

Name _____ Surname _____ Student ID. _____

DUE DATE : Tuesday 5th, October 2017 by 12.00 (After finishing the Exam at B.E. office)

Homework Assignment 3: (65 marks)

I pledge to the Honor Code and to obey all rules for taking and performing homework assignments as specified by the course instructor.

Student Signature: _____

1.(30 Marks) Midterm: Fall-2015

(1.1)What is the Gauss-Markov Theorem?

(1.2)Show that the OLS intercept coefficient estimator $\hat{\beta}_1$ is a linear function of the sample observations Y_i and X_i .

(1.3) Stating explicitly all required assumptions, prove that the OLS intercept coefficient estimator $\hat{\beta}_1$ is an unbiased estimator of the true parameter β_1 .

2.(35 Marks) Midterm: Fall-2016 A researcher is using data for a sample of 30 companies to investigate the relationship between annual business taxes paid Y_i (measured in millions of dollars per year) and gross business income X_i (measured in millions of dollars per year). Preliminary analysis of the sample data produces the following sample information:

$$\sum Y_i = 28.730 \quad \sum X_i = 166.045 \quad \sum Y_i^2 = 33.170$$

$$\sum X_i^2 = 1095.526 \quad \sum X_i Y_i = 190.128 \quad \sum x_i y_i = 31.112$$

$$\sum y_i^2 = 5.657 \quad \sum x_i^2 = 176.80 \quad N = 30$$

where $x_i = X_i - \bar{X}$, $y_i = Y_i - \bar{Y}$, and $\hat{y}_i = \hat{Y}_i - \bar{Y}$

Use the above sample information to answer all the following questions. **Show explicitly all formulas and calculations**

2.1 (5 Marks) Use the above information to compute OLS estimates of the intercept coefficient β_1 and that of the slope coefficient β_2 .

2.2 (5 Marks) Interpret the slope coefficient estimate you calculated in part (a)—i.e., explain in words what the numeric value you calculated for $\hat{\beta}_2$ means.

2.3 (5 Marks) Calculate an estimate of σ^2 .

2.4 (5 Marks) Compute the value of r^2 . Briefly explain what the calculated value of r^2 means.

2.5 (5 Marks) Compute the estimated variance of $\hat{\beta}_1$ and the estimated variance of $\hat{\beta}_2$.

2.6 (5 Marks) Compute the two-sided 90% confidence interval for the β_1 . Briefly explain what the two-sided 90% confidence interval means.

2.7 (5 Marks) Perform a test of the null hypothesis $H_0 : \sigma^2 = 0.01$ against the alternative hypothesis $H_1 : \sigma^2 > 0.01$ at the 5 % significance level (i.e., for significance level $\alpha = 0.05$). Show how you calculated the test statistic. State the decision rule you use, and the inference you would draw from the test. Briefly explain what the test outcome means.