Week Four Homework Exercise

Homework Central / Week Four Homework /

The following table represents results from an environmental engineering study of a certain chemical reaction. The concentrations of 18 separately prepared solutions were recorded at different times (three measurements at each of six times). The natural logarithms of the concentrations were also computed. The data are given in the table below.

You will use the data from this table to complete the homework exercises for the week. Scroll down below the table to view those exercises. Use the **homework forum** to discuss the exercises with your peers and share your discoveries.

If you need help entering data into STATA, please download our tutorial on **how to enter datasets into STATA.**

Solution Number (i)	Time (X_i) (hrs)	Concentration (Y_i) (mg/ml)	Ln of Concentration $(\ln Y_i)$
1	6	0.029	-3.540
2	6	0.032	-3.442
3	6	0.027	-3.612
4	8	0.079	-2.538
5	8	0.072	-2.631
6	8	0.088	-2.430
7	10	0.181	-1.709
8	10	0.165	-1.802
9	10	0.201	-1.604
10	12	0.425	-0.856
11	12	0.384	-0.957
12	12	0.472	-0.751
13	14	1.130	0.122
14	14	1.020	0.020
15	14	1.249	0.222
16	16	2.812	1.034
17	16	2.465	0.902
18	16	3.099	1.131

If desired, you may download the data for this exercise in this **CSV file**

Use Stata to complete the following exercises:

Exercise One

Generate separate graphs of:

1. Concentration (Y) vs. Time (X)
2. Natural Logarithm of Concentration $(\ln Y)$ vs. Time (X)

Exercise Two

Equations and Plotting

Using the output from exercise one, obtain the following:

1. The estimated equation of the straight-line (degree 1) regression of Y on X
2. The estimated equation of the quadratic (degree 2) regression of Y on X
3. The estimated equation of the straight-line (degree 1) regression of $\ln Y$ on X
4. Plots of each of these fitted equations on their respective scatter diagrams.

Exercise Three

Determine and Compare

Determine and compare the proportions of the total variation in Y explained by the straight-line regression on X and by the quadratic regression on X

Exercise Four

F-Tests

1. Carry out F-tests for the significance of the straight-line regression of Y on X
2. Carry out an overall F-test for the significance of the quadratic regression of Y on X and a test for the significance of the addition of x^2 to the model
3. For the straight-line regression of $\ln Y$ on X, carry out F-tests for the significance of the overall regression

Exercise Five

Determine and Compare

- What proportion of the variation in $\ln Y$ is explained by the straight-line regression of $\ln Y$ on X?
- Compare this result with that obtained in Exercise Three for the quadratic regression of $\ln Y$ on X. Discuss this in the **homework forum**

Exercise Six

Examine and Discuss

Use the **homework forum** to explain your thoughts on the following:

- A fundamental assumption in regression analysis is variance homoscedasticity. By examining the scatter diagrams constructed in Exercises One & Two, state why taking natural logarithms of the concentrations helps with regard to the assumption of variance homogeneity.
- Do you think the straight-line regression of $\ln Y$ on X is better for describing this set of data than the quadratic regression of Y on X? Share your thoughts in the **homework forum**.
- Considering the overall table, what key assumption about the data would be in question if, instead of 18 different solutions, there were only 3 different solutions, each of which was analyzed at the six different time points?

You can download all homework assignments for week 4 here

For help and answers to this week's exercises, click the button below to visit the solutions page.

Solutions Page

Created Tue 10 Mar 2015 8:17 AM PDT

Last Modified Mon 13 Apr 2015 6:33 AM PDT