

Problem Set 3. Confidence intervals, t values and p values

This set of exercises is intended to help you become familiar with these concepts and help you become adept at using these concepts in applied econometric work.

1 Given the following regression results estimated over the period 1980-2001 (where annual consumption and income levels are measured in £000)

$$\hat{Consumption} = 2000 + 0.75 * Income$$

standard error (1500) ()
t value () (2.50)

Fill in the missing numbers

Would you reject the hypothesis that the true slope coefficient is zero?

Would you reject the hypothesis that the true intercept coefficient is zero?

2. You are interested in the hypothesis of whether housing rents are influenced by the proportion of students in the local population. An OLS regression of rent on proportion of students produced the following estimates

$$\hat{Rent} = 50 + 100.8 * Prop.Student \quad N=32 \quad R^2 = 0.250$$

(25.2) (50.4)

(where rent is measured in £ a week and standard errors are given in brackets)

Interpret the estimated coefficients

Write down the null hypothesis formally

Test the hypothesis at the 5% and 10% levels of significance (sketch the t distribution, the estimated t value on the student variable and the critical values)

Find the 95% and 90% confidence intervals for the estimated slope coefficient

3. Given the following regression model

$$Inflation_t = a + b Interest Rate_t + u_t$$

where inflation and the interest rate are measured in percentage points
Together with the following information

$$\begin{aligned} \text{Var}(Inflation) &= 100 & \text{Var}(Interest Rate) &= 50 \\ \text{Cov}(Inflation, Interest Rate) &= -25 \\ N &= 100 & \text{RSS} &= 49 \end{aligned}$$

Find the OLS estimate of the effect of interest rates on Inflation and the estimated standard error. Interpret the coefficient.

What happens to your estimated standard error on the interest rate coefficient if the sample size is increased to 1000 and everything else is found to be unchanged. What if the variance of the interest rate is found instead to be 5 and everything else unchanged?

* 4. Using the data from question 3 in Problem Set 1 and your regression estimates from all 25 observations, test hypotheses that the underlying value of the slope is i) $b=1$ ii) $b=0.5$ and construct 99% confidence intervals for these estimates of a and b .

How do these tests change if you estimate the regression over the 1st 10 observations only? Why?

Now rescale the variables, as in the previous problem set (dividing both variables by 100). What happens to the coefficients and standard errors? Why?

* 5. Using the answers from question 1 in problem set 1, calculate the least squares estimates of the standard errors of a) the intercept b) the slope and c) the regression.

Test the hypotheses that a) $b=0$ b) $b=1$. What do you find? Why? Construct a 95% confidence interval for the value of the slope.

What do you find happens to the t value and the confidence interval on the seminar attendance variable as the sample changes. Why?

6. Give real world examples of how Type I and Type II errors might arise.

7. What would you conclude, at the 10%, 5% and 1% levels of significance, about a 2-tailed test of significance based on the following p -values.

- i) $p = .102$
- ii) $p = .005$
- iii) $p = .018$