16. *Writing about Interactions*

SUGGESTED COURSE EXTENSIONS

A. Reviewing

1. Find an article in your field that posits an interaction between two or more independent variables. Evaluate whether they have explained the reasons for that hypothesis

    a. Based on theory
    b. Based on empirical analysis of their own data

2. Find a journal article that presents results of an OLS model with an interaction between a categorical independent variable and a continuous independent variable. Use the criteria in chapter 16 of *Writing about Multivariate Analysis, 2nd Edition* to evaluate the following aspects of the article:

    a. The description of the variables and model specification in the data and methods section.
    b. The table of regression coefficients.
        i. Did they provide enough information to assess the statistical significance of individual main effects and interactions terms?
        ii. Did they provide enough information to assess the contribution of the interactions to overall model fit?
    c. Whether they used a chart to portray the overall shape of the interaction, and if so, whether it satisfied the criteria in chapters 6 and 16 for effective charts.
    d. Whether their prose description satisfied criteria for effective presentation of an interaction pattern.
    e. Rewrite the description of the interaction to correct any shortcomings you identified in parts a through d.

3. Repeat question A.2 for a journal article that presents results of an OLS model with an interaction between two categorical independent variables.

4. Repeat question A.2 for a journal article that presents results of an OLS model with an interaction between two continuous independent variables.

B. Applying Statistics and Writing

1. Using the same variables that you used for Y, X_1, and *DUMMY* in question B.3 in the suggested course extensions for chapter 9, estimate an OLS model with an interaction between X_1 and *DUMMY*.

   a. Write an equation to convey the model specification, including both main effects and interaction terms.
   b. Calculate predicted values of Y for cases in the reference category and those in the other category of *DUMMY* across the observed range of X_1 in your data.
   c. Create a chart showing the shape of the estimated relationship among Y, X_1, and *DUMMY*, using the results from part b, and the guidelines in chapters 6 and 16 of *Writing about Multivariate Analysis, 2nd Edition*.
   d. Calculate differences in predicted values of Y for one-unit increases in X_1 for cases in each category of *DUMMY*.
   e. Optional: Use a spreadsheet to perform parts b through d, working from the online spreadsheet template for continuous by categorical interaction, or by following the instructions in appendix D of *Writing about Multivariate Analysis, 2nd Edition*.

2. Using the same variables as in question B.3 of the suggested course extensions for chapter 9, estimate an OLS model with an interaction between *DUMMY* and a three-category independent variable (*CATEGVAR*). Request the variance-covariance matrix as part of the output.

   a. Write an equation to convey the model specification, including both main effects and interaction terms. Use this equation to help you define appropriate dummy variables to specify the interaction.
   b. Calculate the predicted values of Y for all possible combinations of the variables *DUMMY* and *CATEGVAR*.
   c. Create a chart showing the shape of the estimated relationship between Y, *DUMMY*, and *CATEGVAR*, using the results from part b and guidelines in chapters 6 and 16.
   d. Use the simple slopes technique to test the statistical significance of differences between cases that are *not* in the reference category of *either DUMMY* or *CATEGVAR*, compared to cases in the reference category for *both DUMMY* and *CATEGVAR*.
   e. Optional: Use a spreadsheet to perform parts b through d, working from the online spreadsheet template for a categorical by categorical interaction in OLS, or by following the instructions in appendix D.

3. Write the portion of the data and methods section that pertains to your interaction.

   a. Describe how you defined variables to test for an interaction between two independent variables.

   b. Describe the sequence of model specifications you used to test for interactions.
      i. Using equations
      ii. In prose

4. Based on the results to question B.1 or B.2 above,

   a. create a table to present coefficients and goodness-of-fit statistics from models of main effects only, and main effects plus interactions.
   b. referring to the chart you made in part c of that question and the guidelines in chapters 2 and 16, use the GEE approach to describe the overall shape of the interaction, specifically mentioning exceptions in direction or magnitude of the association.

5. Estimate a logit model of a dichotomous dependent variable Y_2, with an interaction between *DUMMY* and a three-category independent variable (*CATEGVAR*).

   a. Calculate the odds ratio of the outcome you are modeling for all possible combinations of the variables *DUMMY* and *CATEGVAR*.
      i. Working from the logit coefficients (log relative odds) on the pertinent main effect and interaction terms;
      ii. Working from the odds ratios calculated from the pertinent main effect and interaction coefficients;
   b. Create a chart showing the shape of the estimated relationship between Y_2, *DUMMY*, and *CATEGVAR*, using the results from part b and guidelines in chapters 6 and 16.
   c. Optional: Use a spreadsheet to perform parts b and c, working from the online spreadsheet template for a categorical by categorical interaction logit interaction.

C. Revising

1. Review a data and methods section you have written previously about an interaction among variables, using the checklist for chapter 16 in *Writing about Multivariate Analysis, 2nd Edition* to evaluate how you have described the variables and the model specification. Revise the section to correct any shortcomings you find.

2. Review a results section you have written previously about an interaction among variables, using the checklist for chapter 16 to evaluate the following elements:

   a. Bivariate and multivariate tables;
   b. Charts to portray the overall shape of an interaction;
   c. Prose, including direction, magnitude, and statistical significance of the interaction.
   d. Revise those elements to correct any shortcomings you find.

3. Exchange your revised data and methods and results sections from questions C.1 and C.2 with a peer or colleague.

    a. Review them, using the checklist for chapter 16.
    b. Revise your prose, tables, and/or chart to correct the errors he or she found.