ECON 0150 | Fall 2025 | Homework 4.1

Due: Friday November 7, at 5PM

Homework is designed to both test your knowledge and challenge you to apply familiar concepts in new applications. Answer clearly and completely. You are welcomed and encouraged to work in groups so long as your work is your own. Use the provided datasets to answer the following questions. Then submit your figures and answers to Gradescope.

Q1. Unemployment and BMI

The article *Zhang, Q., Lamichhane, R., & Wang, Y. (2014)* in the Journal of Clinical Medicine, 3(1), 153-166 studies the associations between US adult obesity and mental health and state/county economic conditions in recessions.

a) Reading through the introduction, what is the primary research question the authors are trying to answer?

b) Reading through the methods section, what dataset(s) do the authors use for their analysis? Be specific about the years and key variables.

c) What are the main outcome and predictor variables?

d) You are provided with a sample of individual-level data from the 2011 Behavioral Risk Factor Surveillance System (BRFSS), which includes the following variables:

- `bmi` – individual Body Mass Index (kg/m²)
- `Mental Healt` – days of Poor Mental Health in the Past 30 Days
- `county_unemp` – county-level unemployment rate (in percentage points)

Using this data, estimate the following linear model:

$$\texttt{bmi}_i = \beta_0 + \beta_1 \cdot \texttt{county\_unemp}_i + \varepsilon_i \tag{1}$$

Report the estimated coefficients $\hat{\beta}_0$ and $\hat{\beta}_1$, and p-values.

e) What does you estimated coefficient $\hat{\beta}_1$ suggest about the relationship between county unemployment and individual BMI?

f) The 2011 BRFSS also includes information on mental health. The variable `menthlth` records the number of days in the past 30 days when the respondent's mental health was "not good." Estimate the following linear model:

$$\texttt{menthlth}_i = \beta_0 + \beta_1 \cdot \texttt{county\_unemp}_i + \varepsilon_i \tag{2}$$

Report and interpret the estimated coefficient $\hat{\beta}_1$.