Assignment 04

Introduction to Multiple Regression

This assignment is intended to give you experience fitting and interpreting multiple regression models. Submit your responses to each of the questions below in a printed document. All graphics should be resized so that they do not take up more room than necessary and also should have an appropriate caption. This assignment is worth 15 points. (Each question is worth 1 point unless otherwise noted.)

Research. Teaching. Service. The trifecta upon which that almost every university instructor is evaluated, and, ultimately compensated. There has been substantial research to indicate that higher quality teaching is associated with increased faculty salararies. One way which academic administrators judge teaching quality is through teachers' course evaluations. While we know evaluation scores are not perfectly measures of teaching quality, nonetheless, they do play a role in the tenure and promotion process. Unfortunately, many other variables are also associated with evaluation scores (e.g., professor's ethnicity, professor's sex) For this assignment, you will use the file *evaluations.csv* (see the data codebook).

Preparation

Fit the following regression models using R. You will use the output from the fitted models to answer the questions in the assignment.

- Model 1: `avg_eval ~ 1 + beauty`
- Model 2: `avg_eval ~ 1 + beauty + num_courses`
- Model 3: `avg_eval ~ 1 + beauty + num_courses + perc_evaluating`

Part I

1. Create a correlation table that indicates the pairwise correlations between the outcome and each of the predictors, and between each set of predictors. Model this table after Table 7.2 (p. 43) in the *Presenting Your Findings* book. Make sure the table you create also has an appropriate caption.

2. Examine the structure and formatting of Table 9 at http://zief0002.github.io/epsy-8251/misc/creating-tables/creating-tables.html. Mimic the format and structure of this table to create a table to present the numerical information from the three models you fitted in this assignment. Make sure the table you create also has an appropriate caption. If the table is too wide, change the page orientation in your word processing program to "Landscape", rather than changing the size of the font. **(2pts.)**

3. Create a coefficient plot that graphically presents the coefficient estimates and the uncertainty (as 95% confidence intervals) for the coefficients included in the three fitted models. Be sure that the figure is appropriately captioned. **(2pts.)**

4. Based on results presented in the regression table and from the coefficient plot, explain, by referring to the uncertainty in the parameter estimates, why it would be appropriate to adopt Model 2. Note: Do not base this on a *p*-value.

Use the results from Model 2 to answer the remainder of the questions on this assignment.

Part II

5. Report the regression equation from fitting Model 2. Use Equation Editor (or some other program that correctly types mathematical expressions) to typeset the equation correctly.
6. Using output from the ANOVA table, compute and report the value for the model R^2. Show your work for full credit.
7. Interpret the value of the model R^2 using the context of the data.
8. Using symbols, write the omnibus null hypothesis that is tested by the *F*-statistic in this analysis in two different manners: (1) using the coefficient parameters used in the regression model, and (2) using the variance accounted for parameter.
9. Based on the results of the *F*-test, does the model seem to explain variation in course evaluations? Explain. Note: Here you can use the *p*-value as evidence, but do not compare this to 0.05.
10. Interpret the estimated coefficient value associated with the beauty predictor.
11. Based on the 95% confidence interval for the partial effect of beauty on course evaluations, which parameter values are reasonably compatible with the empirical data? Explain.
12. Create a publication quality plot that displays the results from Model 2. For this plot, put the beauty predictor on the *x*-axis. Show two separate lines to show the effect of the number of courses (a small and large number of courses based on the data). The two lines should easily be differentiatedhave different linetypes or use different colors so that they can . (**2pts.**)