Harald Schmidbauer
Sema Bayraktar
Barış Yilmazsoy
Yelda Yücel

İstanbul Bilgi Üniversitesi

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)?