

# Tutorial Business Analytics

## Homework 3

### Exercise 3.3

Install the “AER” (Applied Econometrics with R) package and open the “CPS1988” data set.

- a) Briefly describe the data set:
- Name the dependent variable and the independent variables.
  - Which scales of measurement do the variables belong to (e.g. nominal, ordinal, interval or ratio)?
  - Does the data set consist of cross-sectional, time-series or panel data?
- b) Plot the dependent variable against each independent variable and transform the variables if necessary. Which transformations would you carry out and why?

Estimate the following model (mr\_1):

$$\ln(wage_i) = \beta_0 + \beta_1 \cdot education_i + \beta_2 \cdot ethnicity_i + \beta_3 \cdot experience_i + \beta_4 \cdot experience_i^2$$

- c) Interpret the above model (mr\_1):
- Which variables are statistically significant?
  - Is the entire model statistically significant?
  - What is the explanatory power of the model and why?
  - Interpret each regression coefficient.

Now, estimate the following model (mr\_2):

$$\ln(wage_i) = \beta_0 + \beta_1 \cdot education_i + \beta_2 \cdot ethnicity_i + \beta_3 \cdot education_i * ethnicity_i + \beta_4 \cdot experience_i + \beta_5 \cdot experience_i^2$$

- d) What is the difference between both models from above (mr\_1 and mr\_2)?
- e) Repeat c) with model mr\_2.

**Note:** Use R to solve this exercise (exercise 3.3\_R-template.R). Be aware that the natural logarithm “ln” corresponds to “log” in R.

### Exercise 3.4

Install the “AER” (Applied Econometrics with R) and the “plm” (Panel Data Econometrics in R) packages and open the “Grunfeld” data set. See the R-Script from the lecture Multiple Regression & Panel Data (3.Reggression.R) to solve this exercise.

- a) Briefly describe the data set:
  - i. Name the dependent variable and the independent variables.
  - ii. Which scales of measurement do the variables belong to (e.g. nominal, ordinal, interval or ratio)?
  - iii. Does the data set consist of cross-sectional, time-series or panel data?
- b) Plot the dependent variable against each independent variable and transform the variables if necessary. Which transformations would you carry out and why?

Consider the following model:

$$invest_{it} = \beta_0 + \beta_1 \cdot value_{it} + \beta_2 \cdot capital_{it}$$

- c) How can you test the presence of unobserved individual specific effects in the above model? Do so.
- d) Should you use a Random Effects Regression or a Fixed Effects Regression to take into account the unobserved individual specific effects?

**Note: Use R to solve this exercise (exercise 3.4\_R-template.R).**