Econometrics Test
2011 - 07 - 06

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) Let X be a 3×3 matrix and $\mathbf{x}_1$, $\mathbf{x}_2$, and $\mathbf{x}_3$ its columns. If two scalars a_1 and a_2 exist such that $\mathbf{x}_3 = a_1\mathbf{x}_1 + a_2\mathbf{x}_2$, then X is invertible.

   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   _____
   _____
   _____

   (b) If X is a scalar random variable and a and b are positive constants, then $E(a + bX) > a + bE(X)$

   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   _____
   _____
   _____

   (c) If $\hat{\theta}$ and $\tilde{\theta}$ are two unbiased estimators and λ is a real number, then the statistic $\grave{\theta} = \lambda\hat{\theta} + (1 - \lambda)\tilde{\theta}$ is also an unbiased estimator.

   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   _____
   _____
   _____

   (d) If $\hat{\theta}$ and $\tilde{\theta}$ are two consistent estimators and λ is a real number, then the statistic $\grave{\theta} = \lambda\hat{\theta} + (1 - \lambda)\tilde{\theta}$ is also a consistent estimator.

   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   _____
   _____
   _____

   (e) In an OLS regression, adding explanatory variables raises R^2 even if the added variables are statistically irrelevant.

   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   _____
   _____
   _____

2. You have just estimated two parameters a and b by using some statistical procedure which ensures consistency and asymptotic normality. Your results are

$$\begin{aligned} \hat{a} &= 4.2 \\ \hat{b} &= 4.8 \\ \widehat{V}\begin{pmatrix} \hat{a} \\ \hat{b} \end{pmatrix} &= \begin{pmatrix} 1 & 0.6 \\ 0.6 & 0.8 \end{pmatrix} \end{aligned}$$

Test the hypothesis $H_0 : a/b = 1$ at a significance level $\alpha = 5\%$.

Distribution: _____ Test statistic: _____
Decision: ACCEPT ◯ REJECT ◯

(report the derivation of the test statistic on a separate sheet).

3. The following model

$$f_i = \beta_0 + \beta_1 y_i + \beta_2 n_i$$

was estimated on a cross-section sample of 7958 households. The variables are:

- f_i logarithm of yearly expenditure for food by household i
- y_i logarithm of yearly income by household i
- n_i logarithm of number of people in household i

The results follow:

	Coefficient	Std. Error	t-ratio	p-value
β_0	2.49013	0.100989	24.6574	0.0000
β_1	0.327556	0.0102698	31.8951	0.0000
β_2	0.380791	0.00931318	40.8873	0.0000

Mean dependent var	6.123171	S.D. dependent var	0.495707
Sum squared resid	991.2898	S.E. of regression	0.353004
R^2	0.493007	Adjusted R^2	0.492879
$F(2, 7955)$	3056.241	P-value(F)	0.000000

Answer these questions:

(a) What is the elasticity of food expenditure with respect to income?

(b) What do you expect to happen to food expenditure if income raised by 10%?

(c) Is it possible to reject the hypothesis that the elasticity of food expenditure with respect to income is 1?

(d) What is the elasticity of food expenditure with respect to household size?

(e) Is it possible to reject the hypothesis that the elasticity of food expenditure with respect to household size is 1?

(f) Suppose that in a family of 3 people with an annual income of 25000 € a new baby is born and the income goes to 28000 €. What is your forecast of the percentage change in food expenditure?