# 國立政治大學 114 學年度第 2 學期 小考 (2) 考試命題紙

考試科目： 統計學 (二)　　開課班別： 統計學整合開課　　命題教授: 吳漢銘

| 考試日期：5/19(二)14:40-13:50 | ※准帶項目打「O」，否則打「×」 | | | | | 1. 需加發計算紙或答案紙請在試題內封袋備註。<br>2. 為環保節能減碳，試題一律採雙面印刷，有特殊印製需求，請註記：A 卷 |
|---|---|---|---|---|---|---|
| 本試題共3頁，印刷份數: 67 份 | 計算機 | 課本 | 筆記 | 字典 | 手機平板筆電 | |
| 備註：注意事項要看!! (ch14) | O | × | × | × | × | |

**注意事項:**

(1) 在答題紙上填寫學號和姓名。請在答題紙右上角標明你使用的試卷編號：**A** ( 預設 ) 或 **B** 或 **C**。

(2) 第 2 次小考及期末考皆為選擇題型式 (答錯無倒扣)。加分題除外。

(3) 請按題號順序作答。總分為 120 分。

(4) 建議使用深色原子筆 ( 允許使用鉛筆 )。禁用手機 3C 產品。可使用計算機 (無程式功能)。

(5) 加分題若是計算題，過程必須寫出 (中英文皆可) ( 計算至小數點後 4 位 )。

(6) 答題紙與試題卷須一併交回。

(7) 作弊學生當次及日後考試試卷將不予批改，情節嚴重將報校處理。

**(-) 宣誓詞** (0%): 複寫下列宣誓詞至答案卷的第一頁最上面。(**不寫扣 10 分**)

0. " 本人姓名 恪遵各項考試規則，若如違反，願受校方最嚴厲處罰，謹誓。"

**(I) 選擇題** (每題 7 分，15 題，共 105 分); select one correct answer.

1. Suppose an estimated regression equation is $\hat{y} = 95 - 1.8x$, where $x$ is delivery time and $y$ is customer satisfaction score. Which interpretation is most appropriate? (A). A one-unit increase in delivery time causes satisfaction to decrease by 1.8 units. (B). Within the range of the observed data, predicted satisfaction decreases by 1.8 units for each one-unit increase in delivery time. (C). The intercept 95 must be interpreted as an actually observed satisfaction score when $x = 0$. (D). The error term is fixed at $-1.8$ for every observation.

2. Which statement correctly distinguishes the regression model, regression equation, and estimated regression equation? (A). The regression model excludes the error term, while the regression equation includes it. (B). The regression equation describes an individual value of $y$, not the mean value of $y$. (C). The regression model includes $\varepsilon$, the regression equation describes $E(y)$, and the estimated regression equation substitutes $b_0$ and $b_1$ for unknown parameters. (D). All three equations establish a cause-and-effect relationship between $x$ and $y$.

3. For a sample of $n = 6$ observations, suppose

$$\sum x_i = 48, \qquad \sum y_i = 126, \qquad \sum x_i^2 = 438, \qquad \sum x_i y_i = 1161.$$

The least squares estimated regression equation is approximately (A). $\hat{y} = -1.667 + 2.833x$. (B). $\hat{y} = 2.833 - 1.667x$. (C). $\hat{y} = 21 + 8x$. (D). $\hat{y} = 1.667 + 2.833x$.

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4. In a regression study, suppose

$$\bar{x} = 10, \qquad \bar{y} = 35, \qquad \sum (x_i - \bar{x})^2 = 50, \qquad \sum (x_i - \bar{x})(y_i - \bar{y}) = -125.$$

The least squares prediction when $x = 14$ is (A). 15. (B). 20. (C). 25. (D). 30.

5. Two candidate regression lines produce the following residuals:

| | | | | | |
|---|---|---|---|---|---|
| Line I | 4 | −4 | 3 | −3 | 0 |
| Line II | 5 | −1 | −1 | −1 | −2 |

According to the least squares criterion, which line should be preferred? (A). Line I, because its largest absolute residual is smaller. (B). Line II, because its sum of squared residuals is smaller. (C). Line I, because the residuals add to zero. (D). Both lines, because both have residuals that add to zero.

6. In a simple linear regression analysis, $n = 12$, $MSE = 18$, $SST = 2480$, and the estimated slope is negative. The sample correlation coefficient is approximately (A). .927. (B). −.927. (C). .963. (D). −.963.

7. In a regression analysis, suppose $r^2 = .64$ and $SSE = 72$. The corresponding values of $SST$ and $SSR$ are (A). $SST = 112,\ SSR = 72$. (B). $SST = 200,\ SSR = 128$. (C). $SST = 128,\ SSR = 200$. (D). $SST = 72,\ SSR = 128$.

8. Suppose $SSE = 45$ and $SSR = 155$ for a simple linear regression model. Which statement is correct? (A). The estimated regression equation explains 77.5% of the total variability in $y$. (B). The estimated regression equation explains 77.5% of the residual errors. (C). The sample correlation coefficient must be .775 regardless of the sign of the slope. (D). The regression relationship is automatically statistically significant.

9. A residual plot shows residuals scattered around zero with roughly constant spread, but the residuals form a clear U-shaped pattern. Which conclusion is most appropriate? (A). The normality assumption is certainly satisfied. (B). The constant variance assumption is clearly violated, but the linear form is adequate. (C). The assumed linear model form may be inadequate. (D). The residuals must have mean one.

10. A regression model is fitted to data collected over time. Consecutive residuals tend to have the same sign for long runs. Which assumption is most directly questionable? (A). The error terms are independent. (B). The error terms have mean zero. (C). The independent variable is normally distributed. (D). The estimated slope is unbiased only if $x$ is random.

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11. For a simple linear regression model, suppose $n = 12$, $SSE = 120$, $\sum(x_i - \bar{x})^2 = 80$, and $b_1 = 3.00$. The $t$ statistic for testing

$$H_0 : \beta_1 = 0 \quad \text{versus} \quad H_a : \beta_1 \neq 0$$

is approximately (A). .387. (B). 3.464. (C). 7.75. (D). 60.00.

12. In a simple linear regression analysis with $n = 11$, suppose $SSR = 405$ and $SSE = 135$. The $F$ statistic for testing the significance of the regression relationship is (A). 3. (B). 27. (C). 30. (D). 405.

13. A 95% confidence interval for the slope parameter $\beta_1$ is $(-0.30,\ 1.80)$. For the two-sided test $H_0 : \beta_1 = 0$ versus $H_a : \beta_1 \neq 0$ at $\alpha = .05$, the correct conclusion is (A). Reject $H_0$ because the interval contains positive values. (B). Reject $H_0$ because the upper endpoint is greater than zero. (C). Do not reject $H_0$ because the interval contains zero. (D). Do not reject $H_0$ because the interval is not centered at zero.

14. A computer output for a simple linear regression gives the following ANOVA information:

| Source | $DF$ | $SS$ | $MS$ |
|---|---|---|---|
| Regression | 1 | 960 | 960 |
| Error | 23 | 1840 | |
| Total | 24 | 2800 | |

Which set of values is correct? (A). $n = 25,\ MSE = 80,\ F = 12.00,\ R^2 = 34.29\%$. (B). $n = 24,\ MSE = 76.67,\ F = 12.52,\ R^2 = 34.29\%$. (C). $n = 25,\ MSE = 80,\ F = .083,\ R^2 = 65.71\%$. (D). $n = 23,\ MSE = 80,\ F = 12.00,\ R^2 = 52.17\%$.

15. A computer output for a simple linear regression gives the following coefficient table:

| Term | Coef | SE Coef | T-Value |
|---|---|---|---|
| Constant | 18.0 | 4.5 | 4.00 |
| $X$ | −2.40 | .60 | |

For the slope test in simple linear regression, the corresponding $F$ statistic is (A). −4.00. (B). 4.00. (C). 16.00. (D). .25.

**(II) 加分題** (15 分)

16. Let $(x_i, y_i)$, $i = 1, \ldots, n$, be a sample of paired observations. Consider the simple linear regression model, use the least squares method to estimate the regression coefficients.



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。