Discussion Session # 13

1 Groupwork: Exercise 8.2.2

The processing of raw coal involves "washing," in which coal ash (nonorganic, incombustible material) is removed. The article “Quantifying Sampling Precision for Coal Ash Using Gy’s Discrete Model of the Fundamental Error” (1989) provides data relating the percentage of ash to the volume of a coal particle. The average percentage of ash for six volumes of coal particles was measured. The data are as follows:

<table>
<thead>
<tr>
<th>Volume (x cm$^3$)</th>
<th>0.01</th>
<th>0.06</th>
<th>0.58</th>
<th>2.24</th>
<th>15.55</th>
<th>276.02</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent ash (y)</td>
<td>3.32</td>
<td>4.05</td>
<td>5.69</td>
<td>7.06</td>
<td>8.17</td>
<td>9.36</td>
</tr>
</tbody>
</table>

(a) Compute the least-squares line for predicting percent ash (y) from volume (x). Plot the data, and the residuals versus the fitted values. Does the linear model seem appropriate? Explain.

(b) Compute the least-squares line for predicting percent ash from ln(volume). Plot the data, and the residuals versus the fitted values. Does the linear model seem appropriate? Explain.

(c) Compute the least-squares line for predicting percent ash from $\sqrt{\text{volume}}$. Plot the data, and the residuals versus the fitted values. Does the linear model seem appropriate? Explain.

(d) Using the most appropriate model, predict the percent ash for particles with a volume of 50 cm$^3$.

(e) Using the most appropriate model, construct a 95% confidence interval for the mean percent ash for particles with a volume of 50 cm$^3$.

(f) There’s no item (f) in the book, but there’s a typo in it. The units for $x$ should be cm$^3$. Would your prediction be appropriate if you used $x$ in cm$^3$ for the model construction, and then tried to predict a value for $x = 50m^3$? What would the predicted percent ash value be in this case?