

國立中央大學八十七學年度碩士班研究生入學試題卷

所別: 產業經濟研究所 乙組 科目:

乙統計學

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Statistics

1. Answer the following questions related to the topics of elementary probability and statistics. (12%)
 - (a) Find the number of permutations of the letters in the word BANANA. (3%)
 - (b) How many baseball teams of nine members can be chosen from among twelve boys, without regard to the position played by each member? (3%)
 - (c) A coin is tossed 3 times, and 2 heads and 1 tail fall. What is the probability that the first toss was heads? (3%)
 - (d) Twenty percent of the employees of a company were graduated from university graduate school. Of these, 75% are in manager position. Of those who did not attend graduate school, 20% are in manager positions. What is the probability that a randomly selected manager was graduated from the graduate school? (3%)
2. Answer the following questions related to the topics of expected value. (10%)
 - (a) Find the expected number of boys on a committee of 3 selected at random from 4 boys and 3 girls. (5%)
 - (b) Suppose that 75% of the students taking statistics pass the course. In a class of 40 students, what is the expected number who will pass. Find the variance and standard deviation. (5%)
3. Use Chebyshev's inequality to find a lower bound on $\Pr(-3 < X < 3)$ where the mean value of the random variable X is zero and the variance of X is one. (5%)
4. Let X be a normally distributed random variable representing the hourly wage in a certain position. The mean of the hourly wage is \$4.25 and the standard deviation is \$0.75. (10%)
 - (a) What percentage of workers receive hourly wages between \$3.50 and \$4.90? (5%)
 - (b) What hourly wage represents the 95th percentile? (5%)
[Note: $\Pr(Z \leq 0.80) = 0.788$, $\Pr(Z \leq 0.85) = 0.802$, $\Pr(Z \leq 0.87) = 0.807$,
 $\Pr(Z \leq 0.89) = 0.813$, $\Pr(Z \leq 0.91) = 0.818$, $\Pr(Z \leq 0.97) = 0.834$, $\Pr(Z \leq 0.99) =$
 0.838 , $\Pr(Z \leq 1.00) = 0.841$, $\Pr(Z \leq 1.01) = 0.843$, $\Pr(Z \leq 1.03) = 0.848$,
 $\Pr(Z \leq 1.05) = 0.853$]
5. Two neighboring farmers, Mr. A and Mr. B, were planting different varieties of corn. Each planted 100 acres under similar conditions. Mr. A's yield was 84 bushels per acre with a standard deviation of 5 bushels. Mr. B had a yield of 80 bushels per acre with a standard deviation of 6 bushels. Assume all sampling normal. (8%)
 - (a) What is the maximum likelihood estimate of the difference in means. (3%)
 - (b) What is a 90% confidence interval estimate for the mean difference in yield between the two farmers. (5%)
6. Suppose two thermostats were used in the production process, an experiment was carried out with a sample size of 23. The mean temperature readings were 549.93 with the variance of 77.415 for the old thermostat. For the new thermostat, the mean readings were 551.06 with the variance of 105.93. Can we calculate at a 5% level of significance that there is a difference between the average temperature readings of the old and the new thermostats? (5%) [Note: $t_{22} = 2.07$, $t_{44} = 2.02$ for $\alpha = 0.05$]

注意: 背面有試題

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Econometrics (50%)

State with reason whether the following statements are true, false, or uncertain: (each one is 5 points, remember, no reason, no point).

1. The t test of significance requires that the sampling distribution of estimators $\hat{\beta}_1$ and $\hat{\beta}_2$ follow the normal distribution.
2. Even though the disturbance term in the classical linear regression model is not normally distributed, the OLS estimators are still unbiased, but no longer BLUE (Best Linear Unbiased Estimator).
3. If there is no intercept in the regression model, the estimated μ_i (the error term), which is $\hat{\mu}_i$, will not sum to zero.
4. The p value and the size of a test statistic mean the same thing.
5. If a extra explanatory variable is added to a regression, the estimate of σ^2 will remain the same or fall.
6. In the classical linear regression model, multicollinearity leads to bias, not in the estimation of the regression coefficients themselves, but rather in the estimation of their variances.
7. If heteroscedasticity is present, the conventional t and F tests are invalid.
8. If residuals estimated from an OLS regression exhibit a systematic pattern, it means heteroscedasticity is present in the data.
9. The Durbin-Watson d test assumes that the variance of the error term is homoscedastic.
10. The R^2 values of two models, one involving regression in the first-difference form and another in the level form, are not directly comparable.

