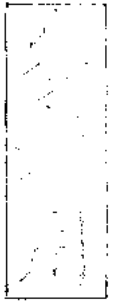


國立中央大學八十五學年度轉學生入學試題卷

財務管理學系 三年級

科目: 統計學

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Instructions: Answer the following questions. Make and state your own assumptions for questions where the information is not sufficient for you to solve them. For example, if you need the corresponding p-value of a normally distributed random variable evaluated at 2.5, you may indicate the value as, for example, $Pr(x \geq 2.5)$, where $x \sim \mathcal{N}(0, 1)$.

- (15 points) Suppose $x_1, \dots, x_n \stackrel{iid}{\sim} \mathcal{N}(\mu_1, \sigma_1^2)$ and $y_1, \dots, y_n \stackrel{iid}{\sim} \mathcal{N}(\mu_2, \sigma_2^2)$ are two independent random samples. Suppose also that the sample estimates for these parameters are: $\bar{x}, \bar{y}, s_x^2, s_y^2$. A statistician suspects that the variance of the first sample is k times the variance of the second sample, where k is a known constant. So he specifies her null and alternative hypotheses: $H_0: s_x^2 = ks_y^2$ and $H_1: s_x^2 \neq ks_y^2$. Also, he wants to test if the sample mean of x is twice the sample mean of y , i.e., $H_0: \bar{x} = 2\bar{y}$ and $H_1: \bar{x} \neq 2\bar{y}$.
 - Are there any problems with his statement?
 - How will you test these hypotheses? Please specify the statistics and their distributions under the null. Remember to specify the degrees of freedom, if any.
- (10 points) Suppose a random variable z is known to have a χ^2 distribution with ν degrees of freedom, and $w = 2z$. Calculate $E(w)$ and $Var(w)$. What do you know about the distribution of w ?
- (10 points) Given a sample of size n , is the $(1 - \alpha) \times 100\%$ confidence interval for a parameter always the same as the corresponding acceptance region for that parameter at α significance level? Briefly explain your answer. You may demonstrate by using examples.
- (15 points) Suppose that on the basis of a random sample of size 250, you are to verify the claim that a population proportion is different from .30.
 - If you set the rejection region to be $|\hat{p} - .30| \geq .06$, what is the size of the type I error?
 - Determine the numerical value of c so that the test based on the rejection region: $|\hat{p} - .30| \geq c$ has $\alpha = .10$.
- (20 points) Suppose you are asked to estimate the following model:

$$y_t = b_1 + b_2 x_{2t} + \dots + b_k x_{kt} + e_t,$$

$t = 1, \dots, T$. And the OLS estimation gives you: $\hat{b}_1, \dots, \hat{b}_k$. However, at the 1%, 5%, and 10% significance levels, none of the estimates is significantly different from zero except b_1 . Therefore, to predict a new observation y_{T+1} with new observation on independent variables x 's, the best estimate for y_{T+1} is $\hat{y}_{T+1} = \hat{b}_1$. Give your comments.

- (10 points) Show that the variable t^2 with ν degrees of freedom is a special case of the F variable with $\nu_1 = 1$ and $\nu_2 = \nu$. Here "t" refers to a Student's t variate.

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7. (20 points) Suppose you are asked to estimate the following model:

$$STEXP = a_0 + a_1 AID + a_2 W + a_3 STINC + a_4 POP + e$$

where $t = 1, \dots, 50$. And you get the following results:

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L3 // Dependent Variable is STEXP
SMPL range:   1   -   50
Number of observations: 50

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VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-89.414484	86.016077	-1.0395090	0.304
AID	4.5006348	0.7642962	5.8886006	0.000
W	-1.3910525	0.8022946	-1.7338425	0.090
STINC	0.0001293	4.222E-05	3.0622413	0.004
POP	-0.5181407	0.1118457	-4.6326405	0.000

R-squared	0.993485	Mean of dependent var	3316.151
Adjusted R-squared	A	S.D. of dependent var	4360.365
S.E. of regression	B	Sum of squared resid	6069400.
Durbin-Watson stat	1.939054	F-statistic	1715.576
Log likelihood	-363.6156		

- (a) (10 points) What are A and B ?
- (b) (10 points) The F -statistic given in the table is provided to test "if the model is significant." What are the degrees of freedom for the F -statistic? What is the underlying null hypothesis for this test?