SMA_t = simple moving average at the end of the period t or estimated demand at the end of that period.

$$SMA_t = \frac{D_{t-(n-1)} + D_{t-(n-2)} + \ldots + D_{t-1} + D_t}{n}$$

3-month Simple Moving Average

MONTH	ORDERS MONTH PER MONTH	*MOVING AVERAGE*
Jan	120	–
Feb	90	–
Mar	100	–
Apr	75	103.3
May	110	88.3
June	50	95.0
July	75	78.3
Aug	130	78.3
Sept	110	85.0
Oct	90	105.0
Nov	-	110.0

$MA_3 =$

$$\frac{\sum_{i=1}^{3} D_i}{3} = \frac{90 + 110 + 130}{3} = 110$$

orders for Nov

5-month Simple Moving Average

MONTH	ORDERS MONTH PER MONTH	*MOVING AVERAGE*
Jan	120	–
Feb	90	–
Mar	100	–
Apr	75	–
May	110	–
June	50	99.0
July	75	85.0
Aug	130	82.0
Sept	110	88.0
Oct	90	95.0
Nov	-	91.0

$MA_5 =$

$$\frac{\sum_{i=1}^{5} D_i}{3} = \frac{90 + 110 + 130 + 75 + 50}{5} = 91$$

orders for Nov

Smoothing effects

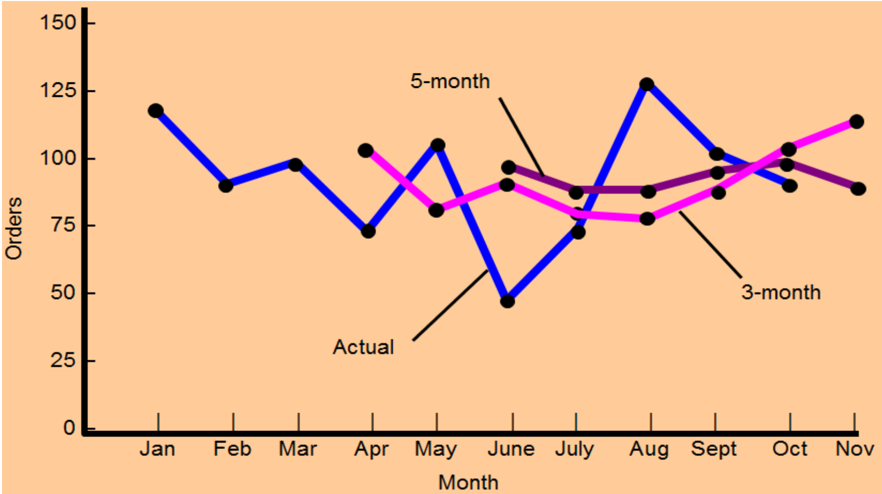

Fig 3.1 Classification of production systems

Note: ⅄ It gives equal weight to the demand in each of the most n periods.

⅄ Small value of n can capture data pattern more closely compared to high value of n Because high value of n averages out more to the data or a greater smoothing effect on random fluctuations.

Weighted Moving Average

While the moving average formula implies an equal weight being placed on each value that is being averaged, the weighted moving average permits an unequal weighting on prior time periods

$$WMA_t = \sum_{i=1}^{n} W_i D_i \qquad \sum_{i=1}^{n} w_i = 1$$

w_t = weight given to time period “t” occurrence (weights must add to one)

Question: Given the weekly demand and weights, what is the forecast for the 4^{th} period or Week 4?

Week	Demand
1	650
2	678
3	720
4	

Weights:
t-1
t-2
t-3

Note that the weights place more emphasis on the most recent data, that is time period “t-1”

Week	Demand	Forecast
1	650	
2	678	
3	720	
4		693.4

INPUT
- Material
- Machines
- Labor

Exponential Smoothing

$$F_{t+1} = \alpha D_t + (1 - \alpha) F_t$$

where:

F_{t+1} =forecast for next period

D_t =actual demand for present period

F_t = previously determined forecast for present period

α =weighting factor, smoothing constant

Effect of Smoothing Constant

$0.0 \leq a \leq 1.0$

If a = 0.20, then $F_{t+1} = 0.20\, D_t + 0.80\, F_t$

If a = 0, then $F_{t+1} = 0\, D_t + 1\, F_t = F_t$

Forecast does not reflect recent data

If a = 1, then $F_{t+1} = 1\, D_t + 0\, F_t = D_t$

Forecast based only on most recent data

Question: Given the weekly demand data, what are the exponential smoothing forecasts for periods 10^{th} using a=0.10 and a=0.60?

Assume $F_1 = D_1$

Week	Demand
1	820
2	775
3	680
4	655
5	750
6	802
7	798
8	689
9	775
10	

Solution: The respective alphas columns denote the forecast values. Note that you can only forecast one time period into the future.

Week	Demand	*0.1*	*0.6*
1	820	820.00	820.00
2	775	820.00	820.00
3	680	815.50	793.00
4	655	801.95	725.20
5	750	787.26	683.08
6	802	783.53	723.23
7	798	785.38	770.49
8	689	786.64	787.00
9	775	776.88	728.20
10		776.69	756.28

Note how that the smaller alpha results in a smoother line in this example

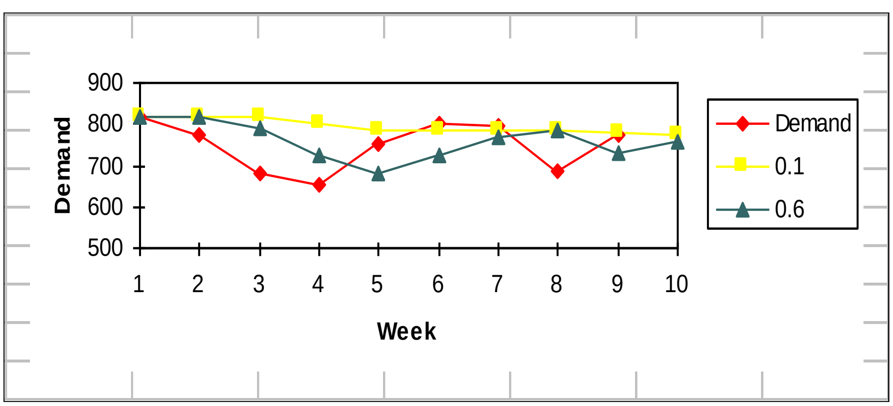

Fig 3.2 Effect of Smoothing Constant