

1. Suppose $Y \sim N(X\beta, \sigma^2\Sigma)$ where $X = (X_I, X_{II}) \in R^{n \times p}$ with $\text{rank}(X) = r$ and $X_I \in R^{n \times p_1}$ with $\text{rank}(X_I) = r_1$.
 - (1) Show that $(\Sigma^{-1/2}X)(\Sigma^{-1/2}X)^+ + (\Sigma^{-1/2}X_I)(\Sigma^{-1/2}X_I)^+ = (\Sigma^{-1/2}X_I)(\Sigma^{-1/2}X_I)^+$
 - (2) Show that $(\Sigma^{-1/2}X_I)(\Sigma^{-1/2}X_I)^+ + (\Sigma^{-1/2}X)(\Sigma^{-1/2}X)^+ = (\Sigma^{-1/2}X)(\Sigma^{-1/2}X)^+$
 - (3) Let $A = \frac{(\Sigma^{-1/2}X)(\Sigma^{-1/2}X)^+ - (\Sigma^{-1/2}X_I)(\Sigma^{-1/2}X_I)^+}{\sigma^2}$.
Find the distribution for $Z^2 = [\Sigma^{-1/2}(Y - X\beta)]' A [\Sigma^{-1/2}(Y - X\beta)]$.
2. File mydata.dat in HW07 contains variable y and character variable Sid that identifies 4 levels of a factor in one-way ANOVA. Find ANOVA table for this ANOVA model.
Keep 4 digits after decimal point.
3. File T6-10.dat in HW08 contains variables y, x_1, x_2 and a character variable type.
Find ANOVA table for regression $y = \beta_1x_1 + \beta_2x_2 + \epsilon$. Keep 4 digits after decimal point.