Tutorial Letter 015/0/2023

Applied Statistics III

STA3701

Year module

Department of Statistics

ASSIGNMENT 5 QUESTIONS

ASSIGNMENT 05

Unique Nr.: 859826

Due date: 31 October 2023

Instructions

1. **Do not PLAGIARISE. Students suspected of plagiarism will be subjected to disciplinary processes.**
2. **Use R to answer all the questions. Present or attach R outputs. Label all the figures and tables.**

Question 1

The dataset saved as Guppy fish in the **Additional Resources** folder on the module site contains the weights of Gulpy fish (*Poecillia reticulata*) before and after being fed experimental diets. The aim of the study was to analyse the effect of diet on the maturation weight of Guppy fish[1]. The fish weights were observed at the beginning of the study prior to being given different types of diets. Three different type of diets (1, 2 and 3) were randomly given to 21 fish for a specific period and thereafter their weights were measured. Three variables, namely initial weight (x, fish weights before the feeding), diet type and the final weight (y, fish weights after feeding) were observed in the study. Import the dataset into R and answer the following questions.

1.1 Plot the final weight of the fish (y) against the initial weight of the fish (x) using different plotting symbols for the diet type. Would you say that there appears to be a diet type effect? (8)

1.2 Test, at five percent level of significance, the null hypothesis that the covariate (initial weight of the fish) is not affected by the type of diet. [**HINT:** $\boldsymbol{H_0: \alpha_1 = \alpha_2 = \alpha_3}$ **where** $\boldsymbol{\alpha_i}$, $\boldsymbol{i = 1, 2, 3}$ **is the diet type (treatment) effect**] (8)

1.3 At 5% level of significance test whether the initial weight (x) and the adjusted diet type means are significant. [**HINT:** $\boldsymbol{H_0: \beta = 0}$ & $\boldsymbol{H_0: \mu_1 = \mu_2 = \mu_3}$.] (10)

1.4 Test the hypothesis of homogeneous regressions (equal slopes) for each of the diet types at 5% level of significance level. [**HINT:** $\boldsymbol{H_0: \beta_1 = \beta_2 = \beta_3}$.] (8)

1.5 Write a one-way covariance model for the data and define what each term represents. (6)

1.6 Use relevant plots to investigate any violation of the assumptions underlying an ANCOVA model. (10)

NB: For all tests of hypotheses, state the null and alternative hypotheses, critical regions (or rejection regions), test statistics and conclusions.

Grand total = [40]

[1]Alvin C. Rencher and G. Bruce Schaalje. (2009). Linear models in statistics. 2nd edition. Hoboken, NJ, Wiley.