

Applied Statistics 2013

Homework 3 - Due 18th March

Exercise 1. *Seven patients each underwent three different methods of kidney dialysis. The following values were obtained for weight change in kilograms between dialysis sessions.*

<i>Patient</i>	<i>Treatment A</i>	<i>Treatment B</i>	<i>Treatment C</i>
1	2.90	2.97	2.67
2	2.56	2.45	2.62
3	2.88	2.76	1.84
4	2.73	2.20	2.33
5	2.50	2.16	1.27
6	3.18	2.89	2.39
7	2.83	2.87	2.39

We wish to test if there is a significant difference in the mean weight change among the three methods. Let \bar{A} , \bar{B} and \bar{C} denote the mean weight change in each group. Define $M = (\bar{A} + \bar{B} + \bar{C})/3$. A reasonable statistic to consider is

$$T = (\bar{A} - M)^2 + (\bar{B} - M)^2 + (\bar{C} - M)^2 .$$

- (a) *Show that the test statistic $S = \bar{A}^2 + \bar{B}^2 + \bar{C}^2$ is equivalent to T , in the sense that it results in the same testing procedure.*
- (b) *Test the null hypothesis that there is no difference in mean weight change among treatments. Notice that now you can permute the 7 patients between 3 different groups, so there are $(3!)^7$ possibilities. Use Monte-Carlo simulation to approximate the p-value of the permutation test.*
- (c) *Provide a confidence interval for the estimated p-value in (b).*