

# EC 320 Intro to Econometrics Final Review

Winter 2022

## F-test

Consider the following linear regression model:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + u_i.$$

Recall that the formula for calculating  $F$  statistic is given as follows:

$$F_{q,n-k} = \frac{(RSS_r - RSS_u)/q}{RSS_u/(n-k)}$$

where  $q$  denotes the number of restrictions,  $n$  denotes the number of observations in the given sample,  $k$  denotes the number of parameters in the regression model.

1. What restricted model would allow you to test the null hypothesis that  $\beta_2 = \beta_3 = \beta_4 = 0$ ? What is unrestricted model?
2. What is the number of restrictions?
3. Suppose that  $RSS = 1000$  for the unrestricted model and  $RSS = 1030$  for the restricted model. The number of observation is 300. Find the  $F$  statistic for this test.
4. Find the critical value from the  $F$  distribution for this test. Can we reject the null hypothesis that  $\beta_2 = \beta_3 = \beta_4 = 0$  at 5% significance level?

$$F_{0.95}(2, 296) = 3.02626$$

$$F_{0.975}(3, 296) = 3.16046$$

$$F_{0.95}(3, 295) = 2.63521$$

$$F_{0.975}(3, 295) = 3.16061$$

5. What restricted model would allow you to test the null hypothesis that  $\beta_2 = \beta_3 = \beta_4$ ? What is the number of restrictions? Sketch out how you would conduct the hypothesis test.

## Interaction and binary variables

1. Consider the following linear regression model:

$$Y_i = \beta_0 + \beta_1 D_{1i} + \beta_2 D_{2i} + u_i,$$

where  $D_{1i}$  is a binary variable that denotes 1 for students studying at night (night owls) while 0 for students studying early in the morning (early birds),  $Y_i$  denotes grades for EC320,  $D_{2i}$  is a binary variable that denotes 0 for students living on campus while 1 for students living off-campus. In this setting who is the reference group? What is the expected grade of the reference group?

2. What is the expected grade for students living on campus studying late at night?
3. What is the expected grade for students living off campus studying late at night?
4. Consider the following linear regression model:

$$Y_i = \beta_0 + \beta_1 X_i + \beta_2 D_i + \beta_3 D_i X_i + u_i.$$

Find the marginal effect of  $X$  on  $Y$  for group  $D_i = 0$ . Find the marginal effect of  $X$  on  $Y$  for group  $D_i = 1$ .

## Non linear regression

Interpret the coefficient  $\beta_1 = 0.3$  as in terms of units or % of  $X$  and  $Y$ .

1.  $Y_i = \beta_0 + \beta_1 X_i + u_i$

2.  $Y_i = \beta_0 + \beta_1 \log(X_i) + u_i$

3.  $\log(Y_i) = \beta_0 + \beta_1 (X_i) + u_i$

4.  $\log(Y_i) = \beta_0 + \beta_1 \log(X_i) + u_i$