

**ASSIGNMENT #4, STAT 5511, Spring, 2008**  
**Due on Wednesday, March 5**

- (1) Do problem 2.10 on p.56.
- (2) Do Problem 2.18 on p.12 on p.59/60.
- (3) Review of matrix algebra.

(a) Let

$$A = \begin{pmatrix} 1 & 4 & 1 \\ 3 & 0 & 1 \\ 1 & 0 & 2 \end{pmatrix} \quad B = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$$

- Compute :
- (a1)  $AA'$  ( $A'$  is the transpose of  $A$ )
  - (a2)  $B'B$
  - (a3)  $AB$

- (b) Consider the following system of linear equations:

$$\begin{aligned} 2x_1 + 3x_2 + 2x_3 &= -10 \\ -x_1 - 2x_2 + 3x_3 &= 4 \\ 3x_1 + 4x_2 + 2x_3 &= -5 \end{aligned}$$

- (b1) Write the system in matrix form:  $AX = b$
- (b2) Find  $A^{-1}$ . ( $A^{-1}$  is the inverse of  $A$ ). You may use SAS to do this.
- (b3) Solve the system by the fact  $Ax = b$  (i.e.  $x = A^{-1}b$ ). You may use SAS to do this.

- (4) (you may use SAS to do b2,b3,b4) Consider the simple linear regression model :

$$Y_i = \beta_0 + \beta_1 x_i + \varepsilon_i \quad \text{where } \varepsilon_i \text{ are independent and Normal with mean 0 and variance } \sigma^2$$

- (a) Write the model in matrix form  $Y = X\beta + \varepsilon$ .

- (b) Consider the following data from HW # 1, problem #6:

$x_i$	50	64	76	64	74	60	69	48
$y_i$	128	159	158	119	133	112	96	118

- (b1) Write down the matrix  $X$  and the vectors  $Y$  and  $\beta$  for this problem.
- (b2) Calculate  $X'X$ .
- (b3) Calculate  $X'Y$ .

(b4) Calculate the least squares estimate  $\hat{\beta}$  of the vector  $\beta$  by using the result  $\hat{\beta} = (X'X)^{-1}X'Y$ .

(b5) Check the result of (b4) with your calculation in HW#1 (Problem 6).

(5) Do Problem 3.5 (a,b,c ) on p. 115.

(6) (Optional) Do Problem 2.28 on p.62.

(7) (Optional) Do Problem 2.29 on p.62..