台灣大學管理學院商學研究所
87學年度博士班入學統計試題

共一頁

1. A replicated experimental design was performed to study the effects of six factors (A to F), and the results of this experiment are summarized in the following table.

Test	A	B	C	D	E	F	Run1	Run2	Average
1	1	1	1	2	2	1	2.3	2.2	2.25
2	2	1	1	1	1	2	3.5	3.3	3.40
3	1	2	1	1	2	2	3.0	2.9	2.95
4	2	2	1	2	1	1	2.1	1.9	2.00
5	1	1	2	2	1	2	3.5	3.6	3.55
6	2	1	2	1	2	1	2.6	2.6	2.60
7	1	2	2	1	1	1	2.9	2.9	2.90
8	2	2	2	2	2	2	3.9	4.0	3.95

Assume there is no interaction effect, you can construct an ANOVA table to identify which of the six factors are significant.

(a) (10%) Total sum of squares = ?

(b) (10%) Sum of squares due to factor A = ?

(c) (10%) Degrees of freedom for error = ?

2. Suppose Y is a random variable with mean = μ and variance = σ^2. Let's define a new random variable A and $A_k = \lambda Y_k + (1-\lambda)A_{k-1}$ $(k = 1, 2, \cdots k)$ $(0 < \lambda < 1)$. It can be proved that A_k is an exponentially weighted moving average of all Y values and,

$$A_k = \sum_{i=0}^{k} \lambda(1-\lambda)^i Y_{k-i}.$$

(a) (10%) Mean of A = ? (assume k is very large)

(b) (10%) Variance of A = ? (assume k is very large)

3. Given a group of sample data vectors $(y \quad x_1 \quad x_2 \quad x_3 \quad \cdots \quad x_k)$, you are asked to build a linear regression model for the prediction of y. Please describe **procedure and steps** in constructing such a model. Your description need to include: the assumptions of adopting such a model, how to prove the correctness of those assumptions, how to justify the number of independent variables in the model, how to judge the acceptance of the model, and the prevention of multicollinearity, etc..(25%)

4. What is (are) the advantages and disadvantages in performing a non-parametric test? (10%)

5. What are the basic assumptions to apply the technique of single factor ANOVA? if either the data are not quantitative or not normally distributed, is there some other way to conduct a test for similar purpose. (15%)

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