MATH 4780 (MSSC 5780) In-class Activity 2

September 24, 2023

Timothy and Matt, please present your work on Sept 26. Remember to ask undergraduate students two Non-yes-no questions. You, as a teacher, try to get students understand your work.

Least absolute deviation regression (Timothy)

In class, we learn ordinary least squares whose estimators minimize the sum of squared residuals. We can use another criterion to find the "best" sample regression line.

1. Explain the idea of least absolute deviation (LAD) regression.

2. Run the code below to generate two simulated data sets (`x1, y1`) and (`x2, y2`). Fit the OLS regression and LAD regression to each of the data sets.

```
x1 <- seq(0, 1, length = 50)
y1 <- 2 + 5 * x1 + rnorm(50)
x2 <- c(x1, 1)
y2 <- c(y1, -3)
```

3. For each data set, plot the data, and their OLS and LAD fitted regression line in one figure. Compare OLS and LAD regressions. (You can use the function `lad()` in the `L1pack` package to fit the LAD regression.)

Confidence Interval for β_1 (Matt)

Run the code below to generate 100 simulated data sets `x` and `y`.

```
n <- 50
M <- 100
```

```
beta0 <- 2
beta1 <- 5
x <- seq(0, 1, length = n)
set.seed(2023)
y <- replicate(M, rnorm(n, mean = beta0 + beta1 * x, sd = 1))
```

Explain the meaning of confidence interval for β_1. Then teach us how to plot the 100 confidence intervals for β_1 like the one shown below.

95% CI for beta_1 from 100 data sets