

Facultad de Economía y Empresa
Grado en Administración y Dirección de Empresas
STATISTICAL METHODS FOR BUSINESS
Convocatoria de Mayo. 28/05/2012

1. Let X and Y be independent random variables:
 - a) Deduce the abbreviated formula for the variance of X .
 - b) Show that the variance of $X + Y$ is the sum of the variances of the two summands.

2. Derive the expression for the pivotal statistic used to carry out inferences on the population mean, given a simple random sample of size n drawn from a normal population with unknown variance. Reason what probability distribution has the pivot.

3. Let X be a $N(\mu, \sigma)$ population from which a simple random sample of size 5 is drawn, $(X_1, X_2, X_3, X_4, X_5)$.
 - a) What are the basic characteristics of the variables in the sample? What probability distribution do they have?
 - b) The following estimators are proposed in order to estimate μ :

$$T_1 = \bar{X}_5 \qquad T_2 = \frac{X_1 + 2X_3 + X_4 + X_5}{5}$$

Given $MSE_{T_1}(\mu) = \frac{\sigma^2}{5}$, analyze which of the two estimators is more efficient.

4. The owner of a gift shop located in a thematic estimates that 30% of park visitors come to his store.
 - a) Calculate the probability that the third visitor to the park is the first to go to the store.
 - b) 200 visitors have come to the park one morning. What is the probability that at least 70 of them go to the store?
 - c) Expenditures (X , in euros) of each customer of the store is a random variable with expectation 6 and standard deviation 1.5. Calculate the probability that the spending of one customer deviates from its expected value in less than 2 euros.

5. The owners of a gym want to study the time devoted to sports by the young people living in the neighborhood, which is a random variable (X , in hours per week) with variance 4.25.
 - a) Calculate the minimum sample size required to estimate the expected weekly sport time with 95% confidence level and an error margin of 0.4 hours.
 - b) An average of 3 sport hours per week has been obtained for a random sample of 36 young people from the neighborhood. Compute a 90% confidence interval for the expectation of X .

6. The manager of a hospital is analyzing the monthly expenditure on food (X , in hundred thousand €). A simple random sample of 16 months has been selected for this purpose.
 - a) The above sample has asymmetry coefficient $g_1 = 0.32$ and kurtosis coefficient $g_2 = -0.52$. Test normality of X .
 - b) The hospital manager assures that the variance of food expenditure does not exceed 3.5. If a variance of 4.02 was obtained in the above sample, is this opinion well founded?
 - c) The manager also states that the percentage of patients satisfied with the food in the hospital is 75%. In a random sample of 80 patients, 48 of them said they are satisfied with the food. Does the sample support the manager's claim?

TIME LIMIT: 2 hours and 15 minutes

Question	1	2	3	4	5	6
Score	1.5	1.5	1.5	2	1.5	2