國際經濟、國際財管、國際企管與行銷組

國立政治大學九十 七 學年度研究所 博(碩) 士班入學考試命題紙

考試科目	統計學	所別	國貿 4111	考試時間	3月 16日 星期 日 第3節

1. True or False. Explain

(a) The t-statistic can be used to calculate p-value associated with the null hypothesis. A small p-value is evidence that the null hypothesis is correct. (5%)

(b) The sample correlation coefficients is an estimator of the population correlation coefficient and measure the linear relationship between two variables, that is, how well their scatterplot is approximated by a straight line. (5%)

(c) A confidence interval contains less information than the result of a single hypothesis test. (5%)

(d) The null hypothesis says that the effect is zero. (5%)

(e) With small samples and large σ, quite large differences may not be statistically significant but may be real and of great practical significance. (5%)

2. An examination of sample items from a shipment showed that 51% of the items were good and 49% were defective. The company president asked the statistician, " What is the probability that over half the items are good?" The statistician replied that the question cannot be answered from the data. Is this correct? Does the question make sense? Explain why? (5%)

3. (a) What is the law of large numbers? Give two examples to illustrate the use of the law of large numbers.(10%)

(b) What is the central limit theorem. Give two examples to illustrate the use of central limit theorem. (10%)

備考	試題隨卷繳交

命題委員： (簽章) 91 年 3 月 6 日

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4. A commercial bank has done a market research survey in which people were asked to rate their image of the bank on a scale of 1 to 10, with 10 being the most favorable. The mean response for the sample of 400 people was 7.25, with a standard deviation of 2.51. On this same question, a country-wide association of commercial banks has found a mean of 7.01.

   A. Samuel Wang, marketing director for the bank, would like to test to see whether the rating for his bank is significantly greater than the norm of 7.01. Perform the appropriate hypothesis test for a 95 percent confidence level. (Make sure you write done the appropriate test hypothesis, and detail every step of your inferences.) (10%)

   B. Draw a diagram to illustrate your result. (5%)

   C. How would your result be affected if the sample size had been 100 rather than 400, with everything else being the same? Explain the differences, if any. (5%)

   Note: You may use the following critical values: $Z_{0.995} = 2.576$, $Z_{0.99} = 2.326$, $Z_{0.95} = 1.645$, $Z_{0.90} = 1.282$, $Z_{0.975} = 1.96$, where Z_α satisfies $P(Z \le Z_\alpha) \equiv \int_{-\infty}^{Z_\alpha} \frac{1}{\sqrt{2\pi}} e^{-x^2} dx = \alpha$.

5. Parade, March 13, 1994, stated that "Heart surgeries, including bypass and angio-plasty, totaled 196,000 in 1980 and reached 839,000 in 1991." (*Source*: National Hospital Discharge Survey, 1991.) The data for the years 1980 to 1991 in thousands are

Year (X)	1980	1981	1982	1983	1984	1985
# of surgeries (Y)	196	217	243	275	314	379

Year (X)	1986	1987	1988	1989	1990	1991
# of surgeries (Y)	490	588	674	719	781	839

$\bar{X} = 1985.5$; $\bar{Y} = 476.25$; $\sum X = 23826$; $\sum Y = 5715$; $\sum X^2 = 47306666$; $\sum Y^2 = 3333379$; $\sum X \times Y = 11356337$; $\sum (X - \bar{X})^2 = 143$; $\sum (X - \bar{X})(Y - \bar{Y}) = 9204.5$.

   A. Find the least square linear regression line that regresses numbers of heart surgeries (Y) on Year (X). Then, make a scatter plot (here a time-sequence) of the data with the least squares regression line superimposed. (10%)

   B. Calculate and plot the residuals. Does linear regression seem to be appropriate? Why or why not? (10%)

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6. An investigator for the Securities and Exchange Commission (SEC) feels that a particular stock traded "too frequently" before a recent important event, suggesting the presence of insider trading. Therefore, the SEC attempts to test the hypothesis of no insider trading. For $t = 1, \cdots, T$ periods before the particular event was announced, the SEC breaks up the set of disjoint equal-length periods into two groups: $t = 1, \cdots, T_1$ and $t = T_1 + 1, \cdots, T_1 + T_2$ where $T_1 + T_2 = T$. In each period of the two sub-periods, the number of times the stock traded is counted and recorded. Denote the samples of the number of trades in the two sub-periods by $\{X_{1t}\}_{t=1}^{T_1}$ and $\{X_{2t}\}_{t=1}^{T_2}$ respectively. Suppose that X_1 and X_2 are distributed Poisson with intensity parameters λ_1 and λ_2 respectively. Based on the all the aforementioned information, describe in detail how you would proceed to test whether there is significant evidence of insider trading. (10%)

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