EE325

Use 4 decimal places for numerical answers

1. In Table 1.a. X_i is total microeconomics exam point (total points are 100) and Y_i is GPA of each student.

Table 1.a

Student	Y_i	X_i
1	2.8	63
2	3.4	72
3	3	78
4	3.5	81
5	3.6	87
6	3.0	75
7	2.7	75
8	3.7	90

1.1 Now consider the two-variable model $Y_i = \beta_1 + \beta_2 X_i + u_i,\ u_i \sim NIID(0, \sigma^2)$ Use OLS to find the estimator of $\beta_1 and \beta_2$. Interpret the regression.

1.2 Find $\hat{Y}_i\ and\ \hat{u}_i$ and show that $\sum_{i=1}^{n} \hat{u}_i \approx 0$

1.3 Find $\text{var}(\hat{u}_i), \text{var}(\hat{\beta}_1), and\ \ \text{var}(\hat{\beta}_2)$

1.4 Test the hypothesis that total microeconomics exam point has no influence on GPA at $\alpha = 5\%$

1.5 What percentage of the total variation in Y explained by the regression model?

1.6 Establish a 95 percent confidence interval for $E(Y \mid X = 77.6)$

1.7 Establish a 95 percent confidence interval for $E(Y \mid X = 100)$. Compare the answer with 1.6 whether the confidence interval is wider or narrower?

2. Data is listed in the table

X_i	Y_i
10	0
12	2
14	5
16	6
18	7
22	10
24	10
26	15
28	16
30	20

2.1 From the simple regression model $Y_i = \beta_1 + \beta_2 X_i + u_i, u_i \sim NIID(0, \sigma^2)$ Find estimators of β_1 and β_2 from the OLS method and interpret the meaning.

2.2 Find the value of $\hat{Y}_i$ and $\hat{u}_i$. Show that $\sum \hat{u}_i \approx 0$

2.3 Plot graph and draw regression line. Does the line pass $(\bar{X}, \bar{Y})$?

2.4 If $X_i = 16$, what is the predicted Y?

2.5 Find $\text{var}(\hat{u}_i)$, $\text{var}(\hat{\beta}_1), \text{var}(\hat{\beta}_2)$

3. Given Y is wages per hour ($), X is year of schooling (years) from a sample of 528 observations

$$\hat{Y}_t = 0.7437 + 0.6416 X_t$$
$$se = (0.8355)(0.0664)$$
$$r^2 = 0.8944, \hat{\sigma}^2 = 0.8040$$

3.1 Test the hypothesis that year of schooling has a positive influence on wages per hour at $\alpha = 1\%$

3.2 Interpret the regression.

3.3 If Miss Lily has 8 years of schooling, what is the predicted average on wages per hour ($)?

4. Consider the two-variable model $Y_i = \beta_1 + \beta_2 X_i + u_i$ Y is Supply for good (unit: hundred pieces), X is price of good (unit: thousand baht) from a sample of 5 observations.

$$\hat{Y}_i = 475.9444 - 0.4579 X_i$$
$$se = (54.3277) \quad (0.0828)$$
$$t = (8.7606) \quad (-5.5294)$$
$$\hat{\sigma}^2 = 2364.7694$$
$$\text{TSS} = 43245.2$$
$$\text{RSS} = 7094.3080$$

4.1 Test the hypothesis that β_2 is different from zero at $\alpha = 1\%$

4.2 Interpret the regression

4.3 Establish a 95 percent confidence interval for β_2 and Test the hypothesis that $\beta_2 = -0.6$ or not.

4.4 What percentage of the total variation in Y explained by the regression model?

4.5 If the unit Supply for good changes from hundred pieces to piece. What is the estimator for β_1 *and* β_2 ? Interpret the regression

4.6 If the unit price of good changes from thousand baht to hundred baht. What is the estimator for β_1 *and* β_2 ? Interpret the regression

4.7 If the unit Supply for good changes from hundred pieces to piece and the unit price of good changes from thousand baht to hundred baht. What is the estimator for β_1 *and* β_2 ? Interpret the regression

5. Consider the following regression output:

$\hat{Y}_i = 0.2033 + 0.6560 X_t$
$se = (0.0976) \quad (0.1961)$
$r^2 = 0.397$
$RSS = 0.0544$
$ESS = 0.0358$

Where Y = labor force participation rate (LFPR) of women in 1972 and X = LFPR of women in 1968. The regression results were obtained from a sample of 19 cities in the United States.

5.1 How do you interpret this regression?

5.2 Test the hypothesis: β_2 is greater than 1? Which test do you use?