

**Statistical Methods for Artificial Intelligence, Autumn 2006**  
**Problem set 4, Due Wednesday Oct. 25**

Problem 1. The least squares error for a parameter  $\beta$  is:

$$E[(y - \beta^T x)^2]$$

where  $y$  and  $x$  are random variables, with  $y \in \mathbb{R}$  and  $x \in \mathbb{R}^p$  (here  $x$  is a column vector).

For the case when  $E[xx^T]$  is a diagonal matrix with  $E[x_i^2] = \sigma_i^2$ , show *by taking derivatives* of the error function that the optimal  $\beta$ , the one that minimizes the above equations, has the form:

$$\beta_i = E[yx_i]/\sigma_i^2$$