

Using Software in Forecasting

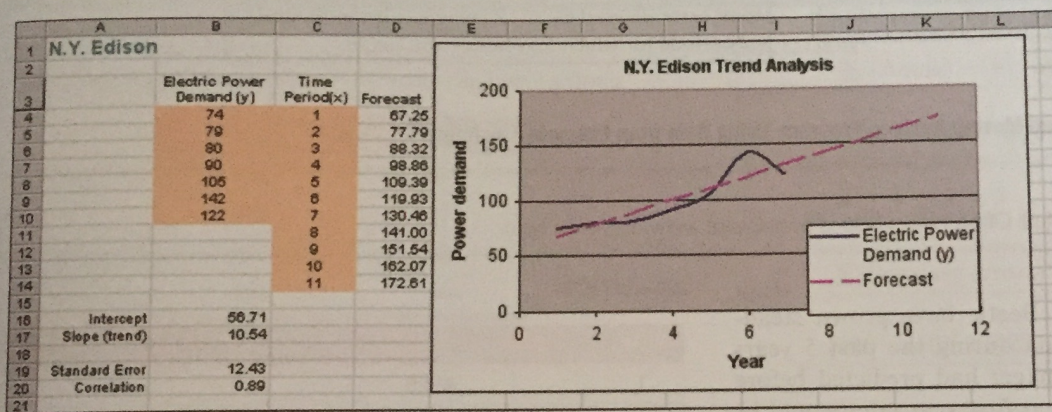
This section presents three ways to solve forecasting problems with computer software. First, you can create your own Excel spreadsheets to develop forecasts. Second, you can use the Excel OM software that comes with the text and is found on our text Web site. Third, POM for Windows is another program that is located on our Web site, at www.pearsonhighered.com/heizer.

CREATING YOUR OWN EXCEL SPREADSHEETS

Excel spreadsheets (and spreadsheets in general) are frequently used in forecasting. Exponential smoothing, trend analysis, and regression analysis (simple and multiple) are supported by built-in Excel functions.

Program 4.1 illustrates how to build an Excel forecast for the data in Example 8. The goal for N.Y. Edison is to create a trend analysis of the year 1 to year 7 data. Note that in cell D4 you can enter either $=\$B\$16 + \$B\$17 * C4$ or $=TREND(\$B\$4:\$B\$10, \$C\$4:\$C\$10, C4)$.

As an alternative, you may want to experiment with Excel's built-in regression analysis. To do so, under the **Data** menu bar selection choose **Data Analysis**, then **Regression**. Enter your *Y* and *X* data into two columns (say B and C). When the regression window appears, enter the *Y* and *X* ranges, then select **OK**. Excel offers several plots and tables to those interested in more rigorous analysis of regression problems.



Program 4.1

Using Excel to Develop Your Own Forecast, with Data from Example 8

COMPUTATIONS			
VALUE	CELL	EXCEL FORMULA	ACTION
Trend line column	D4	$=\$B\$16 + \$B\$17 * C4$ (or $=TREND(\$B\$4:\$B\$10, \$C\$4:\$C\$10, C4)$)	Copy to D5:D14
Intercept	B16	$=INTERCEPT(B4:B10, C4:C10)$	
Slope (trend)	B17	$=SLOPE(B4:B10, C4:C10)$	
Standard error	B19	$=STEYX(B4:B10, C4:C10)$	
Correlation	B20	$=CORREL(B4:B10, C4:C10)$	

✕ USING EXCEL OM

Excel OM's forecasting module has five components: (1) moving averages, (2) weighted moving averages, (3) exponential smoothing, (4) regression (with one variable only), and (5) decomposition. Excel OM's error analysis is much more complete than that available with the Excel add-in.

Program 4.2 illustrates Excel OM's input and output, using Example 2's weighted moving average data.

P USING POM FOR WINDOWS

POM for Windows can project moving averages (both simple and weighted), handle exponential smoothing (both simple and trend adjusted), forecast with least squares trend projection, and solve linear regression (associative) models. A summary screen of error analysis and a graph of the data can also be generated. As a special example of exponential smoothing adaptive forecasting, when using an α of 0, POM for Windows will find the α value that yields the minimum MAD.

Appendix IV provides further details.

Enter the weights to be placed on each of the last three periods at the top of column C. Weights must be entered from oldest to most recent.

	A	B	C	D	E
1	Donna's Garden Supply				
2					
3	Forecasting				
4					
5					
6	Data				
7	Period	Demand	Weights		
8	Jan	10	1		
9	Feb	12	2		
10	Mar	13	3		
11	Apr	16			
12	May	19			
13	June	23			
14	July	26			
15	Aug	30			
16	Sept	28			
17	Oct	18			
18	Nov	16			
19	Dec	14			
20					
21					
22					
23					
24	Next period	15.333333			
25					

= SUMPRODUCT(B17:B19, \$C\$8:\$C\$10)/SUM(\$C\$8:\$C\$10)

Forecast is the weighted sum of past sales (SUMPRODUCT) divided by the sum of the weights (SUM) because weights do not sum to 1.

Error analysis					
Forecast	Error	Absolute	Squared	Abs Pct Err	
12.16667	3.833333	3.833333	14.69444	0.2395833	
14.33333	4.666667	4.666667	21.77778	0.245614	
17	6	6	36	0.2608696	
20.5	5.5	5.5	30.25	0.2115385	
23.83333	6.166667	6.166667	38.02778	0.2055556	
27.5	0.5	0.5	0.25	0.0178571	
28.33333	-10.3333	10.33333	106.7778	0.5740741	
23.33333	-7.33333	7.333333	53.77778	0.4583333	
18.66667	-4.66667	4.666667	21.77778	0.3333333	
Total	4.333333	49	323.3333	2.5467588	
Average	0.481481	5.444444	35.92593	0.2829732	
	Bias	MAD	MSE	MAPE	
			SE	6.796358	

Error (B11 – E11) is the difference between the demand and the forecast.

= AVERAGE(H11: H19)

The standard error is given by the square root of the total error divided by $n - 2$, where n is the number of periods for which forecasts exist, i.e., 9.

Program 4.2

Analysis of Excel OM's Weighted Moving Average Program, Using Data from Example 2 as Input

Solved Problems

Virtual Office Hours help is available at www.myomlab.com.

SOLVED PROBLEM 4.1

Sales of Volkswagen's popular Beetle have grown stead-

SOLUTION

Winter	.8
Spring	1.1
Summer	1.4
Fall	.7

Forecast energy use for the four quarters of year 25 (namely quarters 101 to 104), beginning with winter.

- **4.30** Lori Cook has developed the following forecasting model:

$$\hat{y} = 36 + 4.3x$$

where $\hat{y}$ = demand for Kool Air conditioners and
 x = the outside temperature (°F) **Px**

- Forecast demand for the Kool Air when the temperature is 70°F.
- What is demand when the temperature is 80°F?
- What is demand when the temperature is 90°F? **Px**

d) What is the value of the coefficient of determination in this problem? **Px**

- **4.36** Accountants at the Tucson firm, Larry Youdelman, CPAs, believed that several traveling executives were submitting unusually high travel vouchers when they returned from business trips. First, they took a sample of 200 vouchers submitted from the past year. Then they developed the following multiple-regression equation relating expected travel cost to number of days on the road (x_1) and distance traveled (x_2) in miles:

$$\hat{y} = \$90.00 + \$48.50x_1 + \$.40x_2$$

The coefficient of correlation computed was .68.

- If Donna Battista returns from a 300-mile trip that took her out of town for 5 days, what is the expected amount she should claim as expenses?
- Battista submitted a reimbursement request for \$685. What should the accountant do?
- Should any other variables be included? Which ones? Why? **Px**

- **4.37** Sales of tablet computers at Ted Glickman's electronics store in Washington, D.C., over the past 10 weeks are shown

- The least-squares regression equation.
- Using the results of part (a), find the estimated sales tax collections if new car registrations total 22,000.
- The coefficients of correlation and determination. **Px**

•• **4.39** Dr. Lillian Fok, a New Orleans psychologist, specializes in treating patients who are agoraphobic (i.e., afraid to leave their homes). The following table indicates how many patients Dr. Fok has seen each year for the past 10 years. It also indicates what the robbery rate was in New Orleans during the same year:

YEAR	1	2	3	4	5	6	7	8	9	10
NUMBER OF PATIENTS	36	33	40	41	40	55	60	54	58	61
ROBBERY RATE PER 1,000 POPULATION	58.3	61.1	73.4	75.7	81.1	89.0	101.1	94.8	103.3	116.2

Using trend (linear regression) analysis, predict the number of patients Dr. Fok will see in years 11 and 12 as a function of time. How well does the model fit the data? **Px**

•• **4.40** Using the data in Problem 4.39, apply linear regression to study the relationship between the robbery rate and Dr.