

Bus 273: Statistical Analysis for Business

Fall 2011

PROBLEM SHEET # 11

Problem 1: We assume the circumstances explained in Problem 2 of Problem Sheet # 10.

- a) Find a duration $q_{0.8}$ such that the entire project will be completed in at most $q_{0.8}$ days with probability 0.8. Use a suitable normal distribution to approximate the exact distribution of X . (The value $q_{0.8}$ is the 80% quantile of the distribution of X , i.e. $P(X \leq q_{0.8}) = 0.8$.)
- b) Similar projects have to be carried out regularly. For the next five repetitions, find the probability that the time $q_{0.8}$ will be exceeded at most once. (Hint: Use the distribution of N = number of times $q_{0.8}$ is exceeded in five repetitions of the project. Assume that project repetitions are independent.)

Problem 2: When the euro was introduced, statisticians said that the one euro coin does not have an equal chance of landing “heads” or “tails”. They allege that, when spun on a smooth surface, the coin comes up heads more often.

In a spin experiment carried out by students, this coin fell heads 537 times in a series of 1000.

- a) Assuming the coin is fair, what is the probability that it falls heads more than 537 times when spun 1000 times?
- b) Assuming the coin is fair, what is the probability that it falls heads more than 537 times or less than 463 times when spun 1000 times?

Problem 3: The expected time between two damage events experienced by a typical customer of a certain property insurance is 20 years.

- a) Why can we use the exponential distribution for the time between two damage events? (Hint: Don't forget the properties of the exponential distribution.)
- b) What is the value of the parameter λ of the exponential distribution in this case? (Mind the unit of measurement.)
- c) How many damage events would you expect to happen in a group of 100 customers within a year?
- d) Write down the expression of the probability that a customer will not suffer a damage event during the next 10 years.
- e) Now consider a group of 10000 insurants (customers of the insurance). Let N = number of those among the 10000 who will stay damage-free during the next 10 years. What is the distribution of N ? Give reasons for your answer. (Hint: The probability in (d) is 0.607.)
- f) From the insurance's point of view: Why is it useful to know the distribution in (e)?