

考生注意: 1. 依次序作答, 只要標明題號, 不必抄題。

2. 答案必須寫在答案卷上, 否則不予計分, 並限以藍黑色筆作答。

3. 試題隨卷繳回。(餘詳閱試場規則)

1. Table 1 gives the rating (X) and yield to maturity Y (%) of 50 bonds, where the rating is measured at three levels: X=1 (Bbb), X=2 (Bb), and X=3 (B). As per Standard and Poor's bond rating scheme, Bbb, Bb, and B are all medium-quality bonds; Bb is of slightly higher quality than B; and Bbb is of slightly better quality than Bb. That is, the fewer the letters in the grading, the riskier is the bond.

Table 1 The frequency distribution of two random variables: bond rating (X) and bond yield (Y)

X \ Y (%)	1 (Bbb)	2 (Bb)	3 (B)	Total
8.5	13	5	0	18
11.5	2	14	2	18
17.5	0	1	13	14
Total	15	20	15	50

- (a) Find the marginal probability distributions of X and Y. (5%)
- (b) What are the expected value of the bond rating and the expected value of the bond yield? (5%)
- (c) Find the conditional probability density function of $f(Y = 8.5 | X = 1)$. It means that the bond rating is 1 (i.e., Bbb) as known, what's the probability that the bond yield takes a value of 8.5%? (5%)
- (d) Are the bond rating and bond yield independent random variables? (5%)
- (e) Find out the $\text{var}(X+Y)$. How would you interpret this variance? (5%)
2. Suppose someone has presented the following regression results for your consideration:

$$\hat{Y}_t = 2.6911 - 0.4795X_t$$

Y=the coffee consumption (cups per person per day)

X=the retail price of coffee (\$ per pound)

t=the time period

- (a) Sketch the regression line. (5%)
- (b) What is the interpretation of this intercept in this example? Does it make economic sense? (5%)
- (c) How would you interpret the economic meaning of the slope coefficient? (5%)
- (d) Is it possible to tell what the true PRF is in this example? (5%)

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- (e) You know the price elasticity of demand is defined as the percentage change in the quantity demanded for a percentage change in the price. From the regression present earlier, can you tell what the price elasticity of demand is for coffee? If not, what additional information would you need to compute the price elasticity? (5%)

3. Consider the following transformations:

- (a) Suppose X has a uniform distribution on $(0, 2\pi)$, that is,

$$f_X(x) = \begin{cases} 1/(2\pi) & 0 < x < 2\pi \\ 0 & \text{otherwise} \end{cases}$$

Consider $Y = \sin^2(X)$. Find the cumulative distribution function (C.D.F.) and the probability density function (P.D.F.) of Y . (10%)

- (b) X_1 and X_2 are independent Normal distributed random variables with mean 0 and variance σ^2 , that is, $N(0, \sigma^2)$.

- (i) Find the joint distribution of Y_1 and Y_2 , where $Y_1 = X_1^2 + X_2^2$ and

$$Y_2 = X_1/\sqrt{Y_1}. \quad (5\%)$$

- (ii) Are Y_1 and Y_2 independent? Try to interpret this result geometrically. (5%)

4. The following data are observations of some discrete random variable X :

7	5	4	6	5	5	6	4	6	4
6	6	4	3	6	5	4	4	7	6
6	5	4	12	9	6	7	5	6	5
7	4	3	8	6	7	5	2	9	8
5	8	9	4	9	7	7	9	4	11

Test whether X is distributed as Poisson distribution with significance level $\alpha = 0.05$. (8%)

$$(\chi_{0.05}^2(3) = 7.815, \chi_{0.05}^2(4) = 9.488, \chi_{0.05}^2(5) = 11.07, \chi_{0.05}^2(6) = 12.59,$$

$$e^{-3} = 0.050, e^{-4} = 0.018, e^{-5} = 0.007, e^{-6} = 0.002, e^{-7} = 0.001)$$

5. Conceptually: (with necessary explanatory)

- (a) Draw two Venn diagrams to express separately: (i) two events are independent, and (ii) two events are disjoint. According to your diagrams

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第 3 節統計學 適用:(財金所 343)

(本試題共 3 頁,第 3 頁)

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to explain whether or not independence and disjointed are the same relationship. (5%)

- (b) True or false: "The sampling distribution of the sample mean will tend to be Normal distribution as the sample size increases" is according to the Law of Large Number. (5%)
- (c) True or false: "According to the Central Limiting Theorem, the sampling distribution of the sample mean will always be the Normal distribution whatever the population distributed and whatever the sample size is. (5%)

6. Let X, X_1, X_2, \dots be identically distributed random variables. The joint distribution of (X_n, X) be as followings:

$X_n \backslash X$	0	1
0	0	1/2
1	1/2	0
	1/2	1

for each n. Do the sequence of random variables X_1, X_2, \dots converge in probability to X ? (7%)

試

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