Exercise: Growth of guinea pigs

The effect of a vitamin E diet on the growth of guinea pigs is investigated in the following way:

In the beginning of week 1, 10 animals received a growth inhibitor. Then followed a randomisation, so that 5 animals received vitamin E therapy from the beginning of week 5, while the other 5 animals served as controls. In the end of the weeks 1, 3, 4, 5, 6 and 7, the weight of each animal was recorded.

The data is in the file `'vitamin.txt'` on the home page, with variables `grp` (1: control, 2: vitamin E), `animal`, `week` and `weight` (in g), and with a total of 2*5*6=60 observations. The first line contains the variable names.

We wish to describe the effect of vitamin E on the growth of the animals.

1. *Read in the data and construct a more informative variable (called* `group`*) to denote the groups.*

2. *Make an illustrative plot of the individual weight curves, and discuss what you see:*

   - *How do we expect to see an effect of vitamin E in these profiles?*
   - *Does it make sense to make a model with a constant weight difference between the two groups?*

3. *Use a CS correlation structure and an unstructured mean value to investigate whether we have any evidence of differences in the growth for the two groups?*
   Give an estimate of the difference in weight between the groups at the end of week 7.

4. *Define a new variable called* `period` *to distinguish between the first 3 weeks and the last 3 weeks, i.e.*

   - `period=1`*: The weeks 1, 3 and 4.*
   - `period=2`*: The weeks 5, 6 and 7.*

   Compare the two groups of animals in each of the periods separately. Which conclusions do we get?

   The next step is to be more specific in modelling the effect of vitamin E, by using new covariates as suggested below

```
data q5;
set q4;

if week>4 then period=2;  else period=1;
if grp=2 and week>4 then number_week=week-4;  else number_week=0;
if grp=2 and week=5 then week5=1;  else week5=0;
if grp=2 and week=6 then week6=1;  else week6=0;
if grp=2 and week=7 then week7=1;  else week7=0;
run;
```

We now use the above defined variables as covariates in various combinations. Try the following

(a) `week week5 week6 week7`

(b) `week number_week`

(c) `week number_week week6 week7`

From one or more of these analyses you can answer the following:

5. *What happens to the animals in the vitamin group just after they start their vitamin diet? Do the two groups behave in the same way?*
   For each model, give an estimate of the difference in weight between the groups at the end of week 7.

6. *Can we conclude, that the difference between the vitamin and the control group increases linearly with time, or is the effect more complicated than that?*
   Try to make a picture of the predicted weight profiles for the model of your choice.

7. *Investigate the correlation structure between the observations on the same animal.*

8. *Do we have a baseline issue in this investigation?*