Questions and Exercises - Tutorial #12

Ettore Gallo

June 26, 2018

1. For a sample of size 5, a test of a null hypothesis versus a two-sided alternative gives t= 2.45

(a) Is the test result significant at the 5% level? Draw a sketch of the appropriate t distribution and illustrate your calculation with this sketch.

(b) Now assume that the same statistic was obtained for a sample size of n = 10. Assess the statistical significance of the result and illustrate the calculation with a sketch. How did the statistical significance change with the sample size? Explain your answer.

2. Repeat the previous exercise for the two situations where the alternative is one-sided.

3. Consider the estimated equation from Example 4.3, which can be used to study the effects of skipping class on college GPA:

$$\widehat{colGPA} = \underset{(0.33)}{1.39} + \underset{(.094)}{.412}\ hsGPA + \underset{(.011)}{.015}\ ACT - \underset{(.026)}{.083}\ skipped$$

$$n = 141,\ R^2 = .234.$$

(i) Using the standard normal approximation, find the 95% confidence interval for $\beta_{hsGPA} = 0.4$ against the two-sided alternative at the 5% level?

(ii) Can you reject the hypothesis $H_0 : \beta_{hsGPA} = 0.4$ against the two-sided alternative at the 5% level?

(iii) Can you reject the hypothesis $H_0 : \beta_{hsGPA} = 1$ against the two-sided alternative at the 5% level?

4. The following equation has been estimated.

reg lbwght cigs white male motheduc fatheduc

Source	SS	df	MS			
				Number of obs	=	1,191
				F(5, 1185)	=	10.32
Model	1.75546431	5	.351092861	Prob > F	=	0.0000
Residual	40.309609	1,185	.034016548	R-squared	=	0.0417
				Adj R-squared	=	0.0377
Total	42.0650733	1,190	.035348801	Root MSE	=	.18444

lbwght	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cigs	-.0052334	.0010275	-5.09	0.000	-.0072493	-.0032175
white	.047343	.0148293	3.19	0.001	.0182484	.0764375
male	.0325049	.010707	3.04	0.002	.0114982	.0535116
motheduc	-.0029184	.0029157	-1.00	0.317	-.008639	.0028022
fatheduc	.0041424	.002563	1.62	0.106	-.0008862	.009171
_cons	4.703638	.0340527	138.13	0.000	4.636828	4.770449

(i) Formulate the hypothesis that the gender of the child has no effect on his/her weight.
(ii) Provide the rejection rule (alpha=0.05)
(iii) Show/calculate the test statistic
(iv) What is the test decision?
(v) Formulate the hypothesis that the years of schooling of the parents have no effect on birth weight.
(vi) Provide the rejection rule and find the critical value (alpha=0.05).

5. Write down the AR(1) model equation and interpret the slope. Explain an informal (descriptive) method to check whether a time series is integrated of order one.

6.

11.5 For the U.S. economy, let *gprice* denote the monthly growth in the overall price level and let *gwage* be the monthly growth in hourly wages. [These are both obtained as differences of logarithms: $gprice = \Delta\log(price)$ and $gwage = \Delta\log(wage)$.] Using the monthly data in WAGEPRC.RAW, we estimate the following distributed lag model:

$$
\begin{aligned}
\widehat{gprice} = &-\underset{(.00057)}{.00093} + \underset{(.052)}{.119}\, gwage + \underset{(.039)}{.097}\, gwage_{-1} + \underset{(.039)}{.040}\, gwage_{-2} \\
&+ \underset{(.039)}{.038}\, gwage_{-3} + \underset{(.039)}{.081}\, gwage_{-4} + \underset{(.039)}{.107}\, gwage_{-5} + \underset{(.039)}{.095}\, gwage_{-6} \\
&+ \underset{(.039)}{.104}\, gwage_{-7} + \underset{(.039)}{.103}\, gwage_{-8} + \underset{(.039)}{.159}\, gwage_{-9} + \underset{(.039)}{.110}\, gwage_{-10} \\
&+ \underset{(.039)}{.103}\, gwage_{-11} + \underset{(.052)}{.016}\, gwage_{-12}
\end{aligned}
$$

$$n = 273,\ R^2 = .317,\ \bar{R}^2 = .283.$$

(i) Sketch the estimated lag distribution. At what lag is the effect of *gwage* on *gprice* largest? Which lag has the smallest coefficient?
(ii) For which lags are the *t* statistics less than two?
(iii) What is the estimated long-run propensity? Is it much different than one? Explain what the LRP tells us in this example.
(iv) What regression would you run to obtain the standard error of the LRP directly?
(v) How would you test the joint significance of six more lags of *gwage*? What would be the *df*s in the *F* distribution? (Be careful here; you lose six more observations.)

7.

For this exercise, we use JTRAIN.RAW to determine the effect of the job training grant on hours of job training per employee. The basic model for the three years is

$$hrsemp_{it} = \beta_0 + \delta_1 d88_t + \delta_2 d89_t + \beta_1 grant_{it} + \beta_2 grant_{i,t-1} + \beta_3 \log(employ_{it}) + a_i + u_{it}.$$

(i) Estimate the equation using fixed effects. How many firms are used in the FE estimation? How many total observations would be used if each firm had data on all variables (in particular, *hrsemp*) for all three years?

(ii) Interpret the coefficient on *grant* and comment on its significance.

(iii) Is it surprising that $grant_{-1}$ is insignificant? Explain.

(iv) Do larger firms provide their employees with more or less training, on average? How big are the differences? (For example, if a firm has 10% more employees, what is the change in average hours of training?)

Partial solution:

(i) The estimated equation is the following:

$$\begin{aligned} hrsemp_{it} = &-1.10\, d88_t + 4.09\, d89_t + 34.23\, grant_{it} + .504\, grant_{i,t-1} - .176 \log(employ_{it}) \\ &\;(1.98) \qquad\quad (2.48) \qquad\quad (2.86) \qquad\qquad (4.127) \qquad\qquad\quad (4.288) \end{aligned}$$

$n = 390, \quad N = 135, \quad T = 3.$