

Econometrics Test

2012 - 05 - 30

Name: _____ Matricola: _____

1. Say if the following statements are unambiguously true (TRUE), unambiguously false (FALSE) or impossible to classify the way they are stated (CAN'T SAY). Write the motivations to your answers **only** in the space provided. Answers with no motivations will not be considered.

- (a) The rank of a matrix cannot be negative.

TRUE ☐ FALSE ☐ CAN'T SAY ☐

- (b) The χ^2 distribution has its support over all the real numbers.

TRUE ☐ FALSE ☐ CAN'T SAY ☐

- (c) If $X_n \xrightarrow{p} X$, then the probability that the difference $|X_n - X|$ is large gets arbitrarily close to 0 as n goes to infinity.

TRUE ☐ FALSE ☐ CAN'T SAY ☐

- (d) If a matrix A can be written as $A = CC'$ for some matrix C , then A is positive definite.

TRUE ☐ FALSE ☐ CAN'T SAY ☐

- (e) In a linear model

$$\ln y_i = \beta_0 + \beta_1 \ln x_i + u_i$$

the coefficient β_1 may be interpreted as the elasticity of y_i with respect to x_i .

TRUE ☐ FALSE ☐ CAN'T SAY ☐

2. You have an iid sample of n Bernoulli random variables x_i with $P(x_i = 1) = 0.5$ (a fair coin, for example). Consider the statistic $a = \ln(\bar{X}) - \ln(1 - \bar{X})$, where \bar{X} is the sample mean of x_i . Find the probability limit of a (call it α) and its limit distribution.

$$a \xrightarrow{p} \alpha =$$

$$\sqrt{n}(a - \alpha) \xrightarrow{d}$$

3. Suppose you want to estimate a model of the form $y_i = \beta_0 + \beta_1 x_i + \varepsilon_i$. The following are the cross-product matrices:

$$X'X = \begin{bmatrix} 100 & 200 \\ 200 & 500 \end{bmatrix} \quad X'y = \begin{bmatrix} 160 \\ 480 \end{bmatrix} \quad y'y = 1002$$

Calculate:

- (a) the OLS statistic $\hat{\beta}' = [\hat{\beta}_0 \quad \hat{\beta}_1] = [\quad]$
- (b) the s^2 statistic: $s^2 =$
- (c) the centered R^2 index: $R_c^2 =$
- (d) the t -ratio for the parameter β_1 ; $t_{\beta_1} =$
- (e) the sum of squared residuals under the constraint $\beta_1 = 2$; $SSR =$
- (f) a test for the hypothesis $\beta_1 = 2$:

Test type: _____ Distribution: _____ Test value: _____
 Decision: ACCEPT ☐ REJECT ☐