Exercises, STK4040, week 43

October 19, 2007

Exercise 1

Do Exercise 6.2.1 from the book. (Tip: P equals M from last week's Exercise 1.)

Exercise 2

Verify Equation (6.5.6) in the book, and show that the definition in Equation (6.5.7) is equivalent.

Exercise 3

Assume $\varepsilon \sim N(0,1)$ independent of $\boldsymbol{x} \sim N_5(\mu, \Sigma)$, where

$$\mu = \begin{pmatrix} 0 \\ 1 \\ 2 \\ 3 \\ -2 \end{pmatrix} \quad \text{and} \quad \Sigma = \begin{pmatrix} 1.0 & 0.5 & 0.5 & -0.2 & 0.0 \\ 0.5 & 1.5 & 0.8 & 0.1 & 1.0 \\ 0.5 & 0.8 & 1.0 & -0.7 & 0.5 \\ -0.2 & 0.1 & -0.7 & 2.0 & -0.5 \\ 0.0 & 1.0 & 0.5 & -0.5 & 2.0 \end{pmatrix},$$

Let $y = 3 + \boldsymbol{x}^T\beta + \varepsilon$, where $\beta = (1, -1, 2, 0.5, 0.3)^T$.

Draw 20 observations $(\mathrm{X}, \boldsymbol{y})$ from $(\boldsymbol{x}^T, y)$ and do a regression of $\boldsymbol{y}$ onto X. (For the regression, we assume that X is fixed.) Calculate the standard deviation and the covariance matrix of the estimated regression coefficients, and compare to the true values.

Now column centre X, and repeat the regression. Compare the results with the results for uncentred data. What is different, and why? Is it best to centre or not?