4.4. Uses the moving average method to estimate the trend.

Moving Averages.

Once the time series data are given annually / quarterly / monthly daily deriving the trend values in moving average or centered moving averages using an appropirate order is known as moving average method.

Moving Average of order n

The moving average of order n of a time series $Y_1, Y_2 \cdots Y_n$ are as follows:

$$\frac{Y_1 + Y_2 + Y_3 + \cdots Y_n}{n} , \quad \frac{Y_2 + Y_3 + Y_4 + \cdots Y_{n+1}}{n}, \quad \frac{Y_3 + Y_4 + Y_5 + \cdots Y_{n+2}}{n}$$

Moving Average of an Odd Number of Result.

Once the order is and odd value, the moving average value is derived straight againest a specific time unit.

Moving Average of an Even Number of Result.

Once the order is an even value the first set of moving averages fall between two time units. By taking the mean of each of those two successive moving of centered moving averages can be derived straight right against each successive time unit.

Note:-

Since long term moving patterns of a time series variable can be seperated from short term fluctations through smoothing a time series, the moving average method is highly applicable and more succesful.

merits

(i) Easy to calculate and convenient method.

(ii) Ability to derive more realistic trend values since : : seasonal and irregular movement abolished

(iii) A smooth trend line being more practical than a straight linear method.

De-merits

(i) Trend values being lost from both ends of the time series according to the order.

(ii) Determining the order being inconvenient once the cyclical patters are irregularly arranged.

(iii). Possibility of appearing new movements which are not obvious in the original time series.

Worked Example (1)

Sales of a particular company from the Year 2009 to 2017 are as follows.

Year	09	10	11	12	13	14	15	16	17
Sales	90	100	88	80	72	80	83	88	100

(i) Calculate moving average of order 3.

(ii) Draw the time series and trend line (order 2) on the same set of axes.

Solution

Year	Sales (Y)	Moving Total (3)	Moving Average (3)
2009	90	—	—
2010	100	278	92·67
2011	88	268	89·33
2012	80	240	80·00
2013	72	232	77·33
2014	80	235	78·33
2015	83	251	83·67
2016	88	271	90·33
2017	100	—	—

(ii) Graph
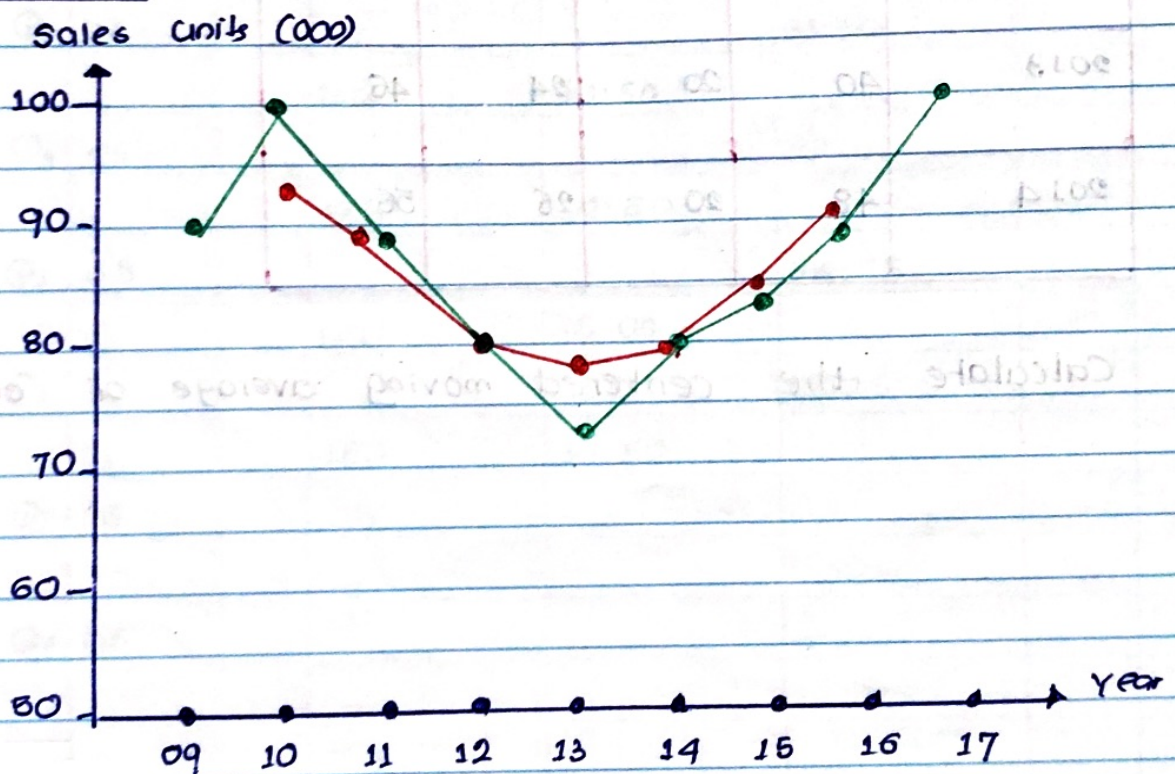
— original seris

— moving average seris

Exercise. ①

Calculate 3 Year moving averages for following time Seris

Year	2001	2002	2003	2004	2005	2006	2007	2008
Y	21	25	32	30	39	47	40	52

Worked Example ②

The table below shows the number of visitors (in thousands) to a hotel during a period of 3 Years.

Year	Q_1	Q_2	Q_3	Q_4
2012	36	18	22	44
2013	40	20	24	46
2014	48	20	26	56

Calculate the centered moving average of order 4.

Solution

Year / Quarter		No. of Visitors (Y)	moving Total (4)	moving Average(y)	Centered Average.
2012	Q₁	36			—
	Q₂	18			—
			120	30·00	
	Q₃	22			30·50
			124	31·00	
	Q₄	44			31·25
			126	31·50	
2013	Q₁	40			31·75
			128	32·00	
	Q₂	20			32·25
			130	32·50	
	Q₃	24			33·50
			138	34·50	
	Q₄	46			34·50
			138	34·50	
2014	Q₁	48			34·75
			140	35·00	
	Q₂	20			36·25
			150	37·50	
	Q₃	26			—
	Q₄	56			—

Exercise.

The profit of a particular company from Year 2010 to 2017 is given below

Year	10	11	12	13	14	15	16	17
Profit (Rs. mn)	40	60	70	85	82	88	96	99

Compute the centered moving average of order 4.