

# POLS 602 Homework 3

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This homework assignment is due October 31<sup>st</sup> via email to the SI. The assignment is worth 100 points total, with each problem and its subsequent parts labeled with their respective worth. You are allowed to collaborate on this assignment and use online resources, so long as you turn in your own work and clearly attribute others' ideas. In your email, please include the .pdf file with your answers and any code used to produce your answers and the .pdf.

## Problem 1 (60 points)

Suppose you are on vacation abroad and did not bring your computer. However, being a good social scientist, you observe some interesting human behavior ( $y = \begin{bmatrix} 3 \\ 7 \\ 6 \\ 8 \end{bmatrix}$ ) and would like to know if it is caused by something else you are observing ( $x = \begin{bmatrix} 2 \\ 5 \\ 8 \\ 9 \end{bmatrix}$ ). You decide to conduct regression by hand using your memory of linear algebra to satisfy your curiosity.

### 1.1 Coefficients (15 points)

What are the point estimates of the regression? More specifically, assuming a linear relationship of  $\mathbf{y} = \mathbf{x}\boldsymbol{\beta} + \boldsymbol{\varepsilon}$ , what is  $\hat{\boldsymbol{\beta}}$ ?

### 1.2 Uncertainty (15 points)

How uncertain are you about these coefficients? More specifically, what are their standard errors ( $se_{\hat{\boldsymbol{\beta}}}$ )?

### 1.3 Inference (20 points)

Given this uncertainty, how statistically significantly different from zero are these coefficients? That is, what are the test statistics for these coefficients and what is the probability that these test statistics would be observed if there were no relationship? In addition to this hypothesis test, construct a confidence interval.

## 1.4 Conclusion (10 points)

Briefly describe your results and the conclusions you would draw from your regression.

## Problem 2 (40 points)

For this problem you will (roughly) replicate findings from Table 2 in Clayton et al. (2019) using a stylized version of their data (`data.csv`). The authors theorize that the gender composition of legislative bodies making decisions about feminist issues (e.g., abortion) influences how legitimate these decisions are seen by citizens. Specifically, they argue that a more equally balanced decision-making body in terms of gender (`balance`) will increase men's (`female=0`) perceived legitimacy of these decisions.

### 2.1 Estimation (10 points)

Estimate the authors' model, which takes on the following form from the discussion above:

$$Y_i = \beta_1 + \beta_2 X_i + \beta_3 Z_i + \beta_4 X_i Z_i + \beta_5 P_i + \varepsilon_i,$$

where  $Y_i$  is an ordinal variable ranging from 1-4 with 1 (4) indicating that respondent  $i$  strongly disagrees (agrees) with the decision being legitimate,  $X_i$  is a dichotomous variable indicating if the decision-making body was gender balanced (1) or not (0),  $Z_i$  is a dichotomous variable indicating if respondent  $i$  was female (1) or not (0),  $\beta_4$  is an interaction term between gender balance ( $X_i$ ) and respondent gender ( $Z_i$ ),  $P_i$  is a control variable for party identification (1 for "Strong Democrat" and 7 for "Strong Republican"), and  $\varepsilon_i$  is a random disturbance. Present the model results in a well-formatted table.

### 2.2 Interpretation (30 points)

Interpret all results presented in your table, keeping in mind that this is an interaction model. For clarification on how to interpret the results of an interaction model beyond class materials, consulting Brambor et al. (2006) may be helpful. What conclusions can you draw from this model about the authors' argument?

## Bibliography

- Brambor, Thomas, William Roberts Clark, and Matt Golder. 2006. “Understanding Interaction Models: Improving Empirical Analyses.” *Political Analysis* 14. <https://www.jstor.org/stable/25791835>.
- Clayton, Amanda, Diana O’Brien, and Jennifer Piscopo. 2019. “All Male Panels? Representation and Democratic Legitimacy.” *American Journal of Political Science* 63 (1). <https://doi.org/10.7910/DVN/7190MT>.
- Greene, William. 2018. *Econometric Analysis*. Pearson India.