PEARSON NEW INTERNATIONAL EDITION

Business Forecasting

John E. Hanke Dean Wichern

Ninth Edition

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TABLE P-6 Capital Spending ($ billions), 1977–1993

Year	*$Billions*	*Year*	*$Billions*	*Year*	*$Billions*
1977	214	1983	357	1989	571
1978	259	1984	416	1990	578
1979	303	1985	443	1991	556
1980	323	1986	437	1992	566
1981	369	1987	443	1993	623
1982	367	1988	545	1994	680[a]

[a] Value Line estimate.

Source: The Value Line Investment Survey (New York: Value Line, 1988, 1990, 1994).

c. What has the average increase in capital spending per year been since 1977?
d. Estimate the trend value for capital spending in 1994.
e. Compare your trend estimate with Value Line's.
f. What factor(s) influence the trend of capital spending?

7. A large company is considering cutting back on its TV advertising in favor of business videos to be given to its customers. This action is being considered after the company president read a recent article in the popular press touting business videos as today's "hot sales weapon." One thing the president would like to investigate prior to taking this action is the history of TV advertising in this country, especially the trend-cycle.

   Table P-7 contains the total dollars spent on U.S. TV advertising (in millions of dollars).

   a. Plot the time series of U.S. TV advertising expenditures.
   b. Fit a linear trend to the advertising data and plot the fitted line on the time series graph.
   c. Forecast TV advertising dollars for 1998.
   d. Given the results in part b, do you think there may be a cyclical component in TV advertising dollars? Explain.

8. Assume the following specific percentage seasonal indexes for March based on the ratio-to-moving-average method:

   102.2 105.9 114.3 122.4 109.8 98.9

   What is the seasonal index for March using the median?

TABLE P-7

Year	*Y*	*Year*	*Y*
			26,891
			29,073
			28,189
			30,450
			31,698
			35,435
			37,828
			42,484
			44,580

9. The expected trend value for October is $850. Assuming an October seasonal index of 1.12 (112%) and the multiplicative model given by Equation 2, what would be the forecast for October?

10. The following specific percentage seasonal indexes are given for the month of December:

    75.4 86.8 96.9 72.6 80.0 85.4

    Assume a multiplicative decomposition model. If the expected trend for December is $900 and the median seasonal adjustment is used, what is the forecast for December?

11. A large resort near Portland, Maine, has been tracking its monthly sales for several years but has never analyzed these data. The resort computes the seasonal indexes for its monthly sales. Which of the following statements about the index are correct?
    a. The sum of the 12 monthly index numbers, expressed as percentages, should be 1,200.
    b. An index of 85 for May indicates that sales are 15% lower than the average monthly sales.
    c. An index of 130 for January indicates that sales are 30% above the average monthly sales.
    d. The index for any month must be between zero and 200.
    e. The average percent index for each of the 12 months should be 100.

12. In preparing a report for June Bancock, manager of the Kula Department Store, you include the statistics from last year's sales (in thousands of dollars) shown in Table P-12. Upon seeing them, Ms. Bancock says, "This report confirms what I've been telling you: Business is getting better and better." Is this statement accurate? Why or why not?

13. The quarterly sales levels (measured in millions of dollars) for Goodyear Tire are shown in Table P-13. Does there appear to be a significant seasonal effect in these sales levels? Analyze this time series to get the four seasonal indexes and determine the extent of the seasonal component in Goodyear's sales.

TABLE P-12

Month	*Sales ($1,000s)*	*Adjusted Seasonal Index (%)*
January	125	51
February	113	50
March	189	87
April	201	93
May	206	95
June	241	99
July	230	96
August	245	89
September	271	103
October	291	120
November	320	131
December	419	189

Source: Based on Kula Department Store records.

TABLE P-13

	Quarter			
Year	***1***	***2***	***3***	***4***
1985	2,292	2,450	2,363	2,477
1986	2,063	2,358	2,316	2,366
1987	2,268	2,533	2,479	2,625
1988	2,616	2,793	2,656	2,746
1989	2,643	2,811	2,679	2,736
1990	2,692	2,871	2,900	2,811
1991	2,497	2,792	2,838	2,780
1992	2,778	3,066	3,213	2,928
1993	2,874	3,000	2,913	2,916
1994	2,910	3,052	3,116	3,210
1995	3,243	3,351	3,305	3,267
1996	3,246	3,330	3,340[a]	3,300[a]

[a]Value Line estimates.

Source: The Value Line Investment Survey (New York: Value Line, 1988, 1989, 1993, 1994, 1996).

a. Would you use the trend component, the seasonal component, or both to forecast?
b. Forecast for third and fourth quarters of 1996.
c. Compare your forecasts to Value Line's.

14. The monthly sales of the Cavanaugh Company, pictured in Figure 1 (bottom), are given in Table P-14.
    a. Perform a multiplicative decomposition of the Cavanaugh Company sales time series, assuming trend, seasonal, and irregular components.
    b. Would you use the trend component, the seasonal component, or both to forecast?
    c. Provide forecasts for the rest of 2006.
15. Construct a table similar to Table P-14 with the natural logarithms of monthly sales. For example, the value for January 2000 is $\ln(154) = 5.037$.
    a. Perform an additive decomposition of ln(sales), assuming the model

$$Y = T + S + I.$$

TABLE P-14

Month	***2000***	***2001***	***2002***	***2003***	***2004***	***2005***	***2006***
January	154	200	223	346	518	613	628
February	96	118	104	261	404	392	308
March	73	90	107	224	300	273	324
April	49	79	85	141	210	322	248
May	36	78	75	148	196	189	272
June	59	91	99	145	186	257	
July	95	167	135	223	247	324	
August	169	169	211	272	343	404	
September	210	289	335	445	464	677	
October	278	347	460	560	680	858	
November	298	375	488	612	711	895	
December	245	203	326	467	610	664	

b. Would you use the trend component, the seasonal component, or both to forecast?
c. Provide forecasts of ln(sales) for the remaining months of 2006.
d. Take the antilogs of the forecasts calculated in part c to get forecasts of the actual sales for the remainder of 2006.
e. Compare the forecasts in part d with those in Problem 14, part c. Which set of forecasts do you prefer? Why?

16. Table P-16 contains the quarterly sales (in millions of dollars) for the Disney Company from the first quarter of 1980 to the third quarter of 1995.
    a. Perform a multiplicative decomposition of the time series consisting of Disney's quarterly sales.
    b. Does there appear to be a significant trend? Discuss the nature of the seasonal component.
    c. Would you use both trend and seasonal components to forecast?
    d. Forecast sales for the fourth quarter of 1995 and the four quarters of 1996.

17. The monthly gasoline demand (in thousands of barrels/day) for Yukong Oil Company of South Korea for the period from January 1986 to September 1996 is contained in Table P-17.
    a. Plot the gasoline demand time series. Do you think an additive or a multiplicative decomposition would be appropriate for this time series? Explain.
    b. Perform a decomposition analysis of gasoline demand.
    c. Interpret the seasonal indexes.
    d. Forecast gasoline demand for the last three months of 1996.

18. Table P-18 contains data values that represent the monthly sales (in billions of dollars) of all retail stores in the United States. Using the data through 1994, perform a decomposition analysis of this series. Comment on all three components of the series. Forecast retail sales for 1995 and compare your results with the actual values provided in the table.

TABLE P-16

	Quarter			
Year	***1***	***2***	***3***	***4***
1980	218.1	245.4	265.5	203.5
1981	235.1	258.0	308.4	211.8
1982	247.7	275.8	295.0	270.1
1983	315.7	358.5	363.0	302.2
1984	407.3	483.3	463.2	426.5
1985	451.5	546.9	590.4	504.2
1986	592.4	647.9	726.4	755.5
1987	766.4	819.4	630.1	734.6
1988	774.5	915.7	1,013.4	1,043.6
1989	1,037.9	1,167.6	1,345.1	1,288.2
1990	1,303.8	1,539.5	1,712.2	1,492.4
1991	1,439.0	1,511.6	1,739.4	1,936.6
1992	1,655.1	1,853.5	2,079.1	2,391.4
1993	2,026.5	1,936.8	2,174.5	2,727.3
1994	2,275.8	2,353.6	2,698.4	3,301.7
1995	2,922.8	2,764.0	3,123.6	

TABLE P-17

Month	*1986*	*1987*	*1988*	*1989*	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*
January	15.5	20.4	26.9	36.0	52.1	64.4	82.3	102.7	122.2	145.8	170.0
February	17.8	20.8	29.4	39.0	53.1	68.1	83.6	102.2	121.4	144.4	176.3
March	18.1	22.2	29.9	42.2	56.5	68.5	85.5	104.7	125.6	145.2	174.2
April	20.5	24.1	32.4	44.3	58.4	72.3	91.0	108.9	129.7	148.6	176.1
May	21.3	25.5	33.3	46.6	61.7	74.1	92.1	112.2	133.6	153.7	185.3
June	19.8	25.9	34.5	46.1	61.0	77.6	95.8	109.7	137.5	157.9	182.7
July	20.5	26.1	34.8	48.5	65.5	79.9	98.3	113.5	143.0	169.7	197.0
August	22.3	27.5	39.1	52.6	71.0	86.7	102.2	120.4	149.0	184.2	216.1
September	22.9	25.8	39.0	52.2	68.1	84.4	101.5	124.6	149.9	163.2	192.2
October	21.1	29.8	36.5	50.8	67.5	81.4	98.5	116.7	139.5	155.4	
November	22.0	27.4	37.5	51.9	68.8	85.1	101.1	120.6	147.7	168.9	
December	22.8	29.7	39.7	55.1	68.1	81.7	102.5	124.9	154.7	178.3	

TABLE P-18

Month	*1988*	*1989*	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*
January	113.6	122.5	132.6	130.9	142.1	148.4	154.6	167.0
February	115.0	118.9	127.3	128.6	143.1	145.0	155.8	164.0
March	131.6	141.3	148.3	149.3	154.7	164.6	184.2	192.1
April	130.9	139.8	145.0	148.5	159.1	170.3	181.8	187.5
May	136.0	150.3	154.1	159.8	165.8	176.1	187.2	201.4
June	137.5	149.0	153.5	153.9	164.6	175.7	190.1	202.6
July	134.1	144.6	148.9	154.6	166.0	177.7	185.8	194.9
August	138.7	153.0	157.4	159.9	166.3	177.1	193.8	204.2
September	131.9	144.1	145.6	146.7	160.6	171.1	185.9	192.8
October	133.8	142.3	151.5	152.1	168.7	176.4	189.7	194.0
November	140.2	148.8	156.1	155.6	167.2	180.9	194.7	202.4
December	171.0	176.5	179.7	181.0	204.1	218.3	233.3	238.0

Source: Based on *Survey of Current Business*, 1989, 1993, 1996.

TABLE P-19

Month	*Adjusted Seasonal Index*	*Month*	*Adjusted Seasonal Index*
January	120	July	153
February	137	August	151
March	100	September	95
April	33	October	60
May	47	November	82
June	125	December	97

Source: Based on Mt. Spokane Resort Hotel records.

19. The adjusted seasonal indexes presented in Table P-19 reflect the changing volume of business of the Mt. Spokane Resort Hotel, which caters to family tourists in the summer and skiing enthusiasts during the winter months. No sharp cyclical variations are expected during 2007.

TABLE P-24

		Sales Volume ($)	*Commodity Price Index (2001 = 100)*
2005	January	358,235	118.0
	February	297,485	118.4
	March	360,321	118.7
	April	378,904	119.2
	May	394,472	119.7
	June	312,589	119.6
	July	401,345	119.3

a. If 600 tourists were at the resort in January 2007, what is a reasonable estimate for February?
b. The monthly trend equation is $\hat{T} = 140 + 5t$ where $t = 0$ represents January 15, 2001. What is the forecast for each month of 2007?
c. What is the average number of new tourists per month?

20. Discuss the performance of the composite index of leading indicators as a barometer of business activity in recent years.

21. What is the present position of the business cycle? Is it expanding or contracting? When will the next turning point occur?

22. What is the purpose of deflating a time series that is measured in dollars?

23. In the base period of June, the price of a selected quantity of goods was $1,289.73. In the most recent month, the price index for these goods was 284.7. How much would the selected goods cost if purchased in the most recent month?

24. Deflate the dollar sales volumes in Table P-24 using the commodity price index. These indexes are for all commodities, with 2001 = 100.

25. Table P-25 contains the number (in thousands) of men 16 years of age and older who were employed in the United States for the months from January

TABLE P-25

Year	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May*	*Jun.*	*Jul.*	*Aug.*	*Sep.*	*Oct.*	*Nov.*	*Dec.*
1993	63,344	63,621	64,023	64,482	65,350	66,412	67,001	66,861	65,808	65,961	65,779	65,545
1994	64,434	64,564	64,936	65,492	66,340	67,230	67,649	67,717	66,997	67,424	67,313	67,292
1995	65,966	66,333	66,758	67,018	67,227	68,384	68,750	68,326	67,646	67,850	67,219	67,049
1996	66,006	66,481	66,961	67,415	68,258	69,298	69,819	69,533	68,614	69,099	68,565	68,434
1997	67,640	67,981	68,573	69,105	69,968	70,619	71,157	70,890	69,890	70,215	70,328	69,849
1998	68,932	69,197	69,506	70,348	70,856	71,618	72,049	71,537	70,866	71,219	71,256	70,930
1999	69,992	70,084	70,544	70,877	71,470	72,312	72,803	72,348	71,603	71,825	71,797	71,699
2000	71,862	72,177	72,501	73,006	73,236	74,267	74,420	74,352	73,391	73,616	73,497	73,338
2001	72,408	72,505	72,725	73,155	73,313	74,007	74,579	73,714	73,483	73,228	72,690	72,547
2002	71,285	71,792	71,956	72,483	73,230	73,747	74,210	73,870	73,596	73,513	72,718	72,437
2003	71,716	72,237	72,304	72,905	73,131	73,894	74,269	74,032	73,715	73,979		

Source: Based on Labor force statistics from the Current Population Survey.