Fox Module 4 Bivariate displays practice problems on ozone co-plots

(The attached PDF file has better formatting.)

CO-PLOTS FOR OZONE

The data relate to ozone levels in the atmosphere. The variables in the data sample are

- *rad:* solar radiation
- *temp:* daily temperature
- *wind:* wind speed
- *ozone:* ozone level in atmosphere

The ranges of the four variables are

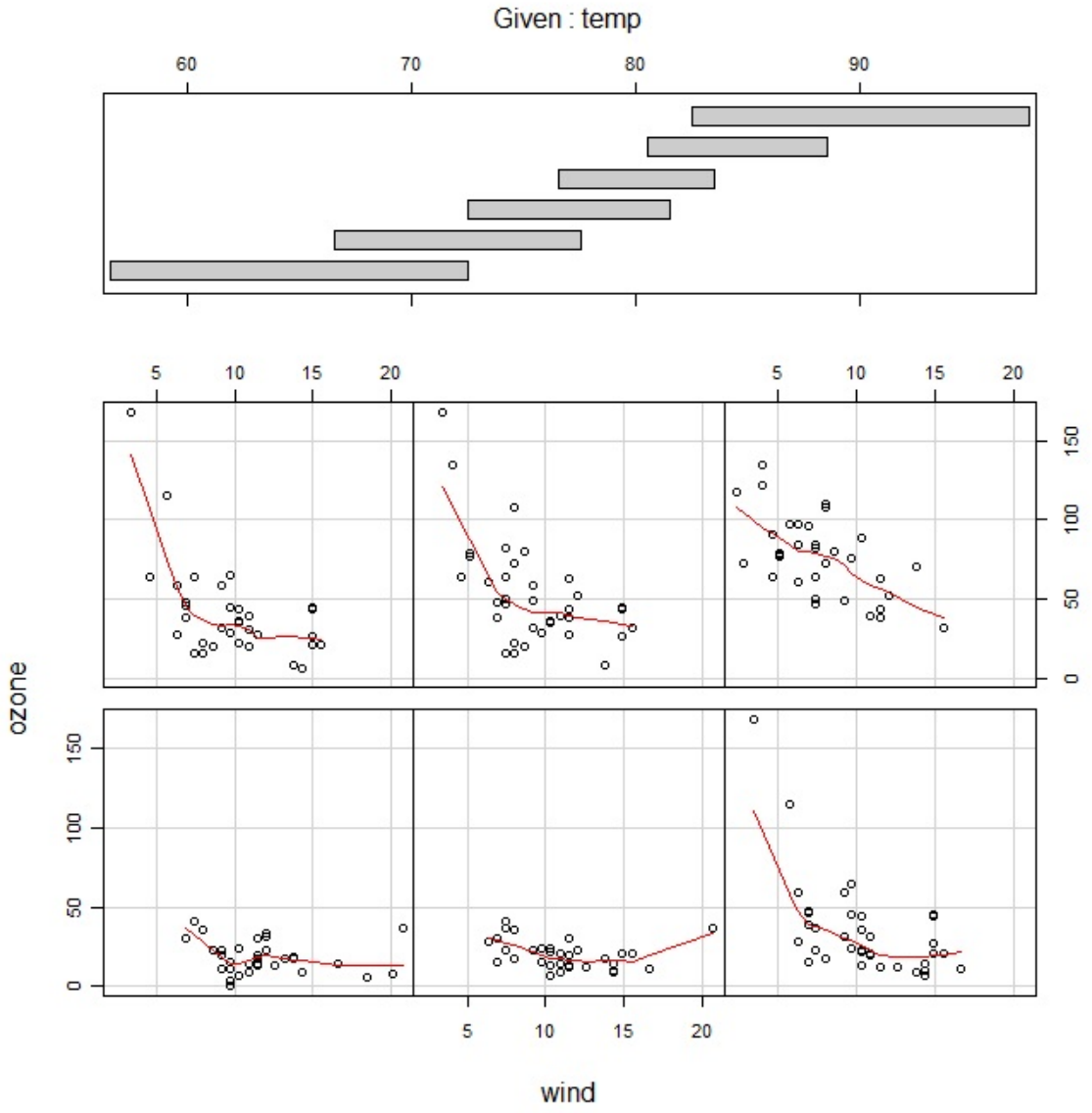
- Daily temperature ranges from 57 to 97 degrees.
- Wind speed ranges from 2.3 to 20.7 miles per hour.
- Solar radiation ranges from 7 to about 334 units.
- Ozone levels range from 1 to 168 units (particles in a given volume of air).

The panels below are ordered from lower-left to upper-right by the values of the conditioning variable in the upper panel (temp) from left to right. The lower-left plot is for the lowest temperatures (56-72 degrees) and the upper right plot is for the highest temperatures (82-96 degrees). Solar radiation is not used in these plots.

The temperatures overlap. Each panel shares 50% of its points with the next higher panel and 50/% of its points with the next lower panel. For example, the first panel is 57°-73°and the second panel is 66°-77°. The overlap avoids distortions from random fluctuations near the end of a panel. For example, suppose the panels were for temperatures of 57°-65° vs 66°-77° and ozone levels were unusually high on a day with 65° temperature. The graph might show a spike in the first panel but not in the second panel.

Jacob: How can we tell the overlap percentage from the plot?

Rachel: One can not see the percentage from the plot, since one needs to know the distribution of points in each temperature group. The 50% is the R default, which Fox uses for his plots. One can change the default to another overlap percentage (if desired). The final exam problems do not ask anything not clear in the plot.


Given : temp
60
70
80
90
5
10
15
20
0
50
100
150
ozone
wind

** Exercise 4.1: Variables

A. What is the explanatory variable in these plots?
B. What is the response variable in these plots?
C. What is the conditioning variable in these plots?

Part A: The explanatory variable is wind speed.

Part B: The response variable is ozone level.

Part C: The conditioning variable is temperature.

** Exercise 4.2: Correlations

A. At what temperatures is higher wind speed positively correlated with ozone levels?
B. At what temperatures is higher wind speed negatively correlated with ozone levels?

Part A: At no temperatures are ozone levels positively correlated with wind speed. The second plot in the lower row shows a slight uptick at the highest wind speed caused by a single outlier. It is a random fluctuation, not the expected correlation of ozone levels and wind speed.

Part B: At temperatures of about 85° or higher, ozone levels are negatively correlated with wind speed. At temperatures of about 70° to 90°, the negative correlation is strong at low wind speeds and weaker at high wind speeds.