HW 10

16.1

|  |  |
| --- | --- |
| Period | Demand |
| 1 | 15 |
| 2 | 12 |
| 3 | 8 |
| 4 | 14 |
| 5 | 19 |
| 6 | 16 |
| 7 | 10 |

1. Demand for period 8, 2 period SMA  
   SMA= (Period 6 demand + Period 7 demand) / 2 = **13**
2. Calculate MAD  
   MAD= (Sum absolute value((At – Ft)) / n  
   MAD= 25.5 / 5 = 5.1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Period | Demand | Forecast Demand | Forecasting error | Absolute Forecasting Error |
| 1 | 15 |  |  |  |
| 2 | 12 |  |  |  |
| 3 | 8 | 13.5 | -5.5 | 5.5 |
| 4 | 14 | 10 | 4 | 4 |
| 5 | 19 | 11 | 8 | 8 |
| 6 | 16 | 16.5 | -0.5 | 0.5 |
| 7 | 10 | 17.5 | -7.5 | 7.5 |
|  |  |  |  | Sum= 25.5 |

1. Forecast demand for period 8 using 3 period SMA  
   SMA= (Period 5 demand + Period 6 demand + Period 7 demand) / 3 = **15**
2. Calculate MAD  
   MAD= (Sum absolute value((At – Ft)) / n  
   MAD= 20 / 4 = 5

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Period | Demand | Forecast Demand | Forecasting error | Absolute Forecasting Error |
| 1 | 15 |  |  |  |
| 2 | 12 |  |  |  |
| 3 | 8 |  |  |  |
| 4 | 14 | 10 | 4 | 4 |
| 5 | 19 | 11 | 8 | 8 |
| 6 | 16 | 16.5 | -0.5 | 0.5 |
| 7 | 10 | 17.5 | -7.5 | 7.5 |
|  |  |  |  | Sum= 20 |

1. Which forecast would you choose?  
   I would choose the 3 period SMA because using more periods for forecasting is more accurate

**16.3**a. Forecast demand for period 9 using exponential smoothing, a=0.1  
Ft= (Ft-1) + a[(At-1)-(Ft-1)]  
Period 9 = 19.8 + 0.1(20-19.8) = **19.82**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Period | Demand | Forecast Demand | Forecasting error | Absolute Forecasting Error |
| 1 | 15 | 15 | --- | --- |
| 2 | 24 | 15 | 9 | 9 |
| 3 | 26 | 15.9 | 10.1 | 10.1 |
| 4 | 33 | 16.91 | 16.09 | 16.09 |
| 5 | 20 | 18.52 | 1.48 | 1.48 |
| 6 | 22 | 18.67 | 3.33 | 3.33 |
| 7 | 27 | 19 | 8 | 8 |
| 8 | 20 | 19.8 | 0.2 | 0.2 |
|  |  |  |  | Sum= 48.2 |

b. Calculate MAD  
MAD= (Sum absolute value((At – Ft)) / n  
MAD= 48.2 / 7 = **6.89**

c. a. Forecast demand for period 9 using exponential smoothing, a=0.3  
Ft= (Ft-1) + a[(At-1)-(Ft-1)]  
Period 9 = 23.90 + 0.3(20-23.90) = **22.73**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Period | Demand | Forecast Demand | Forecasting error | Absolute Forecasting Error |
| 1 | 15 | 15 | --- | --- |
| 2 | 24 | 15 | 9 | 9 |
| 3 | 26 | 17.7 | 8.3 | 8.3 |
| 4 | 33 | 20.19 | 12.81 | 12.81 |
| 5 | 20 | 24.03 | -4.03 | 4.03 |
| 6 | 22 | 22.82 | -0.82 | 0.82 |
| 7 | 27 | 22.57 | 4.43 | 4.43 |
| 8 | 20 | 23.90 | -3.9 | 3.9 |
|  |  |  |  | Sum= 43.29 |

d. Calculate MAD  
MAD= (Sum absolute value((At – Ft)) / n  
MAD= 43.29 / 7 = **6.18  
e.** I would choose the second value of a= 0.3 because the MAD is lower.

**16.9**a. 2 period weighted moving average with weights 3 and 1.  
WMA(p=2, Period 10(2013)) = ((1\*19.4)+(3\*17.9))/4 = **18.28**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year** | **Market Share** | Forecasted Share | Forecasting error | Absolute Forecast Error |
| 2004 | 26.2 |  |  |  |
| 2005 | 33 |  |  |  |
| 2006 | 27.3 | 31.30 | -4.00 | 4 |
| 2007 | 22.1 | 28.73 | -6.63 | 6.63 |
| 2008 | 22.1 | 23.40 | -1.30 | 1.3 |
| 2009 | 19.7 | 22.10 | -2.40 | 2.4 |
| 2010 | 18.8 | 20.30 | -1.50 | 1.5 |
| 2011 | 19.4 | 19.03 | 0.37 | 0.37 |
| 2012 | 17.9 | 19.25 | -1.35 | 1.35 |
|  |  |  |  | Sum 17.55 |

b. Calculate MAD  
MAD= (Sum absolute value((At – Ft)) / n  
MAD= 17.55 / 7 = **2.51**

c. Forecast market share for 2013 using exponential smoothing, a=0.7  
Forecasted 2013 Period 10 Market Share = F9+0.7(Actual9-Forecasted9)  
= 19.38+0.7(17.9-19.38)= **18.34**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year** | **Market Share** | Forecasted Share | Forecasting error | Absolute Forecast Error |
| 2004 | 26.2 | 26.20 |  |  |
| 2005 | 33 | 26.20 | 6.80 | 6.8 |
| 2006 | 27.3 | 30.96 | -3.66 | 3.66 |
| 2007 | 22.1 | 28.40 | -6.30 | 6.3 |
| 2008 | 22.1 | 23.99 | -1.89 | 1.89 |
| 2009 | 19.7 | 22.67 | -2.97 | 2.97 |
| 2010 | 18.8 | 20.59 | -1.79 | 1.79 |
| 2011 | 19.4 | 19.34 | 0.06 | 0.06 |
| 2012 | 17.9 | 19.38 | -1.48 | 1.48 |
|  |  |  |  | Sum =18.15 |
|  |  |  |  |  |

d. Calculate MAD  
MAD= (Sum absolute value((At – Ft)) / n  
MAD= 18.15 / 8 = **2.27**

e. I have more confidence in the exponential smoothing forecast because the MAD is lower.

**16.13**  
a. Forecast demand for period 9

|  |  |  |  |
| --- | --- | --- | --- |
| Period(t) | Demand(y) | **t\*y** | **t^2** |
| 1 | 7 | 7 | 1 |
| 2 | 8 | 16 | 4 |
| 3 | 7 | 21 | 9 |
| 4 | 10 | 40 | 16 |
| 5 | 14 | 70 | 25 |
| 6 | 16 | 96 | 36 |
| 7 | 13 | 91 | 49 |
| 8 | 16 | 128 | 64 |
| **Sum t=36** | **Sum y=91** | **Sum ty=469** | **sum t^2=204** |

Slope b1= (n\*Sum ty) – ((sum t)(Sum y)) / (n\*Sum t^2) – (Sum t)^2  
Slope b1= (8\*469) – ((36)(91)) / (8\*204) – (36)^2  
slope b1 = 1.42  
  
y intercept b0= (Sum y / n) – b1(Sum t/n)  
y intercept b0= (91 / 8) – 1.42(36/8)  
y intercept b0= 4.99  
  
^yt =4.99 + 1.42t  
^y9 =4.99 + 1.42(9)  
**^y9 =17.77**

b. Calculate MAD

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Period(t)** | **Demand(y)** | **Forecast ^y(t)** | **Error yt-^yt** | **Absolute** |
| 1 | 7 | 6.41 | 0.59 | 0.59 |
| 2 | 8 | 7.83 | 0.17 | 0.17 |
| 3 | 7 | 9.25 | -2.25 | 2.25 |
| 4 | 10 | 10.67 | -0.67 | 0.67 |
| 5 | 14 | 12.09 | 1.91 | 1.91 |
| 6 | 16 | 13.51 | 2.49 | 2.49 |
| 7 | 13 | 14.93 | -1.93 | 1.93 |
| 8 | 16 | 16.35 | -0.35 | 0.35 |
|  |  |  |  | 10.36 |

MAD = (sum yt-^yt) / n  
MAD = 10.36 / 8  
**MAD = 1.295**

**16.14**a. Forecast demand for period 9

|  |  |  |  |
| --- | --- | --- | --- |
| **Period(t)** | **Demand(y)** | **t\*y** | **t^2** |
| 1 | 15 | 15 | 1 |
| 2 | 17 | 34 | 4 |
| 3 | 14 | 42 | 9 |
| 4 | 7 | 28 | 16 |
| 5 | 10 | 50 | 25 |
| 6 | 12 | 72 | 36 |
| 7 | 7 | 49 | 49 |
| 8 | 5 | 40 | 64 |
| **36** | **87** | **330** | **204** |

Slope b1= (n\*Sum ty) – ((sum t)(Sum y)) / (n\*Sum t^2) – (Sum t)^2  
Slope b1= (8\*330 – ((36)(87)) / (8\*204) – (36)^2  
slope b1 = -1.46  
  
y intercept b0= (Sum y / n) – b1(Sum t/n)  
y intercept b0= (87 / 8) – (-1.46(36/8)  
y intercept b0= 17.45  
  
^yt =17.45 -1.46t  
^y9 =17.45 -1.46t  
**^y9 =4.31**

**b. Calculate MAD**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Period(t)** | **Demand(y)** | **Forecast ^y(t)** | **Error yt-^yt** | **Absolute** |
| 1 | 15 | 15.99 | -0.99 | 0.99 |
| 2 | 17 | 14.53 | 2.47 | 2.47 |
| 3 | 14 | 13.07 | 0.93 | 0.93 |
| 4 | 7 | 11.61 | -4.61 | 4.61 |
| 5 | 10 | 10.15 | -0.15 | 0.15 |
| 6 | 12 | 8.69 | 3.31 | 3.31 |
| 7 | 7 | 7.23 | -0.23 | 0.23 |
| 8 | 5 | 5.77 | -0.77 | 0.77 |
|  |  |  |  | 13.46 |

Calculate MAD  
MAD = (sum yt-^yt) / n  
MAD = 13.46 / 8  
**MAD = 1.68**