Department of Statistics

COURSE STATS 330

Assignment 1, 2006

Instructions: Hand in your completed assignment to the Student Resource Centre by 4pm on Thursday 3rd August.

Question 1.
The data set in the file **`rabbit.csv`** (available on the course web page) contains some data gathered in an experiment to study the effect of the 5-HT_3 antagonist MDL 72222. Five rabbits were studied on two occasions, after treatment with saline (control) and after treatment with the 5-HT_3 antagonist. After each treatment, ascending doses of phenylbiguanide were injected intravenously at 10 minute intervals and the responses of mean blood pressure measured. The goal was to find out if the effect of increasing doses of phenylbiguanide on the mean blood pressure is different for the treatment and the control.

The data set has 4 variables. These are

`BPchange`: change in blood pressure relative to the start of the experiment

`Dose`: dose of Phenylbiguanide in micrograms

`Treatment`: placebo (denoted by "Control") or the 5-HT_3 antagonist MDL 72222 (denoted by "MDL")

`Animal`: label of animal used ('"R1"' to '"R5"')

Load the data into R. (You will have to include the code for doing this in your answer to get any marks). Draw a suitable graph or graphs that will allow you to examine the effect, if any, of the treatment on the relationship between dose and blood pressure. What conclusions do you reach? Do all rabbits respond in the same way?

NB: you can find more information about this experiment in the article

J. Ludbrook (1994) Repeated measurements and multiple comparisons in cardiovascular research. *Cardiovascular Research*, 28, 303-311.

It is available in the library of the medical school (unfortunately not on line).
[creating data frame: 5 marks, suitable graph or graphs 8 marks, conclusions 7 marks]

PTO for Question 2

Question 2.

In R, there are many built-in data sets, in the form of data frames. For a list of these, you can type

```
data(package = .packages(all.available = TRUE))
```

For example, in the package **datasets** there is a data frame **AirPassengers.** To use it, type

```
library(datasets)  # this may be preloaded
data(AirPassengers)
```

You can then refer to **AirPassengers** by name in other R commands. To get information about the data set (e.g. number type and names of the variables, plus background) type

```
?AirPassengers
```

Use the R data sets indicated below to draw an example of each of the following plots, and comment on what the plot is saying**:**

a) Use trellis graphics to draw a series of side-by side boxplots to illustrate the relationship between a continuous variable and a categorical variable (use the data frame **InsectSprays** in the **datasets** package**,** treating the count variable as continuous). Provide a title and informative axis labels. *[5 marks, 4 for the plot and 1 for comments]*

b) Draw a picture of a surface using a wireframe plot (use the data frame **volcano** in the **datasets** package)**.** Use informative labels for the axes**.** *[5 marks, 4 for the plot and 1 for comments]*

c) Draw a scatterplot, with the points annotated with a label, and the group to which the observation belongs denoted by different plotting symbols. (Use the data set **cathedral** in the **faraway** package. This gives the nave heights and lengths of 25 cathedrals in England, together with the type of cathedral (r = Romanesque, g =Gothic). You can get the cathedral names by typing

```
cathedral.names = rownames(cathedral)
```

The R function **text** is useful for labeling the points, and the function **points** for drawing different kinds of plotting symbols. Make sure you give the plot a title and provide informative axis labels**.** *[10 marks, 8 for the plot and 2 for comments]*

Data set for Q1 follows overleaf (also on the web page)

Data for Question 1 (also in file **`rabbit.csv`**)

BPchange	Dose	Treatment	Animal
0.50	6.25	Control	R1
4.50	12.50	Control	R1
10.00	25.00	Control	R1
26.00	50.00	Control	R1
37.00	100.00	Control	R1
32.00	200.00	Control	R1
1.00	6.25	Control	R2
1.25	12.50	Control	R2
4.00	25.00	Control	R2
12.00	50.00	Control	R2
27.00	100.00	Control	R2
29.00	200.00	Control	R2
0.75	6.25	Control	R3
3.00	12.50	Control	R3
3.00	25.00	Control	R3
14.00	50.00	Control	R3
22.00	100.00	Control	R3
24.00	200.00	Control	R3
1.25	6.25	Control	R4
1.50	12.50	Control	R4
6.00	25.00	Control	R4
19.00	50.00	Control	R4
33.00	100.00	Control	R4
33.00	200.00	Control	R4
1.50	6.25	Control	R5
1.50	12.50	Control	R5
5.00	25.00	Control	R5
16.00	50.00	Control	R5
20.00	100.00	Control	R5
18.00	200.00	Control	R5
1.25	6.25	MDL	R1
0.75	12.50	MDL	R1
4.00	25.00	MDL	R1
9.00	50.00	MDL	R1
25.00	100.00	MDL	R1
37.00	200.00	MDL	R1
1.40	6.25	MDL	R2
1.70	12.50	MDL	R2
1.00	25.00	MDL	R2
2.00	50.00	MDL	R2
15.00	100.00	MDL	R2
28.00	200.00	MDL	R2
0.75	6.25	MDL	R3
2.30	12.50	MDL	R3
3.00	25.00	MDL	R3

5.00	50.00	MDL	R3
26.00	100.00	MDL	R3
25.00	200.00	MDL	R3
2.60	6.25	MDL	R4
1.20	12.50	MDL	R4
2.00	25.00	MDL	R4
3.00	50.00	MDL	R4
11.00	100.00	MDL	R4
22.00	200.00	MDL	R4
2.40	6.25	MDL	R5
2.50	12.50	MDL	R5
1.50	25.00	MDL	R5
2.00	50.00	MDL	R5
9.00	100.00	MDL	R5
19.00	200.00	MDL	R5