

Review Problems for Hypothesis Testing with Bivariate Regressions

1. Suppose that you are hired by the TTC (the company that runs the subway system in Toronto), and they want to understand the relationship between customer service ratings and the number of delays on the TTC. To assess this issue, you collect data on a customer's service rating (a variable that ranges from 1 to 10, where 1 indicates the lowest possible rating, and 10 represents the highest possible rating), and the average number of delays per ride they have experienced. You estimate the following regression:

$$\text{Customer Service Rating} = b_0 + b_1(\text{Average Number of Delays Per Ride})$$

These are your regression results:

	Coefficient	Standard Error
Intercept	8	2
Average Number of Delays Per Ride	-1.5	0.25

- (a) If the TTC management believes that the average number of delays per ride would have no impact on customer service ratings, how would you use your regression results to assess this claim?
- (b) Suppose that the standard error of this regression is 0.75. If the TTC management believes that a rider who experiences one delay (on average) while traveling on the subway would have a customer service rating of 6, how would you use your regression results to assess this claim?

2. You have been employed by an environmental group to examine the relationship between gas prices and sales of gas. To do so, you have collected data from different gas stations on daily sales (in thousands of Litres of gas) and the daily price of gasoline (in cents), and you estimate the following regression:

$$\text{Gas sales per day} = b_0 + b_1(\text{Price of gas on a given day})$$

These are your regression results:

	Coefficient	Standard Error
Intercept	5	1
Price of gas on a given day	-0.02	0.002

- (a) The environmental group believes that the demand for gas is relatively inelastic – that is, demand doesn't change when the price of gas changes (and because of this, the group doesn't believe that government policies like gas taxes will decrease demand). How would you use your regression results to assess this claim?
- (b) Suppose that the standard error of this regression is 0.1. The environmental group is worried about a gas subsidy that would lower the price of gas to 50 cents per Litre. Specifically, they think that demand for gas would be 4500 Litres at each gas station. How would you use your regression results to assess this claim?

3. You would like to examine the efficacy of using commission-based contracts with your sales staff, and want to determine if a higher commission rate results in a higher level of sales. To consider this, you collect data on a salesperson's daily sales (in dollars) and the commission rate used to pay that salesperson (here, you specify commission rates in integers – as an example, a 2% commission rate would be entered in your data as 2). With this data, you estimate the following regression:

$$\text{Daily sales by the salesperson} = b_0 + b_1(\text{Commission rate of the salesperson})$$

These are your regression results:

	Coefficient	Standard Error
Intercept	1000	250
Commission rate of the salesperson	200	150

(a) You think that sales are not related to a salesperson's commission rate – how do you assess your view, given the results from your regression?

(b) Suppose that the standard error of your regression was equal to 50. If you paid a salesperson with 4 percent commission rate, you think that their daily sales would be \$1500. How would you assess your view in light of your regression evidence?