In-Class Lab 7

ECON 4223

September 14, 2023

The purpose of this in-class lab is to practice conducting hypothesis tests about regression parameters in R. The lab may be completed in a group. To get credit, upload your .R script to the appropriate place on Canvas.

For starters

Open up a new R script (named `ICL7_XYZ.R`, where `XYZ` are your initials) and add the usual "preamble" to the top:

```r
# Add names of group members HERE
library(tidyverse)
library(broom)
library(wooldridge)
library(magrittr)
library(modelsummary)
```

Load the data

We'll use a new data set on Research and Development (R&D) expenditures, called `rdchem`. The data set contains information on 32 companies in the chemical industry.

```r
df <- as_tibble(rdchem)
```

Check out what's in the data by typing

```r
datasummary_df(df)
datasummary_skim(df,histogram=FALSE)
```

The main variables are measures of R&D, profits, sales, and profits as a percentage of sales (`profmarg`, i.e. profit margin).

Regression and Hypothesis Testing

Estimate the following regression model:

$$rdintens = \beta_0 + \beta_1 \log(sales) + \beta_2 profmarg + u$$

Note that the variable $log(sales)$ already exists in `df` as `lsales`. $rdintens$ is in percentage units, so a number of 2.6 means that the company's total R&D expenditures are 2.6% of its sales.

I won't show you the code for estimating this model, as it should be old hat by now. If you've forgotten, I recommend looking at code from a previous lab.

Answer the following questions:

1. Interpret the coefficient on `lsales`. If *sales* increase by 10%, what is the estimated percentage point change in *rdintens*?
2. Is this an *economically significant* relationship?
3. Using the output of `tidy(est)`, test the hypothesis that sales affects R&D intensity at the 10% level. In other words, test:
$$H_0 : \beta_1 = 0; H_a : \beta_1 \neq 0$$

4. Does your answer to (3) change if you instead consider a one-sided alternative? (i.e. $H_a : \beta_1 > 0$)
5. Now consider the β_2 parameter. Is there a statistically significant effect of profit margin on R&D intensity?