

# Simulation Based Regression Applications

YOUR NAME

11 November, 2020

## Exercises

### 1. Loans

We will use the loans data set again to create linear models. Remember this data set represents thousands of loans made through the Lending Club platform, which is a platform that allows individuals to lend to other individuals.

- a. Read in the data.
- b. Create a subset of data with 200 with the following three variables `interest_rate`, `loan_amount`, and `term`. Change `term` into a factor and use a stratified sample to keep the proportion of loan term roughly the same as the original data.
- c. Plot `interest_rate` versus `loan_amount`.
- d. Fit a linear model to the data.
- e. Using the  $t$  distribution:
  - i. Find a 95% confidence interval for the slope.
  - ii. Find and interpret a 90% prediction interval for a loan amount of \$20000
- f. Repeat part e using a bootstrap.
- g. Check the assumptions of linear regression.

### 2. Loans II

Again using the `loans_full_schema` dataset use the variable `term` to determine if there is a difference in interest rates for the two different loan lengths.

- a. Build a set of three boxplots that summarize interest rate by term. Describe the relationship you see. Note: You will have to convert the `term` variable to a factor prior to continuing.
- b. Build a linear model fitting interest rate against term. Does there appear to be a significant difference in mean interest rates by term?
- c. Write out the estimated linear model. In words, interpret the coefficient estimate.
- d. Construct a bootstrap confidence interval on the coefficient.
- e. Check model assumptions.