考試科目 Course	Linear Model	開課系級 Dept, & Class	統研所	日期 Date, Period	2 月 18 日 第 節	試題編號 Course No.

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a) Consider the regression model $\underset{\sim}{Y} = \underset{\sim}{X}\underset{\sim}{\beta} + \underset{\sim}{\varepsilon}$ where $\underset{\sim}{Y}, \underset{\sim}{\varepsilon}$ are vectors of observations and errors, respectively, where $\underset{\sim}{X}$ is an n… matrix of predictor variables and where $\underset{\sim}{\beta}$ is a $p \times 1$ vector of parameters to be estimated. If the restriction $\underset{\sim}{C}\underset{\sim}{\beta} = \underset{\sim}{d}$ m… hold, where $\underset{\sim}{C}$ is $q \times p$ $(q < p)$ and of full row rank, fi… the least squares estimate $\hat{\beta}$ in terms of $\underset{\sim}{b} = (X'X)^{-1}\underset{\sim}{X}'\underset{\sim}{Y}$ … $\underset{\sim}{X}$, $\underset{\sim}{d}$ and $\underset{\sim}{C}$. (20 points)

b) Now consider the linear hypothesis $\underset{\sim}{C}\underset{\sim}{\beta} = \underset{\sim}{0}$. Using (a) … otherwise, find the "Sum of Squares due to Ho". (2…

c) Show that, for the data set below, $SS(H_0: \beta_1 = \beta_2)$ has value 24.5 (20 points)

$$
\underset{\sim}{X} = \begin{array}{c} \begin{array}{ccc} 1 & X_1 & X_2 \end{array} \\ \begin{bmatrix} 1 & -1 & -1 \\ 1 & 1 & -1 \\ 1 & -1 & 1 \\ 1 & 1 & 1 \\ 1 & 0 & 0 \end{bmatrix} \end{array}, \quad \underset{\sim}{\beta} = \begin{bmatrix} \beta_0 \\ \beta_1 \\ \beta_2 \end{bmatrix}, \quad \underset{\sim}{Y} = \begin{bmatrix} 22 \\ 20 \\ 27 \\ 29 \\ 24 \end{bmatrix} .
$$

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2. The italiced portion of each of the following statements is either True or False. Indicate whether you feel True or False is the correct answer to each statement and prov a short justification. No credit will be answered without justification. (20 points)

a) Let T be a random variable having a t-distribution wi m degree of freedom. Let G be a random variable having an F distribution with $(1, m)$ degrees of freedo

$$\text{prob}\{T > a\} = \text{Prob}(G > a^2)$$

b) Consider the model $Y = b_0 + b_1 X_1 + b_2 X_2 + e$. Sup you wish to test $H_0: (b_2 = 0 \mid b_0, b_1)$ vs $H_a: (b_2 \neq 0 \mid b_0,$ Assume $\text{Corr}(X_1, X_2) = 0$; $\text{Corr}(Y, X_1) = -0.8$; and $\text{Corr}(Y,$ $= 0.1$, The null hypothesis can never be rejected. (20 poi