

Homework 3 - ECON 5453

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1.

The Department of Economics at Metrics University randomly sampled 22 MSBA students at the beginning of the Fall 2018 semester and obtained data on the following variables: the current grade point average of student “ i ” (call this variable “ GPA_i ”); the grade point average of the student upon graduating from their undergraduate (call this variable “ $UGPA_i$ ”); the average number of hours per week that student i spent at the bar (call this variable “ BAR_i ”); and the average number of hours per week that student i studied (call this variable “ $STUDY_i$ ”). The Department of Economics at Metrics University estimated (by OLS) three alternative regression models using these variables, and their results are shown below:

$$(1.) \quad GPA_i = 0.90 + 0.5UGPA_i + \hat{u}_i \quad \text{S.E. of } \hat{\beta}_0 = 0.20 \quad \text{S.E. of } \hat{\beta}_1 = 0.20$$

$$(2.) \quad GPA_i = 2.0 - 0.1BAR_i + \hat{u}_i \quad \text{S.E. of } \hat{\beta}_0 = 0.14 \quad \text{S.E. of } \hat{\beta}_1 = 0.05$$

$$(3.) \quad GPA_i = 1.6 + 0.3STUDY_i + \hat{u}_i \quad \text{S.E. of } \hat{\beta}_0 = 0.90 \quad \text{S.E. of } \hat{\beta}_1 = 0.10$$

- For all three equations above, compute the t-test statistics for the following null and alternative hypotheses: $H_0 : \beta_0 = 1$ versus $H_A : \beta_0 \neq 1$. Evaluate the test at the 5% significance level.
- For equations (1.) and (3.) above, compute the t-test statistics for the following null and alternative hypotheses: $H_0 : \beta_1 \leq 0$ versus $H_A : \beta_1 > 0$. Evaluate the test at the 5% significance level.
- For equation (2.) above, compute the t-test statistic for the following null and alternative hypotheses: $H_0 : \beta_1 \geq 0$ versus $H_A : \beta_1 < 0$. Evaluate the test at the 10% significance level.

2.

Suppose you estimate the following model for housing prices in the San Francisco Bay area:

$$\begin{array}{cccccc} \hat{HouseP}_i = & 5.2 & -0.725PropTax_i & +0.547SQFT_i & +0.00073Inc_i & +0.064Age_i & -0.0043Travel_i \\ & (0.1.2) & (0.24) & (0.25) & (0.0005) & (0.02) & (0.002) \end{array}$$

Where $HouseP_i$ represents the price of house “ i ” measured in thousands of dollars; “PropTax” represents the amount of property taxes for house i in dollars; “SQFT” represents the square footage of house i ; “Inc” represents mean income (in dollars) of families in the neighborhood; “Age” represents the number of years since home i was built; and “Travel” represents the distance the home is from downtown San Francisco. The numbers in parentheses beneath the

parameter estimates are the corresponding (estimated) standard errors. Note, $N = 15$. Use the above information to evaluate each of the tests described below. In each case, be sure to: write out the null and alternative hypotheses in terms of betas and constants; compute the numerical value of the test; note the numerical values of the degrees of freedom and critical value(s) of the test; and, indicate whether or not the null hypothesis would be rejected.

- (a) Test whether or not the variable “PropTax” has a statistically significant effect on the price of a house. Use the 5% level of significance to evaluate the test.
- (b) Test whether or not the variable “SQFT” has a statistically significant and POSITIVE effect on the price of a house. Use the 5% level of significance to evaluate the test.
- (c) Test whether or not the variable “Travel” has a statistically significant and NEGATIVE effect on the price of a house. Use the 10% level of significance to evaluate the test.
- (d) Test whether or not the variable “Age” has a statistically significant one-to-one effect on the price of a house. Use the 1% level of significance to evaluate the test.