

## HOME ASSIGNMENT 1

The home assignment consists of 4 parts (below), which all should be answered. The home assignment is due on Monday, October 18, 2004. It is worth 15% of the course mark. All aids except personal assistance are allowed.

The topic of the home assignment is maximum quasi-likelihood (MQL) and maximum likelihood (ML) estimation for generalised linear models.

### *Part 1*

Exercise E 5.3 in the textbook.

### *Part 2*

Exercise E 5.10 in the textbook.

### *Part 3*

Carry out a simulation study to compare the finite-sample properties of MQL and ML estimation in the setting of Part 2. Take  $n = 10$  and  $n = 50$  in two different scenarios but restrict the study to the most interesting  $\beta$ -value(s). How well do the finite-sample variances agree with the large-sample variances from Part 2?

(*Hint:* ML estimation can be carried out in the R software using the `mle` function.)

### *Part 4*

Write a small summary (1–2 pages) about MQL and ML estimation in generalised linear models in which you explain the two methods and contrast their assumptions, large-sample and small-sample performance. Include in the summary both the findings from Parts 1–3 and the paper by Firth (1987) referred to in the textbook.