

AREC/ECON 339
Homework Assignment #5
Total Points: 35

1. (5 points) Given are five observations collected in a regression study on two variables.

x_i	2	3	5	1	8
y_i	25	25	20	30	16

- a. Develop a scatter diagram for this data
 - b. Develop the estimated regression equation for this data by computing the values of b_0 and b_1
 - c. Use the estimated regression equation to predict the value of y when $x = 4$
2. (8 points) Technological advances helped make inflatable paddlecraft suitable for backcountry use. These blow-up rubber boats, which can be rolled into a bundle not much bigger than a golf bag, are large enough to accommodate one or two paddlers and their camping gear. Canoe & Kayak magazine tested boats from nine manufacturers to determine how they would perform on a three-day wilderness paddling trip. One of the criteria in their evaluation was the baggage capacity of the boat, evaluated using a 4-point rating scale from 1 (lowest rating) to 4 (highest rating). The following data show the baggage capacity rating and the price of the boat.

Boat	Baggage Capacity	Price (\$)
S14	4	1595
Orinoco	4	1399
Outside Pro	4	1890
Explorer 380X	3	795
River XK2	2.5	600
Sea Tiger	4	1995
Maverik II	3	1205
Starlite 100	2	583
Fat Pack Cat	3	1048

- a. Develop a scatter diagram for these data with baggage capacity rating as the independent variable
 - b. What does the scatter diagram developed in part (a) indicate about the relationship between baggage capacity and price?
 - c. Draw a straight line through the data to approximate a linear relationship between baggage capacity and price
 - d. Use the least squares method to develop the estimated regression equation
 - e. Provide an interpretation for the slope of the estimated regression equation
 - f. Predict the price for a boat with a baggage capacity rating of 3
3. (6 points) An important application of regression analysis in accounting is in the estimation of cost. By collecting data on volume and cost and using the least squares method to develop an estimated regression equation relating volume and cost, an accountant can estimate the cost associated with a particular manufacturing volume. Consider the following sample of production volumes and total cost data for a manufacturing operation.

Production Volume (units)	Total Cost (\$)
400	4000
450	5000
550	5400
600	5900
700	6400
750	7000

- a. Use these data to develop an estimated regression equation that could be used to predict the total cost for a given production volume.
- b. What is the variable cost per unit produced?
- c. Compute the coefficient of determination. What percentage of the variation in total cost can be explained by production volume?
- d. The company's production schedule shows 500 units must be produced next month. What is the estimated total cost for this operation?

4. (3 points) The data from exercise 3 follow.

x_i	2	4	5	7	8
y_i	2	3	2	6	4

- What is the value of the standard error of the estimate?
- Test for a significant relationship by using the t test. Use $\alpha = .05$
- Use the F test to test for a significant relationship. Use $\alpha = .05$

5. (4 points) The data from exercise 2 follow.

x_i	2	3	5	1	8
y_i	25	25	20	30	16

- Estimate the standard deviation of y_p hat when $x = 3$
- Develop a 95% confidence interval for the expected value of y when $x = 3$
- Estimate the standard deviation of an individual value of y when $x = 3$
- Develop a 95% prediction interval for y when $x = 3$

6. (4 points) In exercise 13, data were given on the adjusted gross income x and the amount of itemized deductions taken by taxpayers. Data were reported in thousands of dollars. With the estimated regression equation y hat = $4.68 + .16x$, the point estimate of a reasonable level of total itemized deductions for a taxpayer with an adjusted gross income of \$52,500 is \$13,080.

- Develop a 95% confidence interval for the amount of total itemized deductions for all taxpayers with an adjusted gross income of \$52,500
- Develop a 95% prediction interval estimate for the amount to total itemized deductions for a particular taxpayer with an adjusted gross income of \$52,500
- If the particular taxpayer referred to in part (b) claimed total itemized deductions of \$20,400, would the IRS agent's request for an audit appear to be justified?
- Use your answer to part (b) to give the IRS agent a guideline as to the amount of total itemized deductions a taxpayer with an adjusted gross income of \$52,500 should claim before an audit is recommended.

7. (3 points) Given are data for two variables, x and y

x_i	6	11	15	18	20
y_i	6	8	12	20	30

- Develop an estimated regression equation for these data
- Compute the residuals
- Develop a plot of the residuals against the independent variable x . Do the assumptions about the error terms seem to be satisfied?

8. (3 points) Consider the following data for two variables, x and y .

x_i	4	5	7	8	10	12	12	22
y_i	12	14	16	15	18	20	24	19

- Compute the standardized residuals for these data. Do there appear to be any outliers in the data? Explain
- Compute the leverage values for these data. Do there appear to be any influential observations in these data? Explain
- Develop a scatter diagram for these data. Does the scatter diagram indicate any influential observations? Explain