Optional practice problems

Stat 151A, Fall 2017

September 23, 2017

1. Complete the missing values in the following R output complete

   ```
   > summary(mod1)

   Call:
   lm(formula = prestige ~ education + income, data = dat)

   Residuals:
   Min       1Q    Median      3Q       Max
   -19.4040  -5.3308   0.0154   4.9803  17.6889

   Coefficients:
                 Estimate   Std. Error  t value  Pr(>|t|)
   (Intercept) -6.8477787   3.2189771   -2.127    XXXXX
   education    XXXXX       0.3489120   11.858   < 2e-16 ***
   income       0.0013612   0.0002242    6.071  2.36e-08 ***
   ---
   Signif. codes:  0 âĂŸ***âĂŹ 0.001 âĂŸ**âĂŹ 0.01 âĂŸ*âĂŹ 0.05 âĂŸ.âĂŹ 0.1 âĂŸ âĂŹ

   Residual standard error: 7.81 on XXXX degrees of freedom
   Multiple R-squared:  0.798,      Adjusted R-squared:  0.7939
   F-statistic: 195.6 on 2 and 99 DF,  p-value: < 2.2e-16
   ```

2. For the output above construct 95% confidence intervals for the coefficients of each of the exploratory variables.

3. For the following statements determine whether they are true of false. In each case provide a reason behind your choice.

   (a) In a simple linear regression model with $n > p$, if (β_0, β_1) is not estimable then β_1 is not estimable.

   (b) In the linear regression model, the ols estimator is biased if the errors are correlated.

4. Consider the linear model with J groups

$$y_i = \mu_1 I(i \in 1st) + \ldots + \mu_J I(i \in Jth) + \epsilon_i$$
$$= \mu_1 x_{1i} + \ldots + \mu_J x_{Ji} + \epsilon_i.$$

Show that the ols estimator $\hat{\mu}$ satisfies

$$\hat{\mu}_j = \frac{1}{n_j} \sum_{i \in jth \text{ group}} y_i$$

where n_j is the number of observations i in group j.

5. The following problems from the book: 5.3, 5.4, 6.6, 9.8,