題號： 315
科目： 統計學(D)
節次： 2

國立臺灣大學 106 學年度碩士班招生考試試題

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1. Given a simple linear regression model, $E(Y|X) = \beta_0 + \beta_1 X$, please answer the following questions (26 分)
   a. Describe the concept of Ordinary Least Square (OLS) in fitting the simple linear regression model (10 分)
   b. What are the assumptions behind simple linear regression (10 分)
   c. What are the test statistics for testing whether the estimated parameters β_0 and β_1 are significantly different from zero (6 分)

2. Please define the following descriptive statistics (24 分)
   a. Arithmetic mean (2 分)
   b. Geometric mean (2 分)
   c. Harmonic mean (2 分)
   d. Quadratic mean (2 分)
   e. Range (2 分)
   f. Variance/Standard Deviation (4 分)
   g. Covariance/Correlation (4 分)
   h. Coefficient of Variation (2 分)
   i. Skewness (2 分)
   j. Kurtosis (2 分)

3. Visualization is an important part of statistical analysis. Please answer the following questions (20 分)
   a. Histogram: describe how to construct a histogram, write down its properties and provide an example (10 分)
   b. Boxplot: describe how to construct a boxplot, write down its properties and provide an example (10 分)

4. Let $X_1, ..., X_n$ be i.i.d. with p.d.f. $f(x; \theta) = \theta x^{\theta-1}$, 0 < x < 1, where θ > 0 (20 分)
   a. Find the Maximum Likelihood Estimator (MLE) of θ (10 分)
   b. Find the Method of Moments Estimator (MM) of θ (10 分)

5. A well-dressed stranger approaches you in a bar and suggest the following Game of Chance: A pair of dice will be rolled. If the outcome is a 7, he pays you $5. If the outcome is an 11, he pays you $10. If any other outcome, you pay him $2. Let X be your winnings (positive of negative) after one play of the game. Write the probability mass function of X (10 分)

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