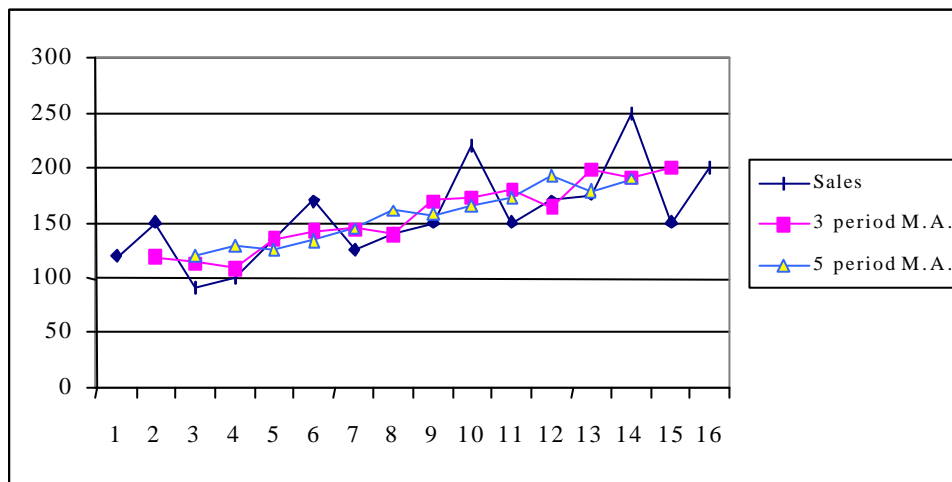


Seminar 24 (Suggested Solution)

1. a)

Time	Sales	3 period M.A.	5 period M.A.
1990 Q ₁	120	-	-
1990 Q ₂	150	120	-
1990 Q ₃	90	113	119
1990 Q ₄	100	108	129
1991 Q ₁	135	135	124
1991 Q ₂	170	143	134
1991 Q ₃	125	145	144
1991 Q ₄	140	138	161
1992 Q ₁	150	170	157
1992 Q ₂	220	173	166
1992 Q ₃	150	180	173
1992 Q ₄	170	165	193
1993 Q ₁	175	198	179
1993 Q ₂	250	192	189
1993 Q ₃	150	200	-
1993 Q ₄	200	-	-

b)



Larger the moving average period, better smoothing effect.

- b) i) forecasted sales in 1994 Q₁ = 200
 ii) forecasted sales in 1994 Q₁ = 189
- d) It seems that there is seasonal effect in the time series, and the effect repeat and repeat every 4 quarters, therefore, it is more appropriate to use 4 periods moving average.

2. a) Non linear trend

b) For $\alpha = 0.2$,

$$E_1 = Y_1 = 23$$

$$E_2 = \alpha Y_2 + (1 - \alpha)E_1 = (0.2)(31) + (1-0.2)(23) = 24.60$$

$$E_3 = \alpha Y_3 + (1 - \alpha)E_2 = (0.2)(25) + (1-0.2)(24.60) = 24.68$$

$$E_4 = \alpha Y_4 + (1 - \alpha)E_3 = (0.2)(35) + (1-0.2)(24.68) = 26.74$$

$$E_5 = \alpha Y_5 + (1 - \alpha)E_4 = (0.2)(42) + (1-0.2)(26.74) = 29.80$$

$$E_6 = \alpha Y_6 + (1 - \alpha)E_5 = (0.2)(70) + (1-0.2)(29.80) = 37.84$$

$$E_7 = \alpha Y_7 + (1 - \alpha)E_6 = (0.2)(58) + (1-0.2)(37.84) = 41.87$$

$$E_8 = \alpha Y_8 + (1 - \alpha)E_7 = (0.2)(120) + (1-0.2)(41.87) = 57.50$$

$$E_9 = \alpha Y_9 + (1 - \alpha)E_8 = (0.2)(103) + (1-0.2)(57.50) = 66.60$$

$$E_{10} = \alpha Y_{10} + (1 - \alpha)E_9 = (0.2)(190) + (1-0.2)(66.60) = 91.28$$

For $\alpha = 0.8$,

$$E_1 = Y_1 = 23$$

$$E_2 = \alpha Y_2 + (1 - \alpha)E_1 = (0.8)(31) + (1-0.8)(23) = 29.40$$

$$E_3 = \alpha Y_3 + (1 - \alpha)E_2 = (0.8)(25) + (1-0.8)(29.40) = 25.88$$

$$E_4 = \alpha Y_4 + (1 - \alpha)E_3 = (0.8)(35) + (1-0.8)(25.88) = 33.18$$

$$E_5 = \alpha Y_5 + (1 - \alpha)E_4 = (0.8)(42) + (1-0.8)(33.18) = 40.24$$

$$E_6 = \alpha Y_6 + (1 - \alpha)E_5 = (0.8)(70) + (1-0.8)(40.24) = 64.05$$

$$E_7 = \alpha Y_7 + (1 - \alpha)E_6 = (0.8)(58) + (1-0.8)(64.05) = 59.21$$

$$E_8 = \alpha Y_8 + (1 - \alpha)E_7 = (0.8)(120) + (1-0.8)(59.21) = 107.84$$

$$E_9 = \alpha Y_9 + (1 - \alpha)E_8 = (0.8)(103) + (1-0.8)(107.84) = 103.97$$

$$E_{10} = \alpha Y_{10} + (1 - \alpha)E_9 = (0.8)(190) + (1-0.8)(103.97) = 172.79$$

c) $\alpha = 0.8$ is highly responsive to the sudden change.

d) The forecasted number = $\hat{Y}_{11} = E_{10} = 172.79$