ECO 610-410
Fall 1998
Test #1

Answer each question in the space provided. Five questions, 20 points each.

1. A local television station has produced a promotional video that relives past University of Kentucky athletic accomplishments. It solicits cost estimates from two different suppliers. Supplier A will charge the station a set-up charge of $1,200 plus $2 for each cassette; supplier B has no set-up charge and will charge $4 per cassette. The station commissioned a group of MBA students to estimate demand for the cassettes, and they found that demand is given by $Q = 1,600 - 200P$, where P is the price in dollars and Q is the number of cassettes.
    a) Suppose the station plans to give away the videos. How many cassettes should it order and from which supplier?
    b) Suppose the station seeks to maximize its profit from the sales of the cassettes. What price should it charge? How many cassettes should it order, and from which supplier?

(a) if $P = 0$, $Q = 1600 - 200(0) = 1600$

TC of 1600 cassettes from supplier A $= \$1200$
   $+ \$2(1600) = \$4400$.

TC of 1600 cassettes from supplier B $=$
   $4(1600) = \$6400$.

Buy from supplier A.

(b) $Q = 1600 - 200P$

$P = 8 - \dfrac{Q}{200}$

$TR = P \cdot Q = 8Q - Q^2/200$

$MR = \dfrac{dTR}{dQ} = 8 - Q/100$

Profit if using supplier A:

$TC = 1200 + 2Q$

$MC = 2$

setting $MR = MC$:

$8 - Q/100 = 2$

$Q = 600$

$P = \$5$

$\pi = 5(600) - 1200 - 2(600)$

$\pi = \$600$

profit if using B:

$TC = 4Q$

$MC = 4$

setting $MR = MC$

$8 - Q/100 = 4$

$Q = 400$

$P = \$6$

$\pi = 6(400) - 4(400)$

$\pi = \$800$

so buy from B, and set $P = \$6.00$

2. The state legislature is considering selling vanity license plates for automobiles, whereby people can personalize their car's license tag. Your next-door neighbor, who happens to be a state senator, comes to you for advice about how to price these personalized license plates. After doing some research, you find that in Tennessee, a state comparable to Kentucky in many ways, the number of vanity plates sold dropped from 95,000 to 45,000 when the price was increased from $25 to $40.

a) Calculate the elasticity of demand for personalized license plates in Tennessee.

b) The state prison system has estimated that it costs an extra $7 for each additional personalized license plate that prisoners stamp out. If elasticity of demand in Kentucky can be assumed to be the same as in Tennessee, what price would you suggest be charged if the legislature wants to maximize net revenue (profit) from this program.

(a)
$$\mathcal{E}_x = -\frac{\Delta Q}{(Q_0 + Q_1)} \Big/ \frac{\Delta P}{(P_0 + P_1)}$$

$$= \frac{50}{(95 + 45)} \Big/ \frac{15}{(25 + 40)}$$

$$= \frac{50}{140} \cdot \frac{65}{15} = \frac{5}{14} \cdot \frac{13}{3} = \frac{65}{42}$$

$$= -1.548$$

(b) using optimal markup formula:

$$P = \frac{\mathcal{E}_x}{1 + \mathcal{E}_x} \cdot mc$$

$$P = \frac{-1.548}{1 - 1.548} \cdot \$7$$

$$P = \$19.77$$

3. After extensive sampling of MBA students, using regression analysis you estimate the following relationship between weight and other factors:

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----------------------------------------------------------------
weight  |   Coef.    Std. Err.      t     P>|t|     [95% Conf. Interval]
--------+-------------------------------------------------------
height  |  4.348447   1.089323    3.992   0.001    2.08933    6.607564
gender  | 17.63311    8.632392    2.043   0.053   -.2693716  35.5356
age     |  .6606681    .705748    0.936   0.359   -.8029638   2.1243
exercise|  .835224     .649709    1.286   0.212   -.5121901   2.182638
income  | -.0000167    .0001114  -0.150   0.882   -.0002478   .0002143
constant| -173.9483   70.98304   -2.451   0.023   -321.1581  -26.73844
----------------------------------------------------------------
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Weight is measured in pounds, height in inches, age in years, exercise in hours per week, income in dollars, and gender = 1 if male. Now, suppose you are told that another MBA student is standing outside the classroom. This person is male, 70 inches tall, 30 years old, exercises 2 hours per week, and has an income of $30,000 per year. Predict his weight.

predicted weight :

$$W = -173.9 + 4.35(H) + 17.63(G) + .66(A)$$

$$+ .84(E) - .00001(I)$$

plugging in $H = 70$, $G = 1$, $A = 30$, $E = 2$, and $I = 30,000$

$$W = -173.9 + 4.35(70) + 17.63(1) + .66(30)$$

$$+ .84(2) - .00001(30,000)$$

$$W = 169.4 \text{ lbs.}$$

4. After completing your MBA at UK, you get a triple-figure offer from Schick Razor Co., largely based upon the knowledge gained in a class exercise in Eco 610. The first project that you are assigned is to evaluate demand for and pricing of their new line of razors and blades, dubbed the MACH4. In the past, Schick has evaluated the demand for blades and razors separately, and separate corporate divisions have produced and set the prices for each completely independently of one another. Now the prices of both razors and blades are going to be set by you. You find that consumers are very price-conscious when it comes to the razors, but don't seem to care too much about the price of the blade cartridge when deciding on the Schick shaving system versus the Gillette shaving system. Explain how you will go about setting prices for razors and blades. Show any formulas that you use in arriving at your pricing decision. Compare the prices that you will set for razors and blades to those that would have been set under the old corporate structure that existed before Schick hired you.

Schick razors and blades are clearly complements in demand. Therefore Schick should take into account the cross-price effects of razors on blades and blades on razors when setting prices for each. The marginal revenue functions for razors (R) and blades (B) are:

$$MR_R = \frac{dTR_R}{dQ_R} + \frac{dTR_B}{dQ_R} = MC_R$$

$$MR_B = \frac{dTR_R}{dQ_B} + \frac{dTR_B}{dQ_B} = MC_B$$

We know that both $\frac{dTR_B}{dQ_R}$ and $\frac{dTR_R}{dQ_B}$ are positive, so we will set both prices lower than we would if there were no demand interdependency. That is the way prices used to be set. Since consumers are very sensitive to the price of razors, $\frac{dTR_B}{dQ_R}$ will be large and we should set razor prices close to marginal cost. Blade prices will have a larger markup over marginal cost, but will still be lower than under the old regime.

5. Four short-answer questions:
   a) What does R-squared tell you?

   R^2 tells us the proportion of the variation in the dependent variable that is "explained" by the independent variables in the regression equation.

   b) If the income elasticity of demand for scratch-off lottery games is −0.5, how should the state lottery commission advertise the product?

   Instant lottery games are an inferior good. Hence we should target low-income households in marketing the product.

   c) True or False and briefly explain: If the own-price elasticity of demand for cigarettes is 0.7, the own-price elasticity of demand for Camel cigarettes is likely to be a number like 0.3.

   False. Demand for the narrowly defined product, Camels, will be more elastic than the demand for the broadly defined product, cigarettes.

   d) Give an example of third-degree price discrimination.

   Third-degree price discrimination involves market segmentation. Different prices are charged to different categories of customers. Airline pricing is a good example, where business and leisure travellers pay different prices for the same commodity.

Name ___**KEY**___

ID # _____

Multiple choice. Circle correct answer. 3 pts. each.

1. A leftward shift in the demand curve for Corn Flakes would be predicted from
    (a) a fall in the price of Wheaties
    b) a change in tastes away from hot cereals
    c) a rise in the price of Corn Flakes
    d) an increase in the price of corn

A

2. As manager of the famous Scottish rock band ME3, you have to decide how to set ticket prices for the upcoming U.S. concert tour. You have narrowed your choices to $50 per ticket and $60 per ticket. Fewer people will want to attend at the higher price, and so there will be more empty seats in the stadiums where ME3 plays. More empty seats along with the higher price may be better than fewer empty seats at the lower price if
    a) demand is elastic
    (b) demand is inelastic
    c) ME3 concerts are a luxury good
    d) ME3 concerts are a normal good

B

3. The income elasticity of demand for food is approximately 0.5. Food items are currently exempted from the sales tax in Kentucky. If the state legislature were to begin taxing food items,
    (a) the burden of the tax would fall relatively more heavily on poorer households, since food is a necessity.
    b) the burden of the tax would fall relatively more heavily on richer households, since food is a normal good.
    c) the burden of the tax would fall on grocery stores, since they collect the tax.
    d) the sales tax does not really hurt anyone, so this is actually an example of a free lunch.

A

4. As manager of a local convenience store, you decide to try a marketing experiment. You raise the price of Pepsi from $4.99 per case to $5.49 per case, while holding the price of Coke constant. You find that Coke sales increase by about 50 percent. The cross-price elasticity of demand between Pepsi and Coke thus is approximately equal to
    a) -5.0
    b) -0.2
    c) 0.2
    (d) 5.0

D

5. Country Slim wants to make money charging tourists a price to see his remarkable beagle dance the polka. If he can run his tourist trap for zero total cost, under which of the following rules will he maximize profits?
    a) Charge a price high enough that two-thirds of the tourists passing through won't pay to see the pooch prance, and the other one-third will.
    b) Charge a price such that demand is inelastic.
    (c) Charge a price such that marginal revenue is zero.
    d) Charge the highest price on the demand curve.

C

6. Which of the following is the best definition of sample bias?
    a) Survey respondents may have preconceptions about the product and be biased against it.
    b) Survey questions are slanted one way or the other.
    c) Only a portion of the population is sampled, so results may be inaccurate.
    (d) The survey sample is not representative of the population that you are attempting to analyze.

D

7. Suppose that the R^2 statistic is 0.85. What is the interpretation of this number?
   a) 85% of the variation in the independent variable is explained by the regression equation.
   b) The correlation between the dependent variable and the independent variable is the square root of 0.85.

   D
   c) 15% of the variation in the independent variable is not explained by the regression equation.
   d) 85% of the variation in the dependent variable is explained by the regression equation.

8. Ordinary least-squares regression
   a) Is one way to fit a line through some data points.
   b) Minimizes the sum of the squared differences between actual and predicted values of the dependent variable.

   D
   c) Provides the statistical equivalent of a controlled laboratory experiment.
   d) All of the above.

9. For which of the following would you expect demand to be the most elastic?
   a) Swiss cheese.
   b) Cheese.

   A
   c) Dairy products.
   d) Food.

10. Microsoft produces and sells the Windows operating system, as well as software products like Word and Excel that are compatible with Windows. It has been proposed by the U.S. Justice Department that Microsoft be split into two separate companies. One company would produce and sell Windows, and a second company would produce and sell software products like Word and Excel. If Microsoft is split into two separate and independent companies,
    a) Consumers can expect the price of Windows to fall and the price of Word to rise.
    b) Consumers can expect the prices of Windows and Word both to rise.

    B
    c) Consumers can expect the prices of Windows and Word both to fall.
    d) Consumers can expect the price of Windows to rise and the price of Word to fall.

11. (15 pts.) Ralph and Gordon, owners of a local grocery store, are currently pricing their milk at $2.00 per gallon, a 15% markup over cost. However, they have experimented with other prices. They have found that a price increase from $2.00 to $2.20 reduces sales by 40% while a price decrease from $2.00 to $1.80 increases sales by 40%. Given this information, should Ralph and Gordon raise, lower, or keep their price at $2.00? Explain your answer.

optimal price: $P = \dfrac{\epsilon}{1+\epsilon} \cdot MC$

$\epsilon \approx -\dfrac{40\%}{10\%} = -4$

$MC \approx \$1.70$

optimal $P = \dfrac{-4}{1-4} \cdot (1.70) = \dfrac{4}{3} \cdot \$1.70 \approx \$2.27$

so Ralph and Gordon should raise the price of their milk.

12. (15 pts.) You are the manager of the institutional research department of a Kentucky liberal arts college. After collecting data on enrollment and other factors, you find that demand for enrollment at your college can be expressed by:

$$Q = 6000 - 0.25T + 0.05Y$$

Where Q = enrollment, T = annual tuition (in dollars), and Y = per capital income (in dollars) in Kentucky. If Kentucky per capita income is $18,000 and the college is currently charging $16,000 annually for tuition, what is predicted enrollment? What is elasticity of demand at this price?

$$Q = 6000 - .25(16,000) + .05(18,000)$$

$$Q = 2900 \text{ students}$$

$$\varepsilon = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q} = 0.25 \cdot \frac{16000}{2900} = 1.38$$

13. (20 pts.) As the new CEO of Northeast Airlines, you decide to analyze the prices charged by your airline on different routes. Your current route structure allows you to fly one 300-seat airplane back and forth between Boston and Nantucket each day. Once the route structure is set, marginal costs thus are essentially zero up to the capacity of the plane.

a) Your marketing department has estimated daily demand for this flight to be $Q = 580 - 2P$. What price should you set in order to maximize profits? How much revenue will be generated by this flight?

b) The same hotshot MBA who estimated the demand equation for you suggests that revenue might be increased on this route if the company were to price discriminate between different groups of passengers. She has determined that two distinct groups of customers fly between Boston and Nantucket. Business travelers have a demand curve given by $Q_B = 330 - P_B$, while leisure travelers have a demand curve given by $Q_L = 250 - P_L$. Assume that it is possible to sort customers into these two groups and charge them different prices. What prices should you charge? Does this result in an increase in revenue?

$$MC = 0$$

(a)

$$Q = 580 - 2P$$

$$P = 290 - Q/2$$

$$TR = P \cdot Q = 290Q - Q^2/2$$

$$MR = \frac{dTR}{dQ} = 290 - Q$$

$$MR = MC \Rightarrow 290 - Q = 0, \text{ or } Q = 290$$

$$P = 290 - Q/2 = \underline{145}$$

$$TR = (145)(290) = \underline{\$42,050}$$

(b) Business travellers

$$Q_B = 330 - P_B$$

$$P_B = 330 - Q_B$$

$$TR_B = 330Q_B - Q_B^2$$

$$MR_B = 330 - 2Q_B$$

$$MR_B = MC \Rightarrow Q_B = 165$$

$$\underline{P_B = 165} \quad \underline{TR_B = \$27,225}$$

Leisure travellers

$$Q_L = 250 - P_L$$

$$P_L = 250 - Q_L$$

$$TR_L = 250Q_L - Q_L^2$$

$$MR_L = 250 - 2Q_L$$

$$Q_L = 125$$

$$\underline{P_L = 125}, \quad \underline{TR_L = \$15,625}$$

$$TR_B + TR_L = \$42,850 > \$42,050$$

14. (20 pts.) Your consulting group conducts a demand study for a client that is considering bringing a minor league baseball team to Lexington. You collect data from minor league baseball clubs around the country, and run a regression on various factors that affect attendance. You find that

$$\text{Attendance} = 3471.5 + .0033 \text{ Population} + .0005 \text{ Income} - 175.7 \text{ Price} - 508.0 \text{ Major League,}$$
$$\phantom{\text{Attendance} =} (858.9) \quad (.0009) \quad\quad\quad (.001) \quad\quad\quad (36.8) \quad\quad (210.4)$$

where   Attendance = number of people attending each game,
Population = population of the surrounding city,
Income = per capita income of the surrounding city,
Price = average ticket price in dollars, and
Major League = 1 if a Major League Baseball team is located within 100 miles of the stadium, and
= 0 otherwise.

The numbers in parentheses under each estimated coefficient are the standard errors of the coefficient estimates.

a) Based on your results, which variables seem to be important determinants of attendance and which variables do not seem to have much effect on attendance? Briefly explain how you arrive at your answer.

b) Lexington's population is 260,000. Per capita income is $17,000. The Cincinnati Reds are located 75 miles away. If the anticipated price of a ticket is $10.00, how many people do you predict will show up for a typical game?

(a) $t\text{-statistic} = \dfrac{\hat{\beta}}{S_{\hat{\beta}}}$

12

$t_{population} = \dfrac{.0033}{.0009} = 3.67$

$t_{income} = \dfrac{.0005}{.0010} = 0.5$

$t_{price} = \dfrac{175.7}{36.8} = 4.77$

$t_{Major\,League} = \dfrac{508.0}{210.4} = 2.41$

so population, price, and Major League are all statistically significant, while income is not statistically significant.

(b) $Att = 3471.5 + .0033\,(260,000) + .0005\,(17,000)$

8   $- 175.7\,(10) - 508.0\,(1) = 2073$