

考試科目	統計學 A 41211	所別	金融學系金融管理組	考試時間	2月27日(六)第3節
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1. Let X be a Bernoulli random variable with $\Pr(X = 1) = p$, $Y \sim N(0, 1)$, $W \sim N(0, 9)$ and $S = XY + (1 - X)W$.

(a) (10%) Derive $E(S)$ and $Var(S)$.

(b) (10%) Given that $0 < p < 1$, discuss the skewness and kurtosis for S .

2. Let W and Z be two random variables where $-\infty < W < \infty$ and $-\infty < Z < \infty$. The joint density $f(w, z)$ is a well-defined continuous function.

(a) (10%) Show that $E[E(W|Z)] = E(W)$.

(b) (10%) Consider a linear model $Y = \beta_0 + \beta_1 X + u$ where X , Y and u are random variables. The consistency of least square estimator $\hat{\beta}_1$ requires that $E(u|X) = 0$ so that X is not correlated with u . If $E(u|X) = k$ where $k \neq 0$ is a constant, is X still uncorrelated with u in this case? Prove your answer.

3. Let X_1, X_2, \dots, X_n denote a random sample from $f(x; \theta) = \theta x^{\theta-1}$ where $0 < x < 1$ and $\theta > 0$.

(a) (10%) Find the method of moment estimator for θ and check whether it is consistent.

(b) (10%) Derive the best critical region for testing $\theta = 1$ against $\theta = 2$.

4. Regression analysis is widely used in various applications, but its validity requires several conditions.

(a) (10%) Consider a linear model $Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki} + u_i, i = 1, 2, \dots, n$. When testing the hypothesis $\beta_1 = \beta_2 = \dots = \beta_k = 0$ given the significance level α , can you check the significance of individual coefficient one at a time, i.e., $\beta_1 = 0, \beta_2 = 0, \dots, \beta_k = 0$? Why or why not?

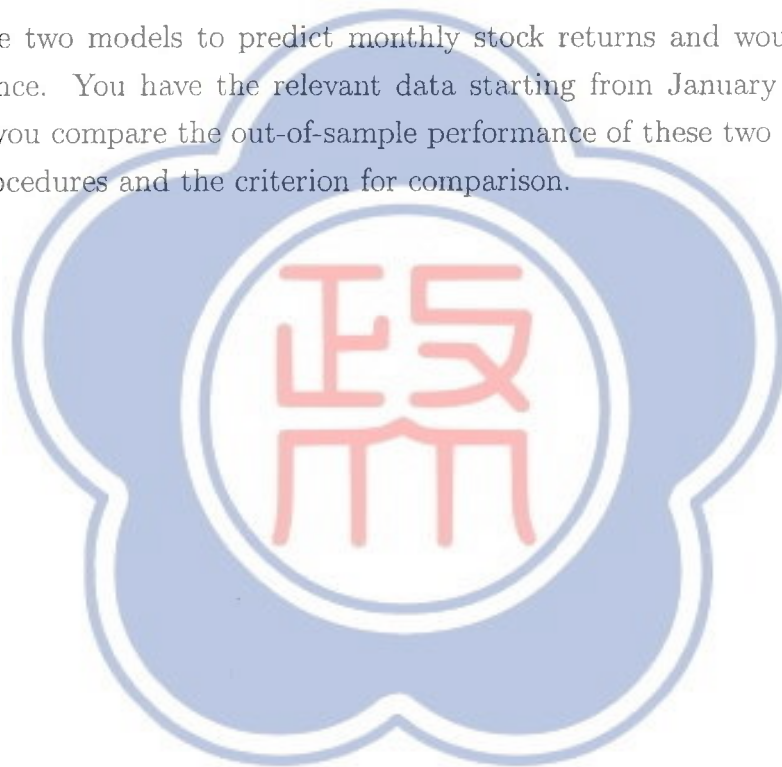
(b) (10%) In the above linear model, the calculation of $Var(\hat{\beta}_j)$ depends on the properties of the error term. Use graphs to explain the concept of homoskedastic and heteroskedastic errors in regression analysis.

備註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。
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(c) (10%) Someone studies the relationship between education and income by regressing hourly wage on years of schooling. Most of the observations have the same years of schooling since the data come from his friends and peers for convenience. What are the problems (at least two) that could contaminate the validity of regression analysis in this case? In addition, explain how these problems affect the validity of least square estimator in details.

5. (10%) You use two models to predict monthly stock returns and would like to compare their performance. You have the relevant data starting from January 1966 to December 2015. How do you compare the out-of-sample performance of these two models? Articulate the relating procedures and the criterion for comparison.



備

註

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- 二、試題請隨卷繳交。