

Assignment 06

Regression Assumptions

This assignment is intended to give you more experience evaluating the assumptions underlying 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 12 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 salaries. 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 examine whether instructor attractiveness explains differences in course evaluation scores—and thus on earnings differences. To do so, you will use the file *evaluations.csv* (see the [data codebook](#)).

Preparation

Fit three regression models to predict the variation in course evaluation ratings using professors' beauty ratings and number of courses for which the professor has evaluations: the two simple regression models, and the two-predictor model. You will use the output from the fitted model to answer the questions in the assignment.

Preliminary Examination of Model Assumptions

1. Create the density plots for the outcome and each of the predictors (three total).
2. Do any of these distributions foreshadow problems for the normality assumption? Explain.
3. Create the scatterplot of the outcome vs. each predictor (two total). Include the fitted simple regression line in each plot.
4. Do any of these relationships foreshadow problems for the linearity assumption? Explain.

Examination of the Standardized Residuals from Each Simple Regression Model

5. Create the residual plots (residual versus fitted values) using the standardized residuals for each of the simple regression models (two total).
6. Do any of these plots foreshadow problems for the linearity assumption? Explain.
7. Do any of these plots foreshadow problems for the homogeneity of variance assumption? Explain.

Examination of the Standardized Residuals from the Multiple Regression Model

8. Create the density plot of the marginal distribution of the standardized residuals from the two-predictor model. Add the confidence envelope for the normal distribution.
9. Does this plot suggest problems about meeting the normality assumption? Explain.
10. Create the scatterplot of the standardized residuals versus the fitted values from the two-predictor model. In the plot identify observation with extreme residuals (≤ -3 or ≥ 3) by indicating the row number of that observation in the plot.
11. Does this plot suggest problems about meeting the linearity assumption? Explain.
12. Does this plot suggest problems about meeting the homogeneity of variance assumption? Explain.