

620-371: Linear Models

Practice Class 11

19th May, 2009

1. Let $H_0 : C\beta = \mathbf{0}$ be testable. Show that $C(X^T X)^c C^T$ is unique, i.e. does not depend on the choice of conditional inverse for $X^T X$. (*Hint: Let $(X^T X)_1^c$ be another conditional inverse for $X^T X$ and show that $C(X^T X)^c C^T = C(X^T X)_1^c C^T$. Remember that since H_0 is testable, $C(X^T X)^c X^T X = C$ for any conditional inverse of $X^T X$).*)
2. An industrial psychologist is investigating absenteeism among production-line workers, based on different types of work hours: (1) 4-day week with a 10-hour day, (2) 5-day week with a flexible 8-hour day, and (3) 5-day week with a structured 8-hour day. A study was conducted and the following data obtained of the average number of days missed:

	Work plan		
	1	2	3
Mean	9	6.2	10.1
Number	100	85	90

We also have $s^2 = 110.15$. Test the hypothesis that the work plan has no effect on the absenteeism. The 95% critical value for an F distribution with 2 and 272 degrees of freedom is 3.03.

3. For the one-way classification model, given the expressions for $X^T \mathbf{y}$ and $(X^T X)^c$ in the lecture slides, show that

$$SS_{Reg} = \sum_{i=1}^k (\bar{y}_i)^2 n_i.$$

4. We are interested in looking at the effect of breed and diet on the milk yield of cows. A study is conducted and the following data obtained:

Breed	Diet		
	1	2	3
1	18.8	16.7	19.8
	21.2		23.9
2	22.3	15.9	21.8
		19.2	

- (a) Express this as a two-factor model with no interaction in matrix form.
- (b) Express this as a two-factor model with interaction in matrix form.
- (c) Express the hypothesis that there is no interaction in terms of your parameters. Eliminate any redundancies.