

ECON 4130

HG Nov. 2010

Calculation of MLE's for gamma distributed data using Excel

The data are the Precipitation data from Rice example 8.4C and 8.5C. The data can be downloaded from <http://folk.uio.no/haraldg/>

(The web-reference given in the preface in Rice does not appear to work properly at the moment)

Reasonable start values are often given by consistent estimates, e.g. the mme's are often used:

$$\text{The mme's: } \tilde{\lambda} = \frac{\bar{X}}{\frac{1}{n} \sum_{i=1}^n X_i^2 - (\bar{X})^2} = 1.684, \quad \tilde{\alpha} = \frac{(\bar{X})^2}{\frac{1}{n} \sum_{i=1}^n X_i^2 - (\bar{X})^2} = 0.378$$

(Check these values yourself – they are slightly different from the values in Rice example 8.4C)

We want to maximize the log likelihood function, given by

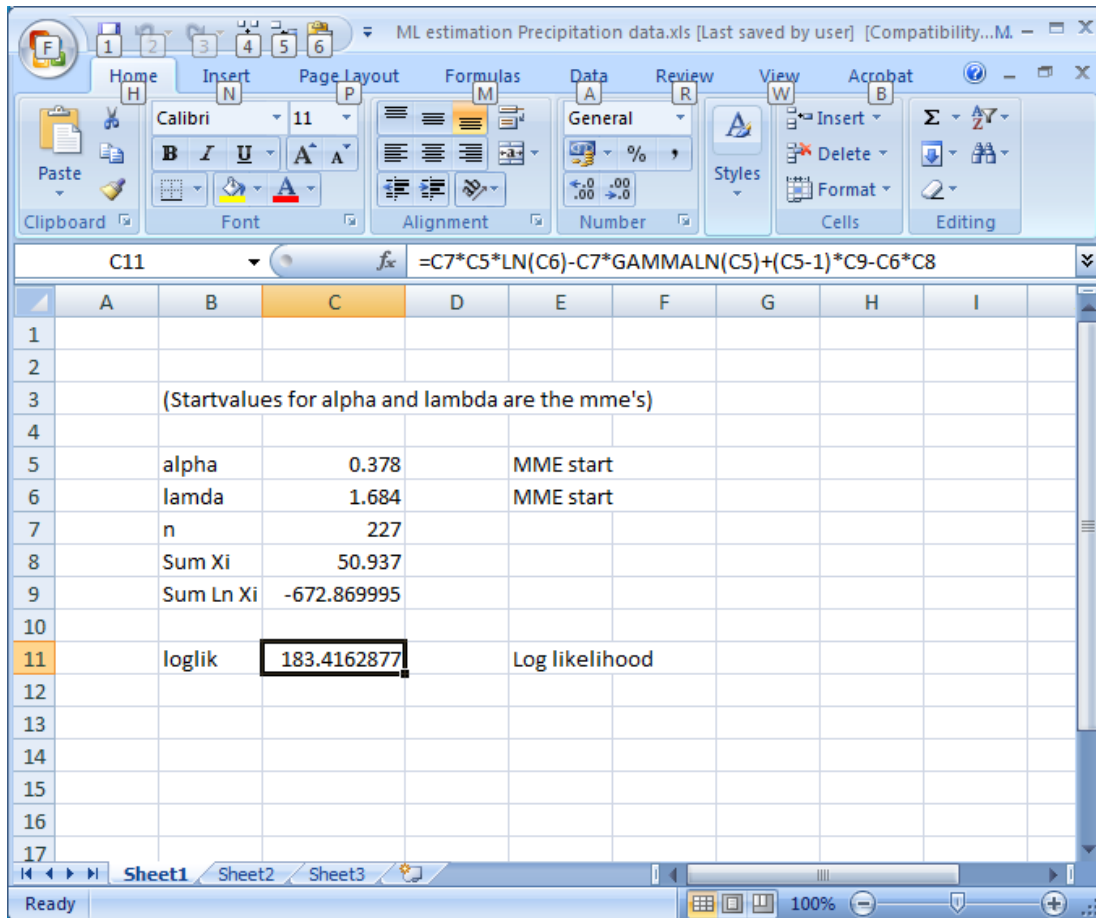
$$l(\alpha, \lambda) = n\alpha \ln(\lambda) - n \ln(\Gamma(\alpha)) + (\alpha - 1) \sum_{i=1}^n \ln(x_i) - \lambda \sum_{i=1}^n x_i$$

where x_1, x_2, \dots, x_n denote the observations and $n = 227$. Now calculate

$$\sum_{i=1}^n x_i = 50.937 \quad \text{and} \quad \sum_{i=1}^n \ln(x_i) = -672.869995 \quad \text{and calculate in Excel } l(\tilde{\alpha}, \tilde{\lambda}) = 183.416\dots \text{ as}$$

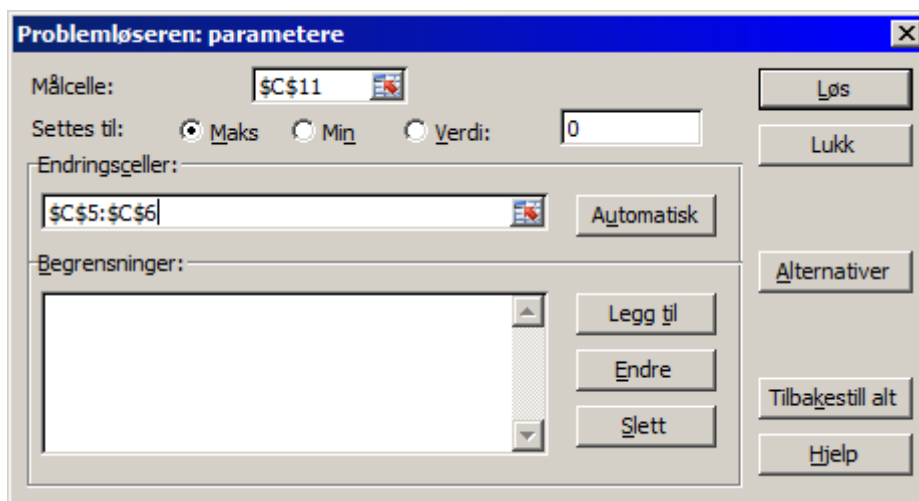
indicated in figure 1 (notice the formula on the top of the sheet).

Figure 1



Now use the module “Solver” (“Problemløser”) that can be found under “Add-ins” if it is not on the Data-menu. Specify the target cell (C11) (“Målcelle”) that is to be maximized by varying α, λ in cells C5 and C6. (Shown in figure 2).

Figure 2



The end result should be as in figure 3, with the mle's in cell C5 and C6, and the maximum value in cell C11.

Try it!

Figure 3

