GLOBAL EDITION

Managerial Economics

Economic Tools for Today's Decision Makers

SEVENTH EDITION

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ALWAYS LEARNING

PEARSON

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Opinion polls. A forecasting method in which sample populations are surveyed to determine consumption trends. (p. 161)

Qualitative forecasting. Forecasting based on the judgment of individuals or groups. Also called *judgmental forecasting*. (p. 160)

Quantitative forecasting. Forecasting that examines historical data as a basis for future trends. (p. 160)

Seasonal indices. A method for describing the seasonal variation in a time series. Seasonal indices may either be multiplicative, in which case the sum of indices should sum to the number of time periods per year (for example, Quarterly indices of 90, 80, 105, and 125), or additive, in which case the sum of indices should sum to zero (for example, Quarterly indices of −10, −20, 5, and 25). (p. 169)

Surveys of spending plans. Examinations of economic trends such as consumer sentiment and inventory. (p. 162)

Time series forecasting. A method of forecasting from past data by using least squares statistical methods. A time series analysis usually examines trends, cyclical fluctuations, seasonal fluctuations, and irregular movements. (p. 168)

Trend projections. A form of naive forecasting that projects trends from past data. Trend projections usually employ compound growth rates, visual time series, or least squares time series methods. (p. 165)

QUESTIONS

Demand Estimation

1. Briefly explain the meaning of the *F*-test. Why do you think this test is considered to be more important in multiple regression analysis than it is in simple regression analysis?
2. What is *multicollinearity*? How can researchers detect this problem? What is the impact of this problem on the regression estimates? What steps can be taken to deal with this problem?
3. Summarize the steps involved in conducting the *t*-test. What is the basis for using the "rule of 2" as a convenient method of evaluating *t*-ratios?
4. Would there be any differences in the set of variables used in a regression model of the demand for consumer durable goods (e.g., automobiles, appliances, furniture) and a regression model of the demand for "fast-moving consumer goods" (e.g., food, beverages, personal care products)? Explain.
5. What is the identification problem? What effect will this problem have on the regression estimates of a demand function? Explain.
6. Briefly explain the meaning of R^2. A time series analysis of demand tends to result in a higher R^2 than one using cross-sectional data. Why do you think this is the case?
7. Explain the difference between time series data and cross-sectional data. Provide examples of each type of data.

Forecasting

1. You have been asked to produce a forecast for your company's product, bottled water. Discuss the kind of information you would look for in order to make this forecast.
2. Describe projections that use either moving averages or exponential smoothing. Under what conditions can these techniques be used? Which of the two appears to be the more useful?
3. How do econometric models differ from "naive" projection methods? Is it always advisable to use the former in forecasting?
4. Discuss the benefits and drawbacks of the following methods of forecasting:
   a. Jury of executive opinion
   b. The Delphi method
   c. Opinion polls

   Each method has its uses. What are they?

5. The compound growth rate is frequently used to forecast various quantities (sales, profits, and so on). Do you believe this is a good method? Should any cautions be exercised in making such projections?
6. "The best forecasting method is the one that gives the highest proportion of correct predictions." Comment.
7. Discuss some of the important criticisms of the forecasting ability of the leading economic indicators.
8. a. Why are manufacturers' new orders, nondefense capital goods, an appropriate leading indicator?
   b. Why is the index of industrial production an appropriate coincident indicator?
   c. Why is the average prime rate charged by banks an appropriate lagging indicator?
9. Manhattan was allegedly purchased from Native Americans in 1626 for $24. If the sellers had invested this sum at a 6 percent interest rate compounded semiannually, how much would it amount to today?
10. The following are the monthly changes in the index of leading economic indicators during 2001 and January 2002:

January	+.1	August	0
February	+.1	September	−.6
March	−.3	October	+.1
April	−.1	November	+.8
May	+.6	December	+1.3
June	+.2	January 2002	+.6
July	+.3		

What would be your prediction for the U.S. economy in 2002?

11. Enumerate methods of qualitative and quantitative forecasting. What are the major differences between the two?

PROBLEMS

Demand Estimation

1. You are given the following demand for European luxury automobiles:

$$Q = 1{,}000P^{-0.93}P_A^{0.75}P_J^{1.2}I^{1.6}$$

where P = Price of European luxury cars
P_A = Price of American luxury cars
P_J = Price of Japanese luxury cars
I = Annual income of car buyers

Assume that each of the coefficients is statistically significant (i.e., that they passed the *t*-test). On the basis of the information given, answer the following questions:

   a. Comment on the degree of substitutability between European and American luxury cars and between European and Japanese luxury cars. Explain some possible reasons for the results in the equation.
   b. Comment on the coefficient for the income variable. Is this result what you would expect? Explain.
   c. Comment on the coefficient of the European car price variable. Is that what you would expect? Explain.

2. One of the most difficult tasks in regression analysis is to obtain the data suitable for quantitative studies of this kind. Suppose you are trying to estimate the demand for home

furniture. Suggest the kinds of variables that could be used to represent the following factors, which are believed to affect the demand for any product. Be as specific as possible about how the variables are going to be measured. Do you anticipate any difficulty in securing such data? Explain.

Determinants of Demand for Furniture	Suggested Variables to Use in Regression Analysis
Price	
Tastes and preferences	
Price of related products	
Income	
Cost or availability of credit	
Number of buyers	
Future expectations	
Other possible factors	

3. A manufacturer of computer workstations gathered average monthly sales figures from its 56 branch offices and dealerships across the country and estimated the following demand for its product:

$$Q = +15{,}000 - 2.80P + 150A + 0.3P_{pc} + 0.35P_m + 0.2P_c$$
$$(5{,}234) \quad (1.29) \quad (175) \quad (0.12) \quad (0.17) \quad (0.13)$$
$$R^2 = 0.68 \qquad \text{SEE} = 786 \qquad F = 21.25$$

The variables and their assumed values are

Q = Quantity
P = Price of basic model = 7,000
A = Advertising expenditures (in thousands) = 52
P_{pc} = Average price of a personal computer = 4,000
P_m = Average price of a minicomputer = 15,000
P_c = Average price of a leading competitor's workstation = 8,000

   a. Compute the elasticities for each variable. On this basis, discuss the relative impact that each variable has on the demand. What implications do these results have for the firm's marketing and pricing policies?
   b. Conduct a *t*-test for the statistical significance of each variable. In each case, state whether a one-tail or two-tail test is required. What difference, if any, does it make to use a one-tail versus a two-tail test on the results? Discuss the results of the *t*-tests in light of the policy implications mentioned.
   c. Suppose a manager evaluating these results suggests that interest rates and the performance of the computer (typically measured in millions of instructions per second, or MIPS) are important determinants of the demand for workstations and must therefore be included in the study. How would you respond to this suggestion? Elaborate.

4. You are the manager of a large automobile dealership who wants to learn more about the effectiveness of various discounts offered to customers over the past 14 months. Following are the average negotiated prices for each month and the quantities sold of a basic model (adjusted for various options) over this period of time.
   a. Graph this information on a scatter plot. Estimate the demand equation. What do the regression results indicate about the desirability of discounting the price? Explain.

Month	Price	Quantity
Jan.	12,500	15
Feb.	12,200	17
Mar.	11,900	16
Apr.	12,000	18
May	11,800	20
June	12,500	18
July	11,700	22
Aug.	12,100	15
Sept.	11,400	22
Oct.	11,400	25
Nov.	11,200	24
Dec.	11,000	30
Jan.	10,800	25
Feb.	10,000	28

b. What other factors besides price might be included in this equation? Do you foresee any difficulty in obtaining these additional data or incorporating them in the regression analysis?

5. The maker of a leading brand of low-calorie microwavable food estimated the following demand equation for its product using data from 26 supermarkets around the country for the month of April:

$$Q = -5{,}200 - 42P + 20P_X + 5.2I + 0.20A + 0.25M$$
$$(2.002)\quad (17.5)\quad (6.2)\quad (2.5)\quad (0.09)\quad (0.21)$$
$$R^2 = 0.55 \qquad n = 26 \qquad F = 4.88$$

Assume the following values for the independent variables:

Q = Quantity sold per month
P (in cents) = Price of the product = 500
P_X (in cents) = Price of leading competitor's product = 600
I (in dollars) = Per capita income of the standard metropolitan statistical area (SMSA) in which the supermarket is located = 5,500
A (in dollars) = Monthly advertising expenditure = 10,000
M = Number of microwave ovens sold in the SMSA in which the supermarket is located = 5,000

Using this information, answer the following questions:

a. Compute elasticities for each variable.
b. How concerned do you think this company would be about the impact of a recession on its sales? Explain.
c. Do you think that this firm should cut its price to increase its market share? Explain.
d. What proportion of the variation in sales is explained by the independent variables in the equations? How confident are you about this answer? Explain.

Forecasting

1. An economist has estimated the sales trend line for the Sun Belt Toy Company as follows:

$$S_t = 43.6 + 0.8t$$

S_t represents Sun Belt's monthly sales (in millions of dollars), and $t = 1$ in January 2008. The monthly seasonal indexes are as follows:

January	60	April	110	July	90	October	110
February	70	May	110	August	80	November	140
March	85	June	100	September	95	December	150

Forecast monthly sales for the year 2013.

2. The sales data over the last 10 years for the Acme Hardware Store are as follows:

2003	$230,000	2008	$526,000
2004	276,000	2009	605,000
2005	328,000	2010	690,000
2006	388,000	2011	779,000
2007	453,000	2012	873,000

   a. Calculate the compound growth rate for the period of 2003 to 2012.
   b. Based on your answer to part *a,* forecast sales for both 2013 and 2014.
   c. Now calculate the compound growth rate for the period of 2007 to 2012.
   d. Based on your answer to part *c,* forecast sales for both 2013 and 2014.
   e. What is the major reason for the differences in your answers to parts *b* and *d?* If you were to make your own projections, what would you forecast? (Drawing a graph is very helpful.)

3. The sales data for the Lonestar Sports Apparel Company for the last 12 years are as follows:

2001	$400,000	2007	$617,000
2002	440,000	2008	654,000
2003	480,000	2009	700,000
2004	518,000	2010	756,000
2005	554,000	2011	824,000
2006	587,000	2012	906,000

   a. What is the 2001–2012 compound growth rate?
   b. Using the result obtained in part *a,* what is your 2013 projection?
   c. If you were to make your own projection, what would you forecast?

4. The MNO Corporation is preparing for its stockholder meeting on May 15, 2013. It sent out proxies to its stockholders on March 15 and asked stockholders who plan to attend the meeting to respond. To plan for a sufficient number of information packages to be distributed at the meeting, as well as for refreshments to be served, the company has asked you to forecast the number of attending stockholders. By April 15, 378 stockholders have expressed their intention to attend. You have available the following data for the last 6 years for total attendance at the stockholder meeting and the number of positive responses as of April 15:

Year	Positive Responses	Attendance
2007	322	520
2008	301	550
2009	398	570
2010	421	600
2011	357	570
2012	452	650

   a. What is your attendance forecast for the 2013 stockholder meeting?
   b. Are there any other factors that could affect attendance, and thus make your forecast inaccurate?

5. In the Columbia Gas of Ohio study that forecasted the demand for gas (see p. 181), the company developed the following coefficients for their equation:

Growth rate	.015
Intercept	1376.0
Forecasted temperature	–17.1
Prior day temperature	–3.7
Forecasted wind speed	4.2

   Forecast the demand for gas for a day, when the expected average temperature will be 40 degrees, the prior day's average temperature was 37, and the average wind speed is predicted to be 8 miles per hour.

6. If the sales of your company have grown from $500,000 five years ago to $1,050,150 this year, what is the compound growth rate? If you expect your sales to grow at a rate of 10 percent for the next five years, what should they be five years from now?
7. Based on past data, Mack's Pool Supply has constructed the following equation for the sales of its house brand of chlorine tablets:

$$Q = 1{,}000 + 100t$$

where Q is quantity and t is time (in years), with 2007 = 0.
   a. What is the sales projection for 2013?
   b. The tablet sales are seasonal, with the following quarterly indexes:

Quarter 1	80%
Quarter 2	100%
Quarter 3	125%
Quarter 4	95%

   What is the quarterly sales projection for 2013?
8. The Miracle Corporation had the following sales during the past 10 years (in thousands of dollars):

2003	200	2008	302
2004	215	2009	320
2005	237	2010	345
2006	260	2011	360
2007	278	2012	382

   a. Calculate a trend line, and forecast sales for 2013. How confident are you of this forecast?
   b. Use exponential smoothing with a smoothing factor $w = 0.7$. What is your 2013 forecast? How confident are you of this forecast?
9. You have the following data for the last 12 months' sales for the PRQ Corporation (in thousands of dollars):

January	500	July	610
February	520	August	620
March	520	September	580
April	510	October	550
May	530	November	510
June	580	December	480

   a. Calculate a 3-month centered moving average.
   b. Use this moving average to forecast sales for January of next year.
   c. If you were asked to forecast January and February sales for next year, would you be confident of your forecast using the preceding moving averages? Why or why not?
10. Office Enterprises (OE) produces a line of metal office file cabinets. The company's economist, having investigated a large number of past data, has established the following equation of demand for these cabinets:

$$Q = 10{,}000 + 60B - 100P + 50C$$

where Q = Annual number of cabinets sold
B = Index of nonresidential construction
P = Average price per cabinet charged by OE
C = Average price per cabinet charged by OE's closest competitor

It is expected that next year's nonresidential construction index will stand at 160, OE's average price will be $40, and the competitor's average price will be $35.
   a. Forecast next year's sales.
   b. What will be the effect if the competitor lowers its price to $32? If it raises its price to $36?
   c. What will happen if OE reacts to the decrease mentioned in part *b* by lowering its price to $37?
   d. If the index forecast was wrong, and it turns out to be only 140 next year, what will be the effect on OE's sales?