7.11 SUMMARY OF LEARNING OBJECTIVES

1. **Understand the role of forecasting for both an enterprise and a supply chain.** Forecasting is a key driver of virtually every design and planning decision made in both an enterprise and a supply chain. Enterprises have always forecasted demand and used it to make decisions. A relatively recent phenomenon, however, is to create collaborative forecasts for an entire supply chain and use this as the basis for decisions. Collaborative forecasting greatly increases the accuracy of forecasts and allows the supply chain to maximize its performance. Without collaboration, supply chain stages farther down the demand chain will likely have poor forecasts that will lead to supply chain inefficiencies and a lack of responsiveness.

2. **Identify the components of a demand forecast.** Demand consists of a systematic and a random component. The systematic component measures the expected value of demand. The random component measures fluctuations in demand from the expected value. The systematic component consists of level, trend, and seasonality. Level measures the current deseasonalized demand. Trend measures the current rate of growth or decline in demand. Seasonality indicates predictable seasonal fluctuations in demand.

3. **Forecast demand in a supply chain given historical data using time-series methodologies.** Time-series methods for forecasting are categorized as static or adaptive. In static methods, the estimates of parameters and demand patterns are not updated as new demand is observed. Static methods include regression. In adaptive methods, the estimates are updated each time a new demand is observed. Adaptive methods include moving averages, simple exponential smoothing, Holt’s model, and Winter’s model. Moving averages and simple exponential smoothing are best used when demand displays no trend or seasonality. Holt’s model is best when demand displays a trend but no seasonality. Winter’s model is appropriate when demand displays both trend and seasonality.

4. **Analyze demand forecasts to estimate forecast error.** Forecast error measures the random component of demand. This measure is important because it reveals how inaccurate a forecast is likely to be and what contingencies a firm may have to plan for. The MAD and the MAPE are used to estimate the size of the forecast error. The bias and TS are used to estimate if the forecast consistently over- or underforecasts.

**Discussion Questions**

1. What role does forecasting play in the supply chain of a build-to-order manufacturer such as Dell?
2. How could Dell use collaborative forecasting with its suppliers to improve its supply chain?
3. What role does forecasting play in the supply chain of a mail order firm such as L.L. Bean?
4. What systematic and random components would you expect in demand for chocolates?
5. Why should a manager be suspicious if a forecaster claims to forecast historical demand without any forecast error?
6. Give examples of products that display seasonality of demand.
7. What is the problem if a manager uses last year's sales data instead of last year’s demand to forecast demand for the coming year?
8. How do static and adaptive forecasting methods differ?
9. What information does the MAD and MAPE provide to a manager? How can the manager use this information?
10. What information do the bias and TS provide to a manager? How can the manager use this information?

**Exercises**

1. Consider monthly demand for the ABC Corporation as shown in Table 7.3. Forecast the monthly demand for year 6 using the static method for forecasting. Evaluate the bias, TS, MAD, MAPE, and MSE. Evaluate the quality of the forecast.
2. Weekly demand at Hot Pizza are as follows:

<table>
<thead>
<tr>
<th>Week</th>
<th>Demand ($)</th>
<th>Week</th>
<th>Demand ($)</th>
<th>Week</th>
<th>Demand ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>108</td>
<td>5</td>
<td>96</td>
<td>9</td>
<td>112</td>
</tr>
<tr>
<td>2</td>
<td>116</td>
<td>6</td>
<td>119</td>
<td>10</td>
<td>102</td>
</tr>
<tr>
<td>3</td>
<td>118</td>
<td>7</td>
<td>96</td>
<td>11</td>
<td>92</td>
</tr>
<tr>
<td>4</td>
<td>124</td>
<td>8</td>
<td>102</td>
<td>12</td>
<td>91</td>
</tr>
</tbody>
</table>

Estimate demand for the next four weeks using a four-week moving average as well as simple exponential smoothing with $\alpha = 0.1$. Evaluate the MAD, MAPE, MSE, bias, and TS in each case. Which of the two methods do you prefer? Why?

3. Quarterly demand for flowers at a wholesaler are as follows:

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Demand ($000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>138</td>
</tr>
<tr>
<td>2</td>
<td>130</td>
</tr>
<tr>
<td>3</td>
<td>147</td>
</tr>
<tr>
<td>4</td>
<td>141</td>
</tr>
</tbody>
</table>

Forecast quarterly demand for year 5 using simple exponential smoothing with $\alpha = 0.1$ as well as Holt’s model with $\alpha = 0.1$ and $\beta = 0.1$. Which of the two methods do you prefer? Why?

4. Consider monthly demand for the ABC Corporation as shown in Table 7.3. Forecast the monthly demand for year 6 using moving average, simple exponential smoothing, Holt’s model, and Winter’s model. In each case, evaluate the bias, TS, MAD, MAPE, and MSE. Which forecasting method do you prefer? Why?

### Bibliography


