

Supply Chain Management, 6e (Chopra/Meindl)
Chapter 7 Demand Forecasting in a Supply Chain

7.1 True/False Questions

1) The forecast of demand forms the basis for all strategic and planning decisions in a supply chain.

Answer: TRUE

Diff: 2

Topic: 7.1 The Role of Forecasting in a Supply Chain

AACSB: Application of knowledge

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

2) For pull processes, a manager must forecast what customer demand will be in order to plan the level of available capacity and inventory.

Answer: TRUE

Diff: 2

Topic: 7.1 The Role of Forecasting in a Supply Chain

AACSB: Application of knowledge

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

3) The result when each stage in the supply chain makes its own separate forecast is often a match between supply and demand because these forecasts are often very different.

Answer: FALSE

Diff: 2

Topic: 7.1 The Role of Forecasting in a Supply Chain

AACSB: Application of knowledge

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

4) Leaders in many supply chains have started moving toward collaborative forecasting to improve their ability to match supply and demand.

Answer: TRUE

Diff: 2

Topic: 7.1 The Role of Forecasting in a Supply Chain

AACSB: Application of knowledge

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

5) Mature products with stable demand are usually the most difficult to forecast.

Answer: FALSE

Diff: 2

Topic: 7.1 The Role of Forecasting in a Supply Chain

AACSB: Application of knowledge

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

6) Forecasting and the accompanying managerial decisions are extremely difficult when either the supply of raw materials or the demand for the finished product is highly variable.

Answer: TRUE

Diff: 1

Topic: 7.1 The Role of Forecasting in a Supply Chain

AACSB: Analytical thinking

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

7) Forecasts should include both the expected value of the forecast and a measure of forecast error.

Answer: TRUE

Diff: 2

Topic: 7.1 The Role of Forecasting in a Supply Chain

AACSB: Application of knowledge

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

8) Aggregate forecasts are usually more accurate than disaggregate forecasts, as they tend to have a smaller standard deviation of error relative to the mean.

Answer: TRUE

Diff: 2

Topic: 7.1 The Role of Forecasting in a Supply Chain

AACSB: Analytical thinking

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

9) Collaborative forecasting based on sales to the end customer can help enterprises further up the supply chain reduce forecast error.

Answer: TRUE

Diff: 2

Topic: 7.1 The Role of Forecasting in a Supply Chain

AACSB: Application of knowledge

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

10) Qualitative forecasting methods are most appropriate when there is good historical data available or when experts do not have market intelligence that is critical in making the forecast.

Answer: FALSE

Diff: 2

Topic: 7.3 Components of a Forecast and Forecasting Methods

AACSB: Analytical thinking

Objective: LO 7.2: Identify the components of a demand forecast.

11) Time series forecasting methods are the most difficult methods to implement.

Answer: FALSE

Diff: 2

Topic: 7.3 Components of a Forecast and Forecasting Methods

AACSB: Application of knowledge

Objective: LO 7.2: Identify the components of a demand forecast.

12) Causal forecasting methods find a correlation between demand and environmental factors and use estimates of what environmental factors will be to forecast future demand.

Answer: TRUE

Diff: 2

Topic: 7.3 Components of a Forecast and Forecasting Methods

AACSB: Analytical thinking

Objective: LO 7.2: Identify the components of a demand forecast.

13) The *forecast error* measures the difference between the forecast and the estimate.

Answer: FALSE

Diff: 2

Topic: 7.3 Components of a Forecast and Forecasting Methods

AACSB: Analytical thinking

Objective: LO 7.2: Identify the components of a demand forecast.

14) The goal of any forecasting method is to predict the systematic component of demand and estimate the random component.

Answer: TRUE

Diff: 2

Topic: 7.5 Time-Series Forecasting Methods

AACSB: Analytical thinking

Objective: LO 7.3: Forecast demand in a supply chain given historical demand data using time-series methodologies.

15) In adaptive forecasting, the estimates of level, trend, and seasonality are updated after each demand observation.

Answer: TRUE

Diff: 2

Topic: 7.5 Time-Series Forecasting Methods

AACSB: Analytical thinking

Objective: LO 7.3: Forecast demand in a supply chain given historical demand data using time-series methodologies.

16) The moving average forecast method is used when demand has an observable trend or seasonality.

Answer: FALSE

Diff: 2

Topic: 7.5 Time-Series Forecasting Methods

AACSB: Analytical thinking

Objective: LO 7.3: Forecast demand in a supply chain given historical demand data using time-series methodologies.

17) Forecasting and the accompanying managerial decisions are extremely difficult when either the supply of raw materials or the demand for the finished product is highly unpredictable.

Answer: TRUE

Diff: 1

Topic: 7.1 The Role of Forecasting in a Supply Chain

AACSB: Application of knowledge

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

18) Long-term forecasts have a larger standard deviation of error relative to the mean than short-term forecasts.

Answer: TRUE

Diff: 1

Topic: 7.2 Characteristics of Forecasts

AACSB: Analytical thinking

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

7.2 Multiple Choice Questions

1) The basis for all strategic and planning decisions in a supply chain comes from

A) the forecast of demand.

B) sales targets.

C) profitability projections.

D) production efficiency goals.

Answer: A

Diff: 1

Topic: 7.1 The Role of Forecasting in a Supply Chain

AACSB: Application of knowledge

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

2) For push processes, a manager must forecast what customer demand will be in order to

A) plan the service level.

B) plan the level of available capacity and inventory.

C) plan the level of productivity.

D) plan the level of production.

Answer: D

Diff: 2

Topic: 7.1 The Role of Forecasting in a Supply Chain

AACSB: Application of knowledge

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

3) The result of each stage in the supply chain making its own separate forecast is

- A) an accurate forecast.
- B) a more accurate forecast.
- C) a match between supply and demand.
- D) a mismatch between supply and demand.

Answer: D

Diff: 2

Topic: 7.1 The Role of Forecasting in a Supply Chain

AACSB: Application of knowledge

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

4) When all stages of a supply chain produce a collaborative forecast, it tends to be

- A) much more detailed.
- B) much more complex.
- C) much more accurate.
- D) much more flexible.

Answer: C

Diff: 2

Topic: 7.1 The Role of Forecasting in a Supply Chain

AACSB: Application of knowledge

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

5) The resulting accuracy of a collaborative forecast enables supply chains to be

- A) more responsive but less efficient in serving their customers.
- B) both more responsive and more efficient in serving their customers.
- C) less responsive but less efficient in serving their customers.
- D) both less responsive and less efficient in serving their customers.

Answer: B

Diff: 2

Topic: 7.1 The Role of Forecasting in a Supply Chain

AACSB: Application of knowledge

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

6) Leaders in many supply chains have started moving

- A) toward independent forecasting to improve their ability to match supply and demand.
- B) toward consecutive forecasting to improve their ability to match supply and demand.
- C) toward sequential forecasting to improve their ability to match supply and demand.
- D) toward collaborative forecasting to improve their ability to match supply and demand.

Answer: D

Diff: 2

Topic: 7.1 The Role of Forecasting in a Supply Chain

AACSB: Application of knowledge

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

7) Production can utilize forecasts to make decisions concerning

- A) scheduling.
- B) sales-force allocation.
- C) promotions.
- D) budgetary planning.

Answer: A

Diff: 2

Topic: 7.1 The Role of Forecasting in a Supply Chain

AACSB: Application of knowledge

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

8) Personnel can utilize forecasts to make decisions concerning

- A) scheduling.
- B) promotions.
- C) plant/equipment investment.
- D) purchasing.

Answer: B

Diff: 2

Topic: 7.1 The Role of Forecasting in a Supply Chain

AACSB: Application of knowledge

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

9) Mature products with stable demand

- A) are usually easiest to forecast.
- B) are usually hardest to forecast.
- C) cannot be forecast.
- D) do not need to be forecast.

Answer: A

Diff: 1

Topic: 7.1 The Role of Forecasting in a Supply Chain

AACSB: Application of knowledge

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

10) When either the supply of raw materials or the demand for the finished product is highly variable, forecasting and the accompanying managerial decisions

- A) are extremely simple.
- B) are relatively straightforward.
- C) are extremely difficult.
- D) should not be attempted.

Answer: C

Diff: 1

Topic: 7.1 The Role of Forecasting in a Supply Chain

AACSB: Application of knowledge

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

11) One of the characteristics of forecasts is

- A) aggregate forecasts are usually less accurate than disaggregate forecasts.
- B) disaggregate forecasts are usually more accurate than aggregate forecasts.
- C) short-term forecasts are usually less accurate than long-term forecasts.
- D) long-term forecasts are usually less accurate than short-term forecasts.

Answer: D

Diff: 2

Topic: 7.2 Characteristics of Forecasts

AACSB: Application of knowledge

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

12) One of the characteristics of forecasts is

- A) aggregate forecasts are usually more accurate than disaggregate forecasts.
- B) disaggregate forecasts are usually more accurate than aggregate forecasts.
- C) short-term forecasts are usually less accurate than long-term forecasts.
- D) long-term forecasts are usually more accurate than short-term forecasts.

Answer: A

Diff: 2

Topic: 7.2 Characteristics of Forecasts

AACSB: Application of knowledge

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

13) Forecasts are always wrong and therefore

- A) should include both the expected value of the forecast and a measure of forecast error.
- B) should not include both the expected value of the forecast and a measure of forecast error.
- C) should only be used when there are no accurate estimates.
- D) should be missing the expected value of the forecast and a measure of forecast error.

Answer: A

Diff: 1

Topic: 7.2 Characteristics of Forecasts

AACSB: Application of knowledge

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

14) Long-term forecasts are usually less accurate than short-term forecasts because

- A) short-term forecasts have a larger standard deviation of error relative to the mean than long-term forecasts.
- B) short-term forecasts have more standard deviation of error relative to the mean than long-term forecasts.
- C) long-term forecasts have a smaller standard deviation of error relative to the mean than short-term forecasts.
- D) long-term forecasts have a larger standard deviation of error relative to the mean than short-term forecasts.

Answer: D

Diff: 2

Topic: 7.2 Characteristics of Forecasts

AACSB: Analytical thinking

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

- 15) Aggregate forecasts are usually more accurate than disaggregate forecasts because
- A) aggregate forecasts tend to have a larger standard deviation of error relative to the mean.
 - B) aggregate forecasts tend to have a smaller standard deviation of error relative to the mean.
 - C) disaggregate forecasts tend to have a smaller standard deviation of error relative to the mean.
 - D) disaggregate forecasts tend to have less standard deviation of error relative to the mean.

Answer: B

Diff: 1

Topic: 7.2 Characteristics of Forecasts

AACSB: Analytical thinking

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

- 16) In general, the further up the supply chain a company is (or the further they are from the consumer),

- A) the greater the distortion of information they receive.
- B) the smaller the distortion of information they receive.
- C) the information they receive is more accurate.
- D) the information they receive is more useful.

Answer: A

Diff: 2

Topic: 7.2 Characteristics of Forecasts

AACSB: Application of knowledge

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

- 17) Forecasting methods that use historical demand to make a forecast are known as

- A) qualitative forecasting methods.
- B) time series forecasting methods.
- C) causal forecasting methods.
- D) simulation forecasting methods.

Answer: B

Diff: 2

Topic: 7.3 Components of a Forecast and Forecasting Methods

AACSB: Application of knowledge

Objective: LO 7.2: Identify the components of a demand forecast.

- 18) Forecasting methods that assume that the demand forecast is highly correlated with certain factors in the environment (e.g., the state of the economy, interest rates, etc.) to make a forecast are known as

- A) qualitative forecasting methods.
- B) time series forecasting methods.
- C) causal forecasting methods.
- D) simulation forecasting methods.

Answer: C

Diff: 2

Topic: 7.3 Components of a Forecast and Forecasting Methods

AACSB: Application of knowledge

Objective: LO 7.2: Identify the components of a demand forecast.

19) Forecasting methods that imitate the consumer choices that give rise to demand to arrive at a forecast are known as

- A) qualitative forecasting methods.
- B) time series forecasting methods.
- C) causal forecasting methods.
- D) simulation forecasting methods.

Answer: D

Diff: 2

Topic: 7.3 Components of a Forecast and Forecasting Methods

AACSB: Application of knowledge

Objective: LO 7.2: Identify the components of a demand forecast.

20) Qualitative forecasting methods are most appropriate when

- A) there is good historical data available.
- B) there is little historical data available.
- C) experts do not have critical market intelligence.
- D) forecasting demand into the near future.

Answer: B

Diff: 2

Topic: 7.3 Components of a Forecast and Forecasting Methods

AACSB: Application of knowledge

Objective: LO 7.2: Identify the components of a demand forecast.

21) Which forecasting methods are the simplest to implement and can serve as a good starting point for a demand forecast?

- A) Qualitative forecasting methods
- B) Time series forecasting methods
- C) Causal forecasting methods
- D) Simulation forecasting methods

Answer: B

Diff: 2

Topic: 7.3 Components of a Forecast and Forecasting Methods

AACSB: Application of knowledge

Objective: LO 7.2: Identify the components of a demand forecast.

22) The goal of any forecasting method is to

- A) predict the random component of demand and estimate the systematic component.
- B) predict the systematic component of demand and estimate the random component.
- C) predict the seasonal component of demand and estimate the random component.
- D) predict the random component of demand and estimate the seasonal component.

Answer: B

Diff: 2

Topic: 7.3 Components of a Forecast and Forecasting Methods

AACSB: Application of knowledge

Objective: LO 7.2: Identify the components of a demand forecast.

23) _____ forecasting methods assume that the demand forecast is highly correlated with certain factors in the environment (the state of the economy, interest rates, etc.).

- A) Qualitative
- B) Time-series
- C) Causal
- D) Simulation

Answer: C

Diff: 2

Topic: 7.3 Components of a Forecast and Forecasting Methods

AACSB: Analytical thinking

Objective: LO 7.2: Identify the components of a demand forecast.

24) _____ forecasting methods are primarily subjective and rely on human judgment.

- A) Qualitative
- B) Time-series
- C) Causal
- D) Simulation

Answer: A

Diff: 2

Topic: 7.3 Components of a Forecast and Forecasting Methods

AACSB: Application of knowledge

Objective: LO 7.2: Identify the components of a demand forecast.

25) _____ forecasting methods use historical demand to make a forecast.

- A) Qualitative
- B) Time-series
- C) Causal
- D) Simulation

Answer: B

Diff: 2

Topic: 7.3 Components of a Forecast and Forecasting Methods

AACSB: Application of knowledge

Objective: LO 7.2: Identify the components of a demand forecast.

26) The multiplicative form of the systematic component of demand is shown as

- A) $\text{level} \times \text{trend} \times \text{seasonal factor}$.
- B) $\text{level} + \text{trend} + \text{seasonal factor}$.
- C) $(\text{level} + \text{trend}) \times \text{seasonal factor}$.
- D) $\text{level} \times (\text{trend} + \text{seasonal factor})$.

Answer: A

Diff: 1

Topic: 7.5 Time-Series Forecasting Methods

AACSB: Analytical thinking

Objective: LO 7.3: Forecast demand in a supply chain given historical demand data using time-series methodologies.

27) The additive form of the systematic component of demand is shown as

- A) $\text{level} \times \text{trend} \times \text{seasonal factor}$.
- B) $\text{level} + \text{trend} + \text{seasonal factor}$.
- C) $(\text{level} + \text{trend}) \times \text{seasonal factor}$.
- D) $\text{level} \times (\text{trend} + \text{seasonal factor})$.

Answer: B

Diff: 1

Topic: 7.5 Time-Series Forecasting Methods

AACSB: Analytical thinking

Objective: LO 7.3: Forecast demand in a supply chain given historical demand data using time-series methodologies.

28) The mixed form of the systematic component of demand is shown as

- A) $\text{level} \times \text{trend} \times \text{seasonal factor}$.
- B) $\text{level} + \text{trend} + \text{seasonal factor}$.
- C) $(\text{level} + \text{trend}) \times \text{seasonal factor}$.
- D) $\text{level} \times (\text{trend} + \text{seasonal factor})$.

Answer: C

Diff: 3

Topic: 7.5 Time-Series Forecasting Methods

AACSB: Analytical thinking

Objective: LO 7.3: Forecast demand in a supply chain given historical demand data using time-series methodologies.

29) A static method of forecasting

- A) assumes that the estimates of level, trend, and seasonality within the systematic component do not vary as new demand is observed.
- B) assumes that the estimates of level, trend, and seasonality within the systematic component vary as new demand is observed.
- C) the estimates of level, trend, and seasonality are updated after each demand observation.
- D) All of the above are true.

Answer: A

Diff: 1

Topic: 7.5 Time-Series Forecasting Methods

AACSB: Analytical thinking

Objective: LO 7.3: Forecast demand in a supply chain given historical demand data using time-series methodologies.

30) In adaptive forecasting,

- A) there is an assumption that the estimates of level, trend, and seasonality within the systematic component do not vary as new demand is observed.
- B) the estimates of level, trend, and seasonality within the systematic component are not adjusted as new demand is observed.
- C) the estimates of level, trend, and seasonality are updated after each demand observation.
- D) All of the above are true.

Answer: C

Diff: 1

Topic: 7.5 Time-Series Forecasting Methods

AACSB: Analytical thinking

Objective: LO 7.3: Forecast demand in a supply chain given historical demand data using time-series methodologies.

31) The moving average forecast method is used when

- A) demand has observable trend or seasonality.
- B) demand has no observable trend or seasonality.
- C) demand has observable trend and seasonality.
- D) demand has no observable level or seasonality.

Answer: B

Diff: 2

Topic: 7.5 Time-Series Forecasting Methods

AACSB: Analytical thinking

Objective: LO 7.3: Forecast demand in a supply chain given historical demand data using time-series methodologies.

32) The simple exponential smoothing forecast method is appropriate when

- A) demand has observable trend or seasonality.
- B) demand has no observable trend or seasonality.
- C) demand has observable trend and seasonality.
- D) demand has no observable level or seasonality.

Answer: B

Diff: 2

Topic: 7.5 Time-Series Forecasting Methods

AACSB: Analytical thinking

Objective: LO 7.3: Forecast demand in a supply chain given historical demand data using time-series methodologies.

33) The trend corrected exponential smoothing (Holt's Model) forecast method is appropriate when

- A) demand has observable trend or seasonality.
- B) demand has no observable trend or seasonality.
- C) demand has observable trend but no seasonality.
- D) demand has no observable level or seasonality.

Answer: C

Diff: 2

Topic: 7.5 Time-Series Forecasting Methods

AACSB: Analytical thinking

Objective: LO 7.3: Forecast demand in a supply chain given historical demand data using time-series methodologies.

Scenario 7.1 - Marshmallow Madness

Historical demand for Peeps is as displayed in the table.

Month	Demand
January	11
February	18
March	31
April	39
May	44
June	53
July	67
August	82
September	96

34) Use a simple moving average of three periods to forecast the demand for July. What is the forecast?

- A) 67
- B) 58
- C) 48.5
- D) 45.3

Answer: D

Diff: 2

Topic: 7.5 Time-Series Forecasting Methods

AACSB: Analytical thinking

Objective: LO 7.3: Forecast demand in a supply chain given historical demand data using time-series methodologies.

35) Use exponential smoothing to forecast the demand for March. What is the forecast if $\alpha = 0.7$?

- A) 27.5
- B) 31.25
- C) 28.75
- D) 29.25

Answer: A

Diff: 2

Topic: 7.5 Time-Series Forecasting Methods

AACSB: Analytical thinking

Objective: LO 7.3: Forecast demand in a supply chain given historical demand data using time-series methodologies.

36) What is the trend component of Holt's model for period 0?

- A) -2.5
- B) 10.3
- C) 2.5
- D) 6.4

Answer: B

Diff: 3

Topic: 7.5 Time-Series Forecasting Methods

AACSB: Analytical thinking

Objective: LO 7.3: Forecast demand in a supply chain given historical demand data using time-series methodologies.

37) What is the level component of Holt's model for period 0?

- A) -2.5
- B) 10.3
- C) 2.5
- D) 6.4

Answer: A

Diff: 3

Topic: 7.5 Time-Series Forecasting Methods

AACSB: Analytical thinking

Objective: LO 7.3: Forecast demand in a supply chain given historical demand data using time-series methodologies.

38) What is the level component of Holt's model for period 0?

- A) -2.5
- B) 10.3
- C) 2.5
- D) 6.4

Answer: A

Diff: 3

Topic: 7.5 Time-Series Forecasting Methods

AACSB: Analytical thinking

Objective: LO 7.3: Forecast demand in a supply chain given historical demand data using time-series methodologies.

39) The measure of forecast error where the amount of error of each forecast is squared and then an average is calculated is

- A) mean squared error (MSE).
- B) mean absolute deviation (MAD).
- C) mean absolute percentage error (MAPE).
- D) the tracking signal.

Answer: A

Diff: 2

Topic: 7.6 Measures of Forecast Error

AACSB: Analytical thinking

Objective: LO 7.4: Analyze demand forecasts to estimate forecast error.

40) The measure of forecast error where the absolute amount of error of each forecast is averaged is

- A) mean squared error (MSE).
- B) mean absolute deviation (MAD).
- C) mean absolute percentage error (MAPE).
- D) bias.

Answer: B

Diff: 2

Topic: 7.6 Measures of Forecast Error

AACSB: Analytical thinking

Objective: LO 7.4: Analyze demand forecasts to estimate forecast error.

41) The measure of forecast error where the average absolute error of each forecast is shown as a percentage of demand is

- A) mean squared error (MSE).
- B) mean absolute percentage error (MAPE).
- C) bias.
- D) the tracking signal.

Answer: B

Diff: 3

Topic: 7.6 Measures of Forecast Error

AACSB: Analytical thinking

Objective: LO 7.4: Analyze demand forecasts to estimate forecast error.

42) The measure of whether a forecast method consistently over- or underestimates demand is

- A) mean absolute deviation (MAD).
- B) mean absolute percentage error (MAPE).
- C) bias.
- D) the tracking signal.

Answer: C

Diff: 2

Topic: 7.6 Measures of Forecast Error

AACSB: Analytical thinking

Objective: LO 7.4: Analyze demand forecasts to estimate forecast error.

43) The measure of how significantly a forecast method consistently over- or underestimates demand is

- A) mean squared error (MSE).
- B) mean absolute deviation (MAD).
- C) bias.
- D) the tracking signal.

Answer: D

Diff: 3

Topic: 7.6 Measures of Forecast Error

AACSB: Analytical thinking

Objective: LO 7.4: Analyze demand forecasts to estimate forecast error.

44) Which of the following is a commonly used measure for measuring forecast error?

- A) MDE
- B) MKE
- C) MAD
- D) MES

Answer: C

Diff: 2

Topic: 7.6 Measures of Forecast Error

AACSB: Analytical thinking

Objective: LO 7.4: Analyze demand forecasts to estimate forecast error.

45) The _____ is a good measure of forecast error when the underlying forecast has significant seasonality and demand varies considerably from one period to the next.

- A) MAD
- B) MSE
- C) MKE
- D) MAPE

Answer: D

Diff: 3

Topic: 7.6 Measures of Forecast Error

AACSB: Analytical thinking

Objective: LO 7.4: Analyze demand forecasts to estimate forecast error.

Scenario 7.2

Period	Demand
1	173
2	177
3	180
4	151
5	168
6	184
7	198
8	191
9	167
10	177

46) Calculate the MAD for this scenario if the forecasts for periods 1-10 are in order, 176.6, 174.2, 176.1, 178.7, 160.4, 165.4, 177.7, 191.1, 191.0, and 175.2.

- A) 11.04
- B) 9.52
- C) 10.40
- D) 12.25

Answer: A

Diff: 3

Topic: 7.6 Measures of Forecast Error

AACSB: Analytical thinking

Objective: LO 7.4: Analyze demand forecasts to estimate forecast error.

47) Calculate the MSE for this scenario if the forecasts for periods 1-10 are in order, 176.6, 174.2, 176.1, 178.7, 160.4, 165.4, 177.7, 191.1, 191.0, and 175.2.

- A) 216.60
- B) 219.80
- C) 210.40
- D) 221.20

Answer: B

Diff: 3

Topic: 7.6 Measures of Forecast Error

AACSB: Analytical thinking

Objective: LO 7.4: Analyze demand forecasts to estimate forecast error.

48) What is the largest value for the tracking signal (either under or overforecasting) if the forecasts for periods 1-10 are in order, 176.6, 174.2, 176.1, 178.7, 160.4, 165.4, 177.7, 191.1, 191.0, and 175.2?

- A) 1.86
- B) -2.07
- C) 2.58
- D) 3.24

Answer: C

Diff: 3

Topic: 7.6 Measures of Forecast Error

AACSB: Analytical thinking

Objective: LO 7.4: Analyze demand forecasts to estimate forecast error.

49) What is the mean absolute percentage error if the forecasts for periods 1-10 are in order, 176.6, 174.2, 176.1, 178.7, 160.4, 165.4, 177.7, 191.1, 191.0, and 175.2?

- A) 5.8
- B) 5.6
- C) 5.4
- D) 5.2

Answer: B

Diff: 3

Topic: 7.6 Measures of Forecast Error

AACSB: Analytical thinking

Objective: LO 7.4: Analyze demand forecasts to estimate forecast error.

50) Use Solver to determine the alpha that minimizes the MAD for the ten period forecast for the data that appear in this table. Use the actual demand as the forecast for period 1 and then use exponential smoothing.

Period	Demand
1	300
2	250
3	200
4	500
5	128
6	184
7	166
8	191
9	167
10	177

A) 0.2

B) 0.3

C) 0.4

D) 0.5

Answer: D

Diff: 3

Topic: 7.6 Measures of Forecast Error

AACSB: Analytical thinking

Objective: LO 7.4: Analyze demand forecasts to estimate forecast error.

7.3 Essay Questions

1) Describe the basic characteristics of forecasts that managers should be aware.

Answer: Companies and supply chain managers should be aware of the following characteristics of forecasts:

1. Forecasts are always wrong and should thus include both the expected value of the forecast and a measure of forecast error. Thus, the forecast error (or demand uncertainty) must be a key input into most supply chain decisions. An estimation of demand uncertainty is unfortunately often missing from forecasts, resulting in estimates that vary widely among different stages of a supply chain that is not forecasting collaboratively.
2. Long-term forecasts are usually less accurate than short-term forecasts; that is, long-term forecasts have a larger standard deviation of error relative to the mean than short-term forecasts.
3. Aggregate forecasts are usually more accurate than disaggregate forecasts, as they tend to have a smaller standard deviation of error relative to the mean. The greater the degree of aggregation, the more accurate the forecast.
4. In general, the further up the supply chain a company is (or the further they are from the consumer), the greater the distortion of information they receive. One classic example of this is the bullwhip effect, where order variation is amplified as orders move further from the end customer. As a result, the further up the supply chain an enterprise exists, the higher the forecast error. Collaborative forecasting based on sales to the end customer can help enterprises further up the supply chain reduce forecast error.

Diff: 2

Topic: 7.2 Characteristics of Forecasts

AACSB: Application of knowledge

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

2) Explain the basic, six-step approach to help an organization perform effective forecasting.
Answer: The following basic, six-step approach helps an organization perform effective forecasting:

1. Understand the objective of forecasting. The objective of every forecast is to support decisions that are based on the forecast, so an important first step is to clearly identify these decisions. Examples of such decisions include how much of a particular product to make, how much to inventory, and how much to order. All parties affected by a supply chain decision should be aware of the link between the decision and the forecast. Failure to make these decisions jointly may result in either too much or too little product in various stages of the supply chain.
2. Integrate demand planning and forecasting throughout the supply chain. A company should link its forecast to all planning activities throughout the supply chain. These include capacity planning, production planning, promotion planning, and purchasing, among others. This link should exist at both the information system and the human resource management level. As a variety of functions are affected by the outcomes of the planning process, it is important that all of them are integrated into the forecasting process. To accomplish this integration, it is a good idea for a firm to have a cross-functional team, with members from each affected function responsible for forecasting demand—and an even better idea to have members of different companies in the supply chain working together to create a forecast.
3. Understand and identify customer segments. Here a firm must identify the customer segments the supply chain serves. Customers may be grouped by similarities in service requirements, demand volumes, order frequency, demand volatility, seasonality, and so forth. In general, companies may use different forecasting methods for different segments. A clear understanding of the customer segments facilitates an accurate and simplified approach to forecasting.
4. Identify the major factors that influence the demand forecast. A proper analysis of these factors is central to developing an appropriate forecasting technique. The main factors influencing forecasts are demand, supply, and product-related phenomena. On the demand side, a company must ascertain whether demand is growing, declining, or has a seasonal pattern. These estimates must be based on demand—not sales data. On the supply side, a company must consider the available supply sources to decide on the accuracy of the forecast desired. If alternate supply sources with short lead times are available, a highly accurate forecast may not be especially important. However, if only a single supplier with a long lead time is available, an accurate forecast will have great value. On the product side, a firm must know the number of variants of a product being sold and whether these variants substitute for or complement each other. If demand for a product influences or is influenced by demand for another product, the two forecasts are best made jointly.
5. Determine the appropriate forecasting technique. In selecting an appropriate forecasting technique, a company should first understand the dimensions that will be relevant to the forecast. These dimensions include geographical area, product groups, and customer groups. The company should understand the differences in demand along each dimension. A firm would be wise to have different forecasts and techniques for each dimension. At this stage, a firm selects an appropriate forecasting method from the four methods discussed earlier—qualitative, time series, causal, or simulation. Using a combination of these methods is often effective.

6. Establish performance and error measures for the forecast. Companies should establish clear performance measures to evaluate the accuracy and timeliness of the forecast. These measures should correlate with the objectives of the business decisions based on these forecasts.

Each organization must use all six steps to forecast effectively.

Diff: 2

Topic: 7.4 Basic Approach to Demand Forecasting

AACSB: Application of knowledge

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.

Scenario 7.1 - Marshmallow Madness

Historical demand for Peeps is as displayed in the table.

Month	Demand
January	11
February	18
March	31
April	39
May	44
June	53
July	67
August	82
September	96

3) Develop forecasts for June through October using these techniques: moving average of two period, simple exponential smoothing with an alpha of 0.8, and Holt's method. For the exponential smoothing model assume that the forecast for May is the actual demand for May. Comment on the use of these three methods to generate a forecast in this situation.

Answer: The moving average of two periods results in these forecasts:

Month	Actual	MA(2)
June	53	41.5
July	67	48.5
August	82	60
September	96	74.5
October		89

The exponential smoothing with $\alpha = 0.8$

Month	Actual	Expon(.8)
June	53	44
July	67	51.2
August	82	63.8
September	96	78.4
October		92.5

For Holt's model the regression equation has an intercept of -2.5 and a trend component of 10.3. Beta was used as 0.1 and alpha 0.2.

Month	Actual	Forecast	Error	Level	Trend
June	53	59.1	6.1	57.8	10.1
July	67	58.0	1.0	67.8	10.1
August	82	77.9	-4.1	78.7	10.2
September	96	88.9	-7.1	90.3	10.3
October		100.7			

The data show a strong trend, so use of the simple moving average or exponential smoothing will just result in forecasts that lag behind the actual demand. Holt's model can capture the trend and provide a much more accurate forecast.

Diff: 2

Topic: 7.5 Time-Series Forecasting Methods

AACSB: Analytical thinking

Objective: LO 7.3: Forecast demand in a supply chain given historical demand data using time-series methodologies.

Scenario 7.2

Period	Demand
1	173
2	177
3	180
4	151
5	168
6	184
7	198
8	191
9	167
10	177

4) Develop a forecast for this data using simple exponential smoothing with an alpha of 0.66. Then calculate MAD, MSE and the tracking signal.

Answer: The forecast, forecast error, absolute deviation, bias and tracking signal appear in the table.

Period	Forecast	Error	Abs Error	Bias	TS
1	176.6	3.6	3.6	3.6	1.00
2	174.2	-2.8	2.8	0.8	0.26
3	176.1	-3.9	3.9	-3.1	-0.91
4	178.7	27.7	27.7	24.5	2.58
5	160.4	-7.6	7.6	16.9	1.86
6	165.4	-18.6	18.6	-1.6	-0.15
7	177.7	-20.3	20.3	-22.0	-1.82
8	191.1	0.1	0.1	-21.9	-2.07
9	191.0	24.0	24.0	2.2	0.18
10	175.2	-1.8	1.8	0.3	0.03

The MAD is 11.043

The MSE is 219.79

The tracking signal appears in the table.

Diff: 3

Topic: 7.6 Measures of Forecast Error

AACSB: Analytical thinking

Objective: LO 7.4: Analyze demand forecasts to estimate forecast error.

5) Discuss key issues of forecasting in practice.

Answer: *Collaborate in building forecasts.* Collaboration with supply chain partners can often create a much more accurate forecast. However, most forecasts are still made not just within one company, but within one function in a company. It takes an investment of time and effort to build the relationships with your partners to begin sharing information and creating collaborative forecasts. The supply chain benefits of collaboration, however, are often an order of magnitude greater than the cost.

The value of data depends on where you are in the supply chain. Although collaboration is a hot topic, this does not mean that reams and reams of data need to be shared across the supply chain. The value of data depends on where one sits in the supply chain. To avoid being overwhelmed with data when collaborating and not being able to sort out what's valuable, think about what data is valuable to each member of the supply chain and share only that data.

Be sure to distinguish between demand and sales. Often, companies make the mistake of looking at historical sales and assuming that this is what the historical demand was. To get true demand, adjustments need to be made for unmet demand due to stockouts, competitor actions, pricing, promotions, and so forth. In many cases, these adjustments are qualitative in nature but are crucial to accurately reflect reality. Although it is not always easy, making an adjustment in a forecast to move toward demand from just sales will increase accuracy and therefore supply chain performance.

Diff: 2

Topic: 7.11 Forecasting in Practice

AACSB: Application of knowledge

Objective: LO 7.1: Understand the role of forecasting for both an enterprise and a supply chain.