

EEB 581, Problem Set Four

Due Tuesday, 17 Feb. 2004

1 : Consider the following set of equations

$$\begin{aligned}8x_1 + 13x_2 - 4x_3 + x_4 &= 9 \\-4x_1 + x_2 + 5x_3 - 3x_4 &= 5 \\7x_1 + 9x_2 + 2x_3 + 7x_4 &= -4 \\3x_1 + 4x_2 + 6x_3 + 2x_4 &= 12\end{aligned}$$

- (a) Express this system of equations in matrix form
- (b) Solve for the vector of the unknown x_i .

2 : Suppose $x_1, x_2,$ and x_3 are multivariate normally distributed with means $\mu_1 = 1, \mu_2 = 0,$
 $\mu_3 = -2,$ and covariance structure

$$\sigma^2(x_1) = 3, \quad \sigma^2(x_2) = 4, \quad \sigma^2(x_3) = 6, \quad \sigma(x_1, x_2) = 1, \quad \sigma(x_1, x_3) = -1, \quad \sigma(x_2, x_3) = 2$$

Finally, define $y = x_1 - 3x_2 + 4x_3$ and $z = 3x_1 + 4x_2 - 7x_3$.

- (a) Compute $\sigma^2(y)$.
- (b) Compute $\sigma^2(z)$.
- (c) Compute $\sigma^2(y, z), \rho(y, z)$
- (d) What is the distribution of x_1, x_2 given x_3 ?
- (e) What is the regression of x_1 on x_2 and x_3 ?
- (f) What is the conditional variance of x_1 given x_2 and x_3 ?