

OLLSCOIL NA hEIREANN, GAILLIMH
NATIONAL UNIVERSITY OF IRELAND, GALWAY

Semester 2, 2001/2002: August Exam

Statistics for Economics (EC224)
2nd Arts

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Time allowed: Three hours.

Instructions: Answer 10 questions in Section 1 (each worth 2 marks). Answer 2 questions in Section 2 (each worth 20 marks). Answer 8 questions in Section 3 (each worth 10 marks). Total marks are 140.

Section 1

For all of the following statements, indicate if they are true or false.

- 1- (1) $\sum \frac{(x_i - \bar{x})^2}{n-1}$ is the usual formula for sample variance.
- 1- (2) The sum of deviations from a mean is always zero.
- 1- (3) The random distribution of questions with a 'false' answer in the 'true/false' section of an exam can be seen as an example of a Binomial (Bernoulli) process.
1. (4) \bar{x} must be never equal to μ for confidence intervals to be possible.
- 1- (5) If the median is larger than the mean the distribution is skewed right.
1. (6) A high p-value will generally lead to rejection of null hypotheses.
1. (7) The interquartile range is the interval between the 3rd and 4th quartile.
- 1- (8) The coefficient of determination is often negative.
- 1- (9) Non-parametric tests need stronger assumptions than parametric tests.
- 1- (10) α is the probability of a type 1 error.
- 1- (11) Confidence intervals widen as n increases.

- 1- (12) The median is not calculable if we only have frequency (grouped) data.

Section 2

Answer 2 of the following questions.

2. (1) A regression analysis of the relation between rainfall (as measured in millimetres per year) and yield of maize (measured in tons per hectare) grown by farmers in a hot country (50 farmers selected at random) yields the following results:

$$\text{Yield} = 10 + .5(\text{Rainfall})$$

s.e. (2.3) (1.56)

- (a) Interpret the two coefficients.
- (b) Test the hypothesis that an extra millimetre of rain leads on average to an extra ton of maize per hectare.
- (c) Test the hypothesis that rainfall has a significant effect on yield.
- (d) Set up confidence intervals for the two coefficients at the 95% probability level.

2. (2) In a statistical study a researcher is interested in opinions about a new building. The audience are from three different age-groups. The researcher wishes to determine whether there are differences in median opinion among age groups (where each person is allowed to rate the building from 1 – very bad – to 5 – very good). Test the following hypothesis:

$$H_0: M_1 = M_2 = M_3. \quad H_1: \text{Not all } M_j \text{ are equal.}$$

Opinions of Age-Group 1: 5, 1, 3, 5, 4, 3, 3, 2.
 Opinions of Age-Group 2: 4, 4, 4, 3, 3, 2, 5, 5.
 Opinions of Age-Group 3: 2, 2, 1, 2, 3, 5, 5, 5.

2. (3) X is a normally distributed variable, with equal variance in three regions. A policy agency wants to test for equality of means across the three regions using the following sample information on values of X from 15 companies:

REGION A	REGION B	REGION C
52	45	60
71	52	59
40	53	48
64	50	76
50	50	67

- State H_0 and H_1 .
- Develop the ANOVA table.
- Test the null hypothesis at the 5% level of significance and interpret the results.

Section 3:

Answer 8 of the following 10 questions.

- 3- (1) Under what circumstances will the p-value from a hypothesis test approach 1?
- 3- (2) A shop stall sells 50 newspapers per hour. What is the probability that 23 newspapers are sold in any one half-hour interval.
- 3- (3) A box of 11 photograph albums has 3 empty albums in it. If 4 albums are selected from the box, find the probability that 2 are empty.
- 3- (4) The weight distribution of people in a certain place is normally distributed with a mean of 55 kilos and a standard deviation of 10. On this basis, a) what proportion of the inhabitants are more than 58 kilos and b) between what weights do the middle 80% of the people fall?
- 3- (5) What is the probability of there being 4 boys in a family of 9 children.
- 3- (6) A random sample of 251 items is drawn from a normal population with parameters $\mu = 2546$ and $\sigma = 127$. Find the probability that the sample mean is between 2450 and 2650.
- 3- (7) A car is advertised as doing 15 kilometres to the litre in average driving conditions. Consumer tests show an average of 13 kilometres per litre, from a sample of 40. The sample standard deviation is 1.8 and the level of significance chosen for decision making is .05. Should the car manufacturer's claim be accepted?

- 3- (8) Given the following results:
The average performance of 30 randomly selected men in a test of verbal ability is measured as 67. 35 similarly selected women achieve an average score of 72. The sample standard deviation for the men is 5, and for the women is 3. Test $H_0: \mu_1 = \mu_2$ for the two groups.
- 3- (9) Compute Spearman's Correlation coefficient for the following data:
Y 11, 10, 8, 8, 6, 13 X 2, 5, 3, 3, 6, 3
- 3- (10) (a) What are the differences between a type 1 and a type 2 errors?
(b) Discuss differences between one tailed and two tailed tests.