

# Problem Set 3

QTM 200: Applied Regression Analysis

Due: February 17, 2020

## Instructions

- Please show your work! You may lose points by simply writing in the answer. If the problem requires you to execute commands in **R**, please include the code you used to get your answers. Please also include the **.R** file that contains your code. If you are not sure if work needs to be shown for a particular problem, please ask.
- Your homework should be submitted electronically on the course GitHub page in **.pdf** form.
- This problem set is due at the beginning of class on Monday, February 17, 2020. No late assignments will be accepted.
- Total available points for this homework is 100.

In this problem set, you will run several regressions and create an add variable plot (see the lecture slides) in **R** using the `incumbents_subset.csv` dataset. Include all of your code.

## Question 1 (20 points)

We are interested in knowing how the difference in campaign spending between incumbent and challenger affects the incumbent's vote share.

1. Run a regression where the outcome variable is `voteshare` and the explanatory variable is `difflog`.

2. Make a scatterplot of the two variables and add the regression line.

3. Save the residuals of the model in a separate object.

4. Write the prediction equation.

## Question 2 (20 points)

We are interested in knowing how the difference between incumbent and challenger's spending and the vote share of the presidential candidate of the incumbent's party are related.

1. Run a regression where the outcome variable is `presvote` and the explanatory variable is `difflog`.
2. Make a scatterplot of the two variables and add the regression line.
3. Save the residuals of the model in a separate object.
4. Write the prediction equation.

### Question 3 (20 points)

We are interested in knowing how the vote share of the presidential candidate of the incumbent's party is associated with the incumbent's electoral success.

1. Run a regression where the outcome variable is **voteshare** and the explanatory variable is **presvote**.
2. Make a scatterplot of the two variables and add the regression line.
3. Write the prediction equation.

## Question 4 (20 points)

The residuals from part (a) tell us how much of the variation in **voteshare** is *not* explained by the difference in spending between incumbent and challenger. The residuals in part (b) tell us how much of the variation in **presvote** is *not* explained by the difference in spending between incumbent and challenger in the district.

1. Run a regression where the outcome variable is the residuals from Question 1 and the explanatory variable is the residuals from Question 2.

2. Make a scatterplot of the two residuals and add the regression line.

3. Write the prediction equation.

## Question 5 (20 points)

What if the incumbent's vote share is affected by both the president's popularity and the difference in spending between incumbent and challenger?

1. Run a regression where the outcome variable is the incumbent's `voteshare` and the explanatory variables are `difflog` and `presvote`.
2. Write the prediction equation.
3. What is it in this output that is identical to the output in Question 4? Why do you think this is the case?