Use the appleProdFr86 data set from the micEcon package for the following tasks!

# Production theory and Efficiency Analysis I

**Exercise 1.** Calculate the following :

(a) Show the distribution of the apple production with usefull diagrams

(b) Calculate the average product of labour, capital and material.

(c) Show their distributions with histograms.

(d) Calculate and plot the total factor productivity of the apple production.

(e) Calculate the total costs, variable costs as well as profit and gross margins

**Exercise 2.** Consider the following production function:

$$Q = 15K^{4/5}L^{1/5}$$

where Q is output, K is capital and L is labour.

(a) Transform the function into logarithmic form.

(b) Use R to compute ln Q. Let L=10 and K=5.

(c) Use the "exp" function to determine Q.

**Exercise 3.** Use the appleProdFra86 dataset and the "lm" function for the following tasks:

(a) Fit a linear production function.

(b) Fit a Cobb-Douglas production function.

(c) Fit a Quadratic production function.

(d) Fit a Translog production function.

**Exercises for SFA after lunch session!**

**Exercise 4.**

(a) Fit a Cobb-Douglas production frontier using the "frontier" function

(b) Interpret the elasticity coefficients and express them with one sentece each

(c) What is the mean technical efficiency score? Interpret it

(d) What is the value of gamma? What does it mean?

(e) Use the "efficiencies" function to compute the efficiency score of each producer

(f) Plot a histogram of the scores

(g) Use a likelihood ratio test to compare the Cobb-Douglas frontier model with OLS. Interpret the result in the context of its Null hypothesis.

(h) Compute the returns to scale of the production frontier. What does the value indicate? Is it increasing, decreasing or constant returns to scale?

**Exercise 5.**

(a) Fit a translog production frontier using the "frontier" function and repeat b) - h)

(b) Conduct the Wald test and interpret the result in the context of its Null hypothesis