Department of Statistics

COURSE STATS 330

Assignment 2, 2004

Instructions: Hand in your completed assignment to the Student Resource Centre by 4pm on Thursday 19th August.

The viscometer is a scientific instrument that measures the viscosity of a fluid by measuring the time taken for an inner cylinder in the mechanism to perform a fixed number of revolutions in response to an actuating weight. The viscometer is calibrated by measuring the time taken with varying weights while the mechanism is suspended in fluids of accurately known viscosity. The data overleaf come from such a calibration. The variables are

Viscosity: Viscosity of fluid

Wt: Actuating weight

Time: Time taken

The data (in the form of a tab-delimited text file) are available on the course web page under the title viscosity.txt.

1. Fit a regression model to the data, using time as the response. Then, having fitted the model, examine the fit for
    - Non-planar regression
    - Non-constant variance
    - Outliers and high-leverage points
    - Lack of normality

    Make a list of the defects in the fit that you have found. Show any plots used, together with the code used to produce them.

2. Find a suitable transformation that will cure (or at least partially cure) the defects you listed in 1. Document the reasoning that led you to your transformation.

3. Use the model you have developed in Questions 1 and 2 to predict the time corresponding to a viscosity of 150 and a weight of 60.

Data are listed overleaf.

	Viscosity	Wt	Time
1	14.7	20	35.6
2	27.5	20	54.3
3	42.0	20	75.6
4	75.7	20	121.2
5	89.7	20	150.8
6	146.6	20	229.0
7	158.3	20	270.0
8	14.7	50	17.6
9	27.5	50	24.3
10	42.0	50	31.4
11	75.7	50	47.2
12	89.7	50	58.3
13	146.6	50	85.6
14	158.3	50	101.1
15	161.1	50	92.2
16	298.3	50	187.2
17	75.7	100	24.6
18	89.7	100	30.0
19	146.6	100	41.7
20	158.3	100	50.3
21	161.1	100	45.1
22	298.3	100	89.0
23	298.3	100	86.5