ECON 0150 | Spring 2026 | Homework 1.5

Due: Friday, February 6 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. Submit your figures and answers to Gradescope.

Q1. Transforming Marriage Rates

The following questions are based on **crude marriage rates** in `marriage_rates.csv` — numbers of marriages per one thousand inhabitants — in 1990 and 2019. Each row represents a different European country.

a) Create a multi-boxplot comparing the distribution of marriage rates in 1990 vs 2019. Based on the boxplots, did marriage rates generally increase or decrease across European countries?

b) Create a new column of absolute change in marriage rates from 1990 to 2019. Compute the **absolute change** in the marriage rate by subtracting the old value from the new value. Which country in this dataset has the largest absolute change between these years? (*Hint: do not take an absolute value; treat 1 as larger than -2.*)

c) Create a new column of relative change in marriage rates from 1990 to 2019. Compute the **relative change** as the ratio resulting from dividing the absolute change by the old value. Which country in this dataset has the largest relative change between these years?

d) Create a scatterplot comparing marriage rates in 1990 (x-axis) vs 2019 (y-axis). Add a 45-degree line to show where countries would fall if their marriage rate stayed the same. How many countries are above the line? What does being above the line mean?