



B.E. International Program

Faculty of Economics, Thammasat University



EE 465/463 Project Evaluation

Semester 2/2014

Homework Assignment 2

Due 3pm April 10, 2015 (at my office: 428)

There are four questions in total; each is worth 10 points. Use diagrams to illustrate your answers when needed.

1. The prevalence of a disease among a certain population is .40. That is, there is a 40 percent chance that a person randomly selected from the population will have the disease. An imperfect test that costs \$250 is available to help identify those who have the disease before actual symptoms appear. Those who have the disease have a 90 percent chance of a positive test result; those who do not have the disease have a 5 percent chance of a positive test. Treatment of the disease before the appearance of symptoms costs \$2,000 and inflicts additional costs of \$200 on those who do not actually have the disease. Treatment of the disease after symptoms have appeared costs \$10,000. The government is considering the following possible strategies with respect to the disease:
 - S1. Do not test and do not treat early.
 - S2. Do not test and treat early.
 - S3. Test and treat early if positive and do not treat early if negative.

Find the treatment/testing strategy that has the lowest expected costs for a member of the population.

Hint

The following notation may be helpful: Let D indicate presence of the disease, ND absence of the disease, T a positive test result, and NT a negative test result. Thus, we have the following information:

$$P(D) = .40, \text{ which implies } P(ND) = .60$$

$$P(T|D) = .90, \text{ which implies } P(NT|D) = .10$$

$$P(T|ND) = .05, \text{ which implies } P(NT|ND) = .95$$

This information allows calculation of some other useful probabilities:

$$P(T) = P(T|D)P(D) + P(T|ND)P(ND) = .39 \text{ and } P(NT) = .61$$

$$P(D|T) = P(T|D)P(D)/P(T) = .92 \text{ and } P(ND|T) = .08$$

$$P(D|NT) = P(NT|D)P(D)/P(NT) = .07 \text{ and } P(ND|NT) = .93$$

2. The initial cost of constructing a permanent dam (i.e., a dam that is expected to *last forever*) is \$500 million. The annual net benefits will depend on the amount of rainfall: \$18 million in a “dry” year, \$29 million in a “wet” year, and \$52 million in a “flood” year. Meteorological records indicate that over the last 100 years there have been 86 “dry” years, 12 “wet” years, and 2 “flood” years. Assume the annual benefits, measured in real dollars, begin to accrue at the end of the first year.
 - a. Using the meteorological records as a basis for prediction, what are the net benefits of the dam if the real discount rate is 5 percent?
 - b. Instead of assuming the real discount rate is 5 percent, use several alternative discount rate values to investigate the sensitivity of the present value of net benefits of the dam. What is the breakeven value of the discount rate?

3. A worker, who is typical in all respects, works for a wage of 500,000 baht per year in a perfectly safe occupation. Another typical worker does a job requiring exactly the same skills as the first worker, but in a risky occupation with a known death probability of 5 in 1,000 per year, and receives a wage of 600,000 baht per year.

- a. What value of a human life for workers with these characteristics should a cost-benefit analyst use?
 - b. If the death probability associated with the occupation-related risk increases to 10 in 1,000 per year, what is the new value of statistical life?
4. Consider a project that would involve purchasing marginal farmland that would then be allowed to return to wetlands capable of supporting migrant birds. Researchers designed a survey to implement the dichotomous choice method. They reported the following data:

Stated Price (annual payment in dollars)	Fraction of Respondents Accepting Stated Price (percent)
0	98
10	91
20	82
30	66
40	48
50	32
60	20
70	12
80	6
90	4
100	2

What is the mean willingness to pay for the sampled population?