel, make sure that you demonstrate the logic of your calculations not just single values. You can use proper excel functions.**
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Question

A pharmaceutical company has two market options: Market Asia and Market Australia. Initial studies demonstrate different Net Present Values with different probabilities for each of the markets as given in following tables.

NPVs for Asia \$ million	Probability %
30	25%
50	70%
120	15%

NPVs for Australia \$ million	Probability %
10	5%
80	25%
90	70%

- 1.1 Assuming that there is no correlation between the NPVs of the investments, calculate and tabulate the probability distribution of the total NPVs of investing in both Market Asia and Australia. Please provide the following values in your calculations:
Mean, Median, the standard deviation, the total NPV associated with cumulative probability of 0.9 and the total NPV associated with cumulative probability of 0.15.

Question

Consider an investment project in a mining industry with following NPV outcomes and their probabilities. We drill the mine, the outcome can be successful, and we can find silver, or it can fail and mine does not have any silver. The 400 Million value of success includes the initial cost of mining which is 30 Million dollars as given as the failure value.

Success: (0.15, 400)

Failure: (0.95, -30)

- 3.1 The shareholders do not trust the probability values and asked us to find the breakeven probability point for success. How do you calculate that? They also want you to draw a figure showing the expected NPV values as a function of probability values.

Question

A manufacturing company plans to develop a new type of battery for earplugs that help the patients suffering from hearing loss. However, the engineers are not certain about the level of effectiveness of the new battery. Depending on the efficacy level of the battery they can succeed or fail in the market. The company therefore is considering carrying out a test in a small group of customers to test the efficacy level of the new battery. The test might suggest that the battery is very effective, or it might suggest that the battery is less effective. However, the company can alternatively introduce the new battery to the market without carrying out any test on a limited group. Also, the company can decide to carry on their business without introducing the new battery. The company has not decided on the unit price for the battery yet and the unit price is formulated as a function of the cost. So, they only have cost figures for different options.

The company gathered the following information

- (a) The present value ("PV") of the future operating costs without the test and without introducing new battery are \$3,000.

- (b) With the new battery released to the market, if the battery attracts high market demand, the PV of the future operating costs is \$400.
- (c) With the new battery released to the market, if the battery attracts low market demand, the PV of the future operating costs is \$1800.
- (d) The PV of the capital and operating costs of the initial test is \$100.
- (e) The PV of the initial capital costs of introducing the new battery across the whole operation is \$1,000.
- (f) Without the test and with the introducing the new battery, there is a 60% probability that the battery demand in the market will be low. There is a corresponding 40% probability that the battery 'demand will be high.
- (g) If the battery is introduced and the demand eventually turn out to be low, there is a 60% probability that an initial test will correctly indicate low efficiency of the battery (suggesting low market demand). There is a corresponding 40% probability that they will incorrectly suggest that the battery is highly effective and suggest the market demand will be high.
- (h) If the battery is introduced and their demand eventually turn out to be high, there is an 80% probability that an initial test will correctly indicate the efficiency of the battery (high suggesting market demand). There is a corresponding 20% probability that they will incorrectly suggest that the battery efficiency and suggest their demand will be low.

Questions

- 3.1 Calculate the probabilities of the different cost outcomes given the different possible results of the test.
 - 3.2 Draw and solve a decision tree to help you answer the questions below.
 - 3.3 Should you carry out a test before introducing the battery to the market? Why?
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