

國立政治大學 110 學年度第 1 學期 小考 (2) 考試命題紙

考試科目：Regression Analysis (I)

開課班別：商院選修

命題教授：吳漢銘

考試日期：12 月 02 日 (四) 11:10-12:00

※准帶項目打「O」· 否則打「×」

1. 需加發計算紙或答案紙請備註。

本試題共 1 頁 · 印刷份數：30 份

Calculator

Book
Notes

Dictionary

Cell phone
Laptop

2. 為環保節能減碳 · 試題一律採雙面印刷 · 如有特殊印製需求 · 請註記：

備註：注意事項要看!! (範圍: §5)

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Note: (1) Fill in your name and student ID ° (2) Answer the questions in English ° (3) Answer the questions in the order in which they appear ° (4) Pencils are permitted for use ° (5) Hand in the question, the answer sheets and the sketch papers ° (6) The calculation process is required. (7) Use $\underline{\beta}$ or \underline{X} to represent a vector β or a matrix X .

1. One would like to fit the simple linear regression (SLR) model to a given dataset $\{(Y_i, X_i), i = 1, \dots, n\}$.

(a) (10%) Write down the normal error regression model for SLR in terms of (Y_i, X_i) .

(b) (10%) Express variables and regression coefficient by column vectors or a matrix first. And then Express the model in matrix terms (boldface symbols).

(c) (20%) Derive the normal equations (in matrix notation) by the method of least squares:

$$Q = \sum [Y_i - (\beta_0 + \beta_1 X_i)]^2.$$

(d) (10%) Obtain the estimated regression coefficients (denoted by \mathbf{b}) from normal equations by matrix methods.

2. (20%) Use matrix methods to obtain the estimated regression coefficients for the following data:

i	1	2	3	4	5	6	7	8	9	10
X_i	1	0	2	0	3	1	0	1	2	0
Y_i	16	9	17	12	22	13	8	15	19	11

NOTE: If $\mathbf{A} = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ then $\mathbf{A}^{-1} = \begin{bmatrix} d/D & -b/D \\ -c/D & a/D \end{bmatrix}$, where $D = ad - bc$.

3. ANOVA results from SLR.

(a) (15%) There are three sums of squares in ANOVA results, write down their formulas (definitions) and derive their corresponding matrix representation. (Not just express them in matrix terms directly.)

(b) (15%) Show that these three sums of squares are all quadratic forms.

注意：1、考試求公平及公正，請同學務必自律，維護學校與學生之榮譽。

2、考試時不得有交談、窺視、夾帶、抄襲、傳遞、代考或其它作弊等舞弊行為，考畢務必交卷，不得攜卷出場，違者依考場規則議處。