

POLS 602 Homework 1

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This homework assignment is due September 19th via email to the SI. The assignment is worth 100 points total, with each problem and its subsequent parts labeled with their respective worth. You are allowed to collaborate on this assignment and use online resources, so long as you turn in your own work and clearly attribute others' ideas. In your email, please include the .pdf file with your answers and any code used to produce your answers and the .pdf.

Problem 1 (30 points)

L^AT_EX Basics: Equations, Lists, and Tables

1.1 (15 points)

In “BOX R.1” of his “Review” section, Dougherty (2016, 18) displays the formulas for the expected value of a discrete and a continuous random variable in a table similar to the following.

<i>Discrete</i>	<i>Continuous</i>
$E(X) = \sum_{i=1}^n x_i p_i$ (Summation over all possible discrete values.)	$E(X) = \int X f(X) dX$ (Integration over the range for which $f(X)$ is defined.)

Replicate the above table as exactly as you can.

1.2 (15 points)

In equations (1.20) and (1.21), Dougherty (2016, 92) gives the following formulas for the simple regression estimators:

- $$\hat{\beta}_2 = \frac{\sum_{i=1}^n (X_i - \bar{X})(Y_i - \bar{Y})}{\sum_{i=1}^n (X_i - \bar{X})^2}$$
- $$\hat{\beta}_1 = \bar{Y} - \hat{\beta}_2 \bar{X}$$

Replicate the above list of equations.

Problem 2 (35 points)

R Basics 1: Real-World Data

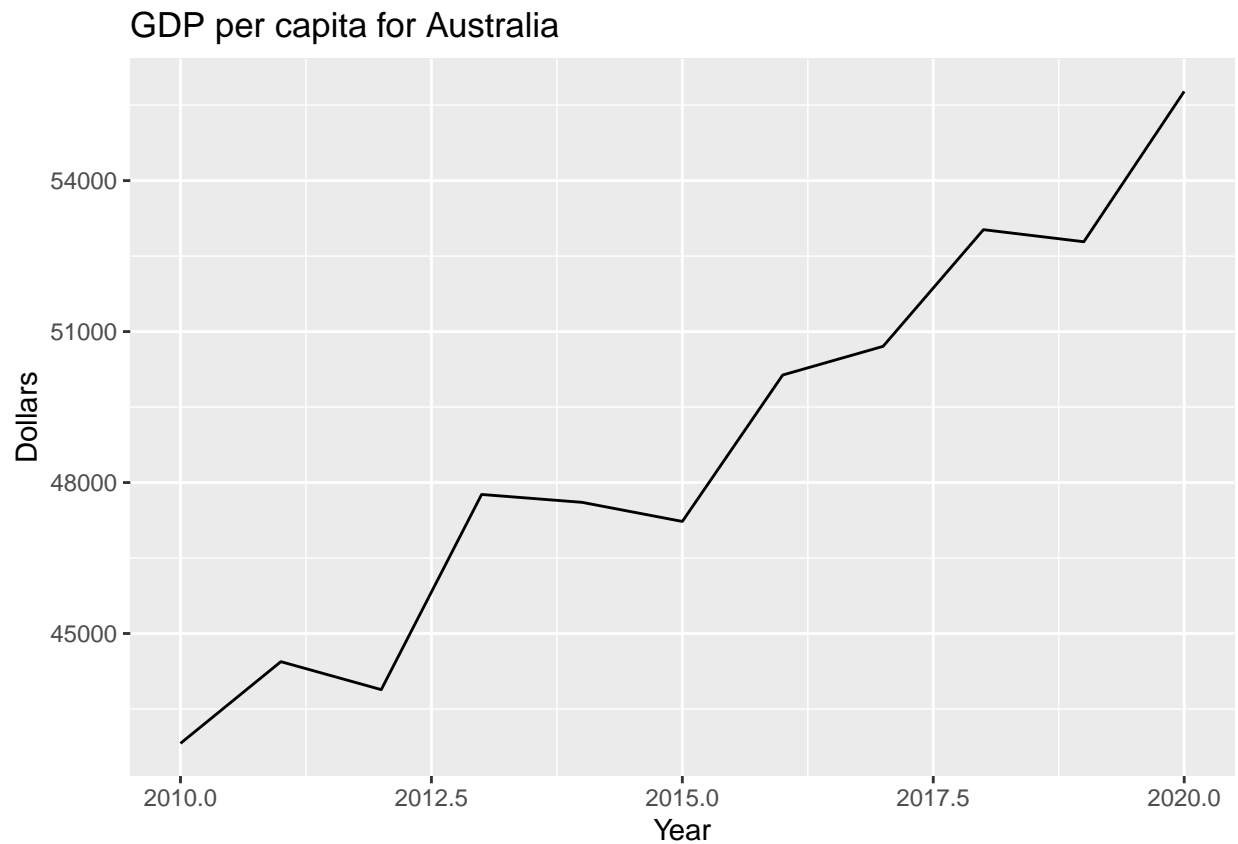
Please read in the data provided with this assignment, “DP_LIVE_08092023021632164” (OECD 2023). This is gross domestic product (GDP) per capita data from 2010-2020 for seven countries part of the Organization for Cooperation and Development (OECD).

2.1 (10 points)

Find the mean GDP per capita of Canada.

2.2 (25 points)

Using the `ggplot` function from the `ggplot2` package, create a line graph of GDP per capita for Australia with appropriate labels. It will look something like the following.



Problem 3 (35 points)

R Basics 2: Simulated Data

3.1 (20 points)

Create a `data.frame` object with two variables, called `x` and `y`. Have `x` be the numbers 1 through 10 while `y` is 10 numbers from the `rnorm` function with the default mean and variance. Before creating this data, run the command `set.seed(1)` to ensure that the numbers generated from `rnorm` are the same for others who may use your code.

3.2 (15 points)

Add a new variable to the data you just created, called `z`. Have `z` be equal to 5 times the variable `x` plus the variable `y`.

Bibliography

Dougherty, Christopher. 2016. *Introduction to Econometrics*. Oxford University Press. New York, NY.

OECD. 2023. “Gross Domestic Product (GDP).” <https://data.oecd.org/gdp/gross-domestic-product-gdp.htm>.