1 Review problem set 4 solutions

Here are solutions to review problem set 4. See the computer programs on the website:

13.52 a) The plot looks fairly linear, so we will fit a simple linear model.

b) We get $\widehat{y}_i = 38.1 - 5.425 * SLEEP_i$

c) Residual by predicted and normal plots look good. Hat value plots also look good.

13.67) Using backward selection or best subset regression with either AIC or BIC, we obtain a final model of $\widehat{y}_i = 1.15 + .266 * STAY_i + .0542 * INS_i$

8.7 a) No, the ANOVA F test has $F = 2.06$, and $F_{.05,2,18} = 3.55$, so we fail to reject the null hypothesis of equal group means.

b) $p = .156$ c) There is not much evidence of variance heterogeneity, and although the normal qq plot does not look great, it is not enough of a problem for the validity of the ANOVA F test.

8.29 a) From the plots, normality and HOV look ok.

b) With $F = 55.67$ and $P < .0001$, we reject $H_0 : \mu_1 = \mu_2 = \mu_3 = \mu_4$ at $\alpha = .05$.

c) Each interval is of the form $\overline{y}_{i\cdot} \pm t_{\alpha/2,df} \sqrt{\frac{MSE}{n_i}}$. Here $t_{\alpha/2,df} \sqrt{\frac{MSE}{n_i}} = t_{.025,28} \sqrt{\frac{.953}{8}} = (2.048) \sqrt{\frac{.953}{8}} = .707$. Thus each interval is of the form $\overline{y}_{i\cdot} \pm .707$. For group I, it is $8.31 \pm .707$, giving $(7.61, 9.02)$.

8.30 a) The Kruskal-Wallis test statistic $= 26.62$, yielding a $P < .0001$, so we would reject the null hypothesis that all distributions are equal.

b) These results are consistent with those of problem 8.29, where the null hypothesis of equality of means was rejected.

8.34) a) School-age children are the population of interest.

b) Strictly speaking, sixth graders who could have ended up in the sample. Further generalization is based on scientific grounds more than statistical grounds.

c) The effective sample size is one per group, since entire classes were randomly assigned.

d) With an effective sample size of one, statistical tests are not possible.

e) Randomize students to treatment groups instead of classes, perhaps block by class (randomize separately within each class).