Econ4130

06 H

Exercises for seminar week 46

Rice chapter 8:

No 7 a,b,c   (no 5 in edition 2)
No 8 a,b   (no 6 in edition 2)
No 23   (no 21 in edition 2) - (An example where the standard
                                      conditions for mle are not fulfilled. How?)

No 46   (no 38 in edition 2)

Hints for no 46 (38):
The data for this exercise, can be downloaded from www.thomsonedu.com/statistics
(from there go to "data library" and then to Rice's book. Download the comma delimited
ascii version and pick out the file "Whales.txt". This ascii file can be imported directly
into Stata by import on the file menu (Use e.g. "ascii data created by a spreadsheet").

Answer first **a**, **b**, and **c.**

Hint for c: Maximum likelihood can be done in STATA by the ml-command, but
somewhat involved. It is much easier to use Excel:

You don't need the whole data set in Excel, only the values of n, $\sum \ln x_i$, $\sum x_i$.
Choose two cells for the arguments, α, and λ , to the log-likelihood, that you fill with
suitable start values, e.g., the moment estimates from **b.** Choose also cells containing the
three values above. Then define the log-likelihood function in a sixth cell (remember to
start the function definition by an equality sign, =). Note also that the function, $\ln \Gamma(\alpha)$ is
implemented in Excel under the name GAMMALN. Click the cell where the log-
likelihood function is, and use the solver- module (too be found under tools on the menu)
to maximize the log likelihood.

Answer d.

Hint for d: You can use "overlaid twoway graphs" on the graph menu, or, alternatively, use the "twoway" graph command in STATA (see help twoway). You can combine several graphs in one by separating several graph commands by double vertical lines, ||. For example, suppose the data are in column, x, and the values of a density, calculated for all values in x, are in a column, g. A graph that combines a histogram with the density plot, is for example made by the command

> twoway histogram x, bin(15) || line g x, sort

The option bin(15) says that the histogram shall contain 15 intervals. Choose the number of intervals yourself. The option, sort, to the line command sorts the data before plotting (try what happens without this option).

To calculate the gamma density, you can use the function, gammaden(a,1,0,x), that calculates the $\Gamma(a,1)$ density. (gammaden(a,b,0,x) does not seem to work properly for b different from 1). To calculate the $\Gamma(a,b)$ density, you can instead use the following: If $g(x)$ is the density for $\Gamma(a,1)$, then $b \cdot g(bx)$ is the density for $\Gamma(a,b)$. Hence, the function, b*gammaden(a,1,0,b*x), should do the trick.

Skip e-f: Instead of **e** and **f** in the book, calculate approximate standard errors for the mle estimators using the asymptotic theory described in "Lecture notes to Rice chapter 8".

Answer g.