

Quant II - Problem Set III

Inference

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Assigned: Wednesday, January 21, 2009

Due: Wednesday, January 28, 2009

1. Indicate whether or not the following statements are correct and justify your answer in one or two sentences.
 - (a) The p-value from a t-test of a regression coefficient reflects the probability that the true effect of the respective variable is zero.
 - (b) You run a regression with two covariates. The p-values from the t-tests of the regression coefficients are .1 for β_1 and .05 for β_2 . Compared to β_1 , it is twice as likely that β_2 has a substantial true effect.
 - (c) If we calculate 100 90%-confidence intervals for a regression coefficient in repeated sampling, we expect 90 of them to include the true parameter.
 - (d) If the F-test that all regression coefficients are jointly zero is significant, this indicates that the regression model is unlikely to be mis-specified.
 - (e) One advantage of the F-test is that it is very flexible. For example, if we model $y = \beta_0 + \beta_1x + \beta_2z + \epsilon$ and test the null hypothesis $\beta_0 = \beta_1 = \beta_2 = 0$, then we can compare the p-values even across two different samples.
2. We use our favourite dataset on campaign spending. As last week, regress first preference votes on total spending and incumbency.
 - (a) Do the following “manually” in R:
Calculate the t-statistic of the incumbency coefficient (the one you find when summarizing the estimated model) and check this test statistic against the critical value for t with $\alpha = 1\%$. Interpret the result very briefly (two to three sentences).
Hints: To calculate the t-statistic, you may use results stored in `reg$coeff` and `vcov(reg)`. Also note that your critical value must reflect the fact that you’re performing a two-tailed test.
 - (b) Extra credit: Calculate the p-value of this t-statistic.

- (c) Some Irish politics expert argues that incumbent TDs on average gain 1000 more 1st preference votes than non-incumbents. Test this hypothesis in form of a constrained F-test. Please do this first “manually” and then with the help of the `anova()` function.
Hints: The Faraway chapter discusses how to constrain coefficients in R. Also note that the critical F-value you have to compute must be based on a one-sided test (choose p respectively).
- (d) Calculate the predicted number of first preference votes for *one specific* candidate who is an incumbent TD and whose spending is average. Please do it the “tedious way” first and then verify your result with the `predict()` function.
- (e) The aim is to calculate a bootstrap estimate for the coefficient of total spending. In order to do so, you draw a 1000 times a bootstrap sample and run the regression, and then report the mean and standard deviation of the obtained coefficients.
Hint: You may find the lecture slides inspiring.