THE UNIVERSITY OF CHICAGO
Graduate School of Business
Business 424-01, Spring Quarter 1998, Mr. Ruey S. Tsay

Solutions to Midterm

I used the current textbook as reference to answer the questions (4/29/02).

1. Answer:
   (a) Yes, based on Result 4.7(a) on page 163.
   (b) False, based on Result 4.6 on page 160. The correct variance is $\sigma_{11} - \frac{\sigma_{12}^2}{\sigma_{22}}$.
   (c) The expectation is σ_{12}/σ_{22}.
   (d) Yes, based on Result 4.3 on page 157 and Result 4.6 on page 160.
   (e) $N_m(\boldsymbol{\mu}, \frac{1}{n}\boldsymbol{\Sigma})$ based on Result 4.3.

2. Answer:
   (a) Apply Result 7.1 on page 358.
   (b) See pages 360-361 of the textbook.

3. Answer: Let $\boldsymbol{z}_0 = (1, 15, 60)'$. Use the results on pages 374-375 of the textbook.
   (a) prediction $= \boldsymbol{z}_0'\hat{\boldsymbol{\beta}} = 73.18$.
   (a) 95% prediction interval $= 73.18 \pm 2.11 * \sqrt{s^2[1 + \boldsymbol{z}_0'(\boldsymbol{Z}'\boldsymbol{Z})^{-1}\boldsymbol{z}_0]}$, which is approximately 73.18 ± 6.98. [The calculation shows that $(\boldsymbol{Z}'\boldsymbol{Z})^{-1}$ matrix might have some rounding errors.]

4. You may use Section 6.2 to solve this problem. Effectively, we are concerned with $\mu_1 - \mu_2 = (1, -1)\boldsymbol{\mu}$. The result of page 279 applies with $\boldsymbol{C} = (1, -1)'$ and $q = 2$. Alternatively, let $\bar{d} = \bar{x}_1 - \bar{x}_2$. Then, $\text{Var}(\bar{d}) = \frac{1}{n}[\text{Var}(x_1) + \text{Var}(x_2) + 2\text{Cov}(x_1, x_2)]$, where x_i denotes the i-th index. You can apply the usual t-test for the $\bar{d}$. Here $\bar{d} = -4.3$ and $\text{Var}(\bar{d}) = 1.42$. The t-ratio is -3.61, which is significant at the 5% level.