

考試科目

統計學

所別

財政

231
236

考試時間

4月20日 上午第二節
星期日

國立政治大學圖書館

1. (15 points) In the following case, set up the null hypothesis and the alternative: Explain how you will proceed in testing the hypothesis.

Case: A tire manufacturer advertises that its tires last for at least 30,000 miles. A consumer group does not believe it.

In the problem above, can you identify the costs of mistaken decisions if we view the hypothesis-testing problem as a decision problem?

2. (20 points) In 1970, a random sample of 50 American men aged 35 to 54 showed the following relation between annual income Y (in dollars) and education X (in years).

$$\hat{Y} = 1200 + 800X$$

Average income was $\bar{Y} = \$10,000$ and the average education was $\bar{X} = 11.0$ years, with $\sum X^2 = 900$. The residual standard deviation about the fitted line was $s = \$7300$.

- Calculate a 95% confidence interval for the population slope.
- Is the relation of income to education statistically significant at the 5% significance level?
- Predict the income of a man who has completed 2 years of high school ($X = 10$). Include an interval wide enough that you would bet on it at odds of 95 to 5.
- Would it be fair to say that each year's education is worth \$800? Why?

3. (25 points) Consider the joint probability density function

$$f(x, y) = (0.6)^x (0.4)^{1-x} (0.3)^y (0.52)^{1-y} (2)^{-xy}$$

where the possible values for X and Y are $x = 0, 1$ and $y = 0, 1$. Find:

- The conditional density function $f(y | x = 0)$
- $E(X)$ and $Var(X)$
- $Cov(X, Y)$
- $E(X + Y)$

備考

試題隨卷繳交

命題委員：

-80-

(簽章) 92年4月7日

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4. (20 points) When S successes occur in n trials, the sample proportion $P = S/n$ customarily is used as an estimator of the probability of success π . However, sometimes there are good reasons to use the estimator $P^* \equiv (S+1)/(n+2)$. Alternatively, P^* can be written as a linear combination of the familiar estimator P :

$$P^* = \frac{nP+1}{n+2} = \left(\frac{n}{n+2}\right)P + \left(\frac{1}{n+2}\right)$$

- What is the mean squared error (MSE) of P ? Is it consistent?
- What is the mean squared error (MSE) of P^* ? Is it consistent?
- To decide which estimator is better, P or P^* , does consistency help? What criterion would help?
- Which estimator is better, P or P^* , when $n=10, \pi=0$?

5. (20 points) To compare three varieties of potatoes, an experiment was conducted by assigning each variety at random to 3 equal-size plots at each of 3 different soil types. The following yields, in bushels per plot, were recorded:

Soil	Variety of Potato		
	A	B	C
Sand	21	20	16
Clay	16	18	11
Loam	23	31	24

- Construct the ANOVA table
- Calculate the family of 95% simultaneous confidence intervals for the differences in the 3 varieties.
- The botanist who developed variety B remarked that he had worked 10 years to find something that grew well in a loam soil. As you glance at the data, do you think he succeeded? In the light of this information, what would you say about your analysis in parts a and b?

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