

考試科目	統計學	所別	財政系	考試時間	3月15日 第4節 星期六
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Important: Answer all the questions. You must provide the complete arguments for each question, otherwise, you do not get any credit by giving the answer only.

1. (10 points) Suppose that the probability density function of a random variable x has the following form:

$$f(x) = \begin{cases} cx & \text{for } 0 < x < 8, \\ 0 & \text{otherwise,} \end{cases}$$

where c is a constant. The question is: what is c and also the value of $Pr(2 \leq x \leq 3)$?

2. (10 points) If the joint probability density function of X_1 and X_2 is defined as:

$$f(X_1, X_2) = \begin{cases} 4X_1X_2 & \text{for } 0 < X_1 < 1 \text{ and } 0 < X_2 < 1, \\ 0 & \text{otherwise.} \end{cases}$$

Calculate the joint probability density function of $y_1 = X_1/X_2$ and $y_2 = X_1X_2$.

3. (10 points) When you make inference, what is the definition of size, what is the definition of power? You may use a specific example to clarify your understanding.
4. (10 points) Consider the standard regression model $y_t = x_t'\beta + \epsilon_t$, where y_t and x_t are from cross-sectional survey data. How do you estimate and test the coefficient β if ϵ_t is not homogenous?

備 考 試 題 隨 卷 繳 交

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5. If the regressor in the standard linear regression model is correlated with the error term,

5.1 (10 points) what happens if you use the ordinary least squares (OLS) estimator.

5.2 (10 points) Provide an example for the question in 5.1, and give a suggestion to solve this problem.

6. You run the following regression model:

$$Y = A_0 + A_1 \text{ age} + A_2 \text{ education level} + A_3 \text{ experience} + A_4 \text{ experience}^2 + u,$$

where Y is log of hourly wage.

6.1 (10 points) How do you explain the estimate of A_4 ?

6.2 (10 points) If you want to prove there is discrimination against the people living in the eastern part of a country, how do you modify the preceding regression model and test it?

7. If X_1, X_2, \dots is independent and identically distributed (i.i.d.) random variable and $E(X_i) = \mu$, $\text{Var}(X_i) \leq K < \infty$ for all i . Define $Y_T = X_1 + \dots + X_T$.

7.1 (10 points) Prove as $T \rightarrow \infty$, Y_T/T converge in mean square to μ .

7.2 (10 points) Prove as $T \rightarrow \infty$, Y_T/T converge in probability to μ .

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