Managerial Economics in a Global Economy, 5th Edition by Dominick Salvatore

Chapter 5

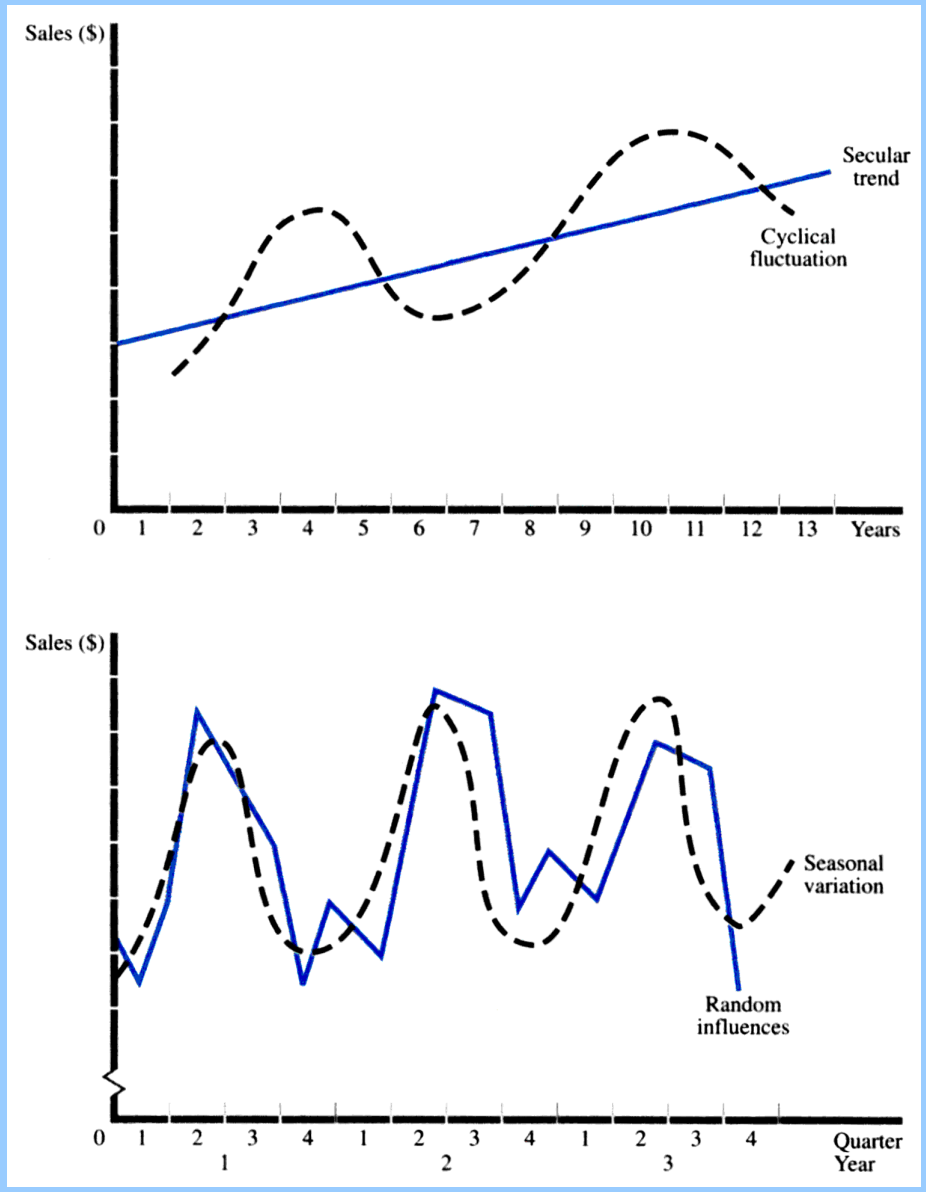
Demand Forecasting

Qualitative Forecasts

- Survey Techniques
  - Planned Plant and Equipment Spending
  - Expected Sales and Inventory Changes
  - Consumers' Expenditure Plans
- Opinion Polls
  - Business Executives
  - Sales Force
  - Consumer Intentions

Time-Series Analysis

- Secular Trend
  - Long-Run Increase or Decrease in Data
- Cyclical Fluctuations
  - Long-Run Cycles of Expansion and Contraction
- Seasonal Variation
  - Regularly Occurring Fluctuations
- Irregular or Random Influences



Trend Projection

- Linear Trend:
  $S_t = S_0 + b\,t$
  b = Growth per time period
- Constant Growth Rate
  $S_t = S_0 (1 + g)^t$
  g = Growth rate
- Estimation of Growth Rate
  $\ln S_t = \ln S_0 + t \ln(1 + g)$

Seasonal Variation

Ratio to Trend Method

$$\text{Ratio} = \frac{\text{Actual}}{\text{Trend Forecast}}$$

$$\text{Seasonal Adjustment} = \text{Average of Ratios for Each Seasonal Period}$$

$$\text{Adjusted Forecast} = \text{Trend Forecast} \bullet \text{Seasonal Adjustment}$$

Seasonal Variation

Ratio to Trend Method: Example Calculation for Quarter 1

Trend Forecast for 1996.1 = 11.90 + (0.394)(17) = 18.60

Seasonally Adjusted Forecast for 1996.1 = (18.60)(0.8869) = 16.50

Year	Trend Forecast	Actual	Ratio
1992.1	12.29	11.00	0.8950
1993.1	13.87	12.00	0.8652
1994.1	15.45	14.00	0.9061
1995.1	17.02	15.00	0.8813
Seasonal Adjustment =			0.8869

Moving Average Forecasts

Forecast is the average of data from *w* periods prior to the forecast data point.

$$F_t = \sum_{i=1}^{w} \frac{A_{t-i}}{w}$$

Exponential Smoothing Forecasts

Forecast is the weighted average of of the forecast and the actual value from the prior period.

$$F_{t+1} = wA_t + (1-w)F_t$$

$$0 \le w \le 1$$

Root Mean Square Error

Measures the Accuracy
of a Forecasting Method

$$RMSE = \sqrt{\frac{\sum (A_t - F_t)^2}{n}}$$

Barometric Methods

- National Bureau of Economic Research
- Department of Commerce
- Leading Indicators
- Lagging Indicators
- Coincident Indicators
- Composite Index
- Diffusion Index

Econometric Models

Single Equation Model of the Demand For Cereal (Good X)

$$Q_X = a_0 + a_1P_X + a_2Y + a_3N + a_4P_S + a_5P_C + a_6A + e$$

Q_X = Quantity of X

P_X = Price of Good X

Y = Consumer Income

N = Size of Population

P_S = Price of Muffins

P_C = Price of Milk

A = Advertising

e = Random Error

Econometric Models

Multiple Equation Model of GNP

$$C_t = a_1 + b_1 GNP_t + u_{1t}$$

$$I_t = a_2 + b_2 \pi_{t-1} + u_{2t}$$

$$GNP_t \equiv C_t + I_t + G_t$$

Reduced Form Equation

$$GNP_t = \frac{a_1 + a_2}{1 - b_1} + \frac{b_2 \pi_{t-1}}{1} - b_1 + \frac{G_t}{1 - b_1}$$

Input-Output Forecasting

Three-Sector Input-Output Flow Table

	Producing Industry				
Supplying Industry	A	B	C	Final Demand	Total
A	20	60	30	90	200
B	80	90	20	110	300
C	40	30	10	20	100
Value Added	60	120	40		220
Total	200	300	100	220	

Input-Output Forecasting

Direct Requirements Matrix

$$\text{Direct Requirements} = \frac{\text{Input Requirements}}{\text{Column Total}}$$

	Producing Industry		
Supplying Industry	A	B	C
A	0.1	0.2	0.3
B	0.4	0.3	0.2
C	0.2	0.1	0.1

Input-Output Forecasting

Total Requirements Matrix

	Producing Industry		
Supplying Industry	A	B	C
A	1.47	0.51	0.60
B	0.96	1.81	0.72
C	0.43	0.31	1.33

Input-Output Forecasting

Total Requirements Matrix				Final Demand Vector		Total Demand Vector
1.47	0.51	0.60	•	90	=	200
0.96	1.81	0.72		110		300
0.43	0.31	1.33		20		100

Input-Output Forecasting

Revised Input-Output Flow Table

	Producing Industry				
Supplying Industry	A	B	C	Final Demand	Total
A	22	62	31	100	215
B	88	93	21	110	310
C	43	31	10	20	104

