

4.5 Uses moving Average method to Estimate Seasonal Indices.

moving Average method.

The moving average method can be identified as a method of highlighting only the seasonal movements removing trend, cyclical and irregular movements containing in time series data step by step.

Through deriving moving averages or centered moving averages of time series data (Y), only the trend and cyclical movements remain, removing seasonal and irregular movements

Once the original data divided by moving averages only seasonal and irregular movements remain.

Expecting that seasonal movements will remain removing irregular movements as well by computing the mean of corresponding values is the logical background of moving average method.

Worked Example (i)

Quarterly sales from 2016 - 2018 of a firm is given below. Evaluate seasonal index for each quarter by assuming multiplicative model.

Year	Q ₁	Q ₂	Q ₃	Q ₄
2016	200	120	160	280
2017	220	140	140	300
2018	200	120	180	320

Solution.

Prepare a table as follows.

Year Quarter	Sales. (CY)	moving Total(4)	moving Ave.	Centered Ave. (TC)	Seasonal SI = Y/TC
2016 Q ₁	200 -			-	-
Q ₂	120 -			-	-
		760	190		
Q ₃	160 -			192.50	83.12
		780	195		
Q ₄	280 -			197.50	141.77
		800	200		
2017 Q ₁	220 -			197.50	111.39
		780	195		
Q ₂	140 -			197.50	70.89
		800	200		
Q ₃	140 -			197.50	70.89
		780	195		
Q ₄	300 -			192.50	155.84
		760	190		
2018 Q ₁	200			195.00	102.56
		800	200		
Q ₂	120			202.50	59.26
		820	205		
Q ₃	180			-	-
				-	-
Q ₄	320			-	-
				-	-

Note:-

By calculating Y/t_c , Seasonal and Irragular movements are extracting.

Removing Irragular movements.

Year	Q_1	Q_2	Q_3	Q_4
2016	xx	xx	83.12	141.77
2017	111.39	70.89	70.89	155.84
2018	102.56	59.26	xx	xx
Total	213.95	130.15	154.01	297.61
Average	106.98	65.08	77.00	148.41
				397.47

Adjusted Equal to 400 (Adjusted Average)

$$Q_1 = \frac{106.98 \times 400}{397.47} = 107.66$$

$$Q_2 = \frac{65.08 \times 400}{397.47} = 65.49$$

$$Q_3 = \frac{77.00 \times 400}{397.47} = 77.49$$

$$Q_4 = \frac{148.41 \times 400}{397.47} = 149.36$$

Seasonal Indices for 4 Quarters.

$$Q_1 = 107.66$$

$$Q_2 = 65.49$$

$$Q_3 = 77.49$$

$$Q_4 = 149.36$$

Worked Example (02)

Evaluate seasonal index for each day by assuming an additive model.

Week	Mon:	Tue:	Wed:	Thu:	Fri:
01	51	45	43	38	49
02	62	55	51	47	59
03	70	66	64	58	68

$$Y = T + S + C + I$$

$$S + I = Y - (T + C)$$

Extract Seasonal and Irragular movements.

Week.	Y	Moving Total (5)	Moving Ave. T+C	Seasonal $S+F = Y - (T+C)$
1	mon 51 ✓		xx	xx
	Tue 45 ✓		xx	xx
	Wed 43 ✓	226	45.2	-2.2
	Thu 38 ✓	237	47.4	-9.4
	Fri 49 ✓	247	49.4	0.4
2	mon 62 ✓	255	51.0	11.0
	Tue 55 ✓	264	52.8	2.2
	Wed 51 ✓	274	54.8	-3.8
	Thu 47 ✓	282	56.4	-9.4
	Fri 59 ✓	293	58.6	0.4
3	mon 70	306	61.2	8.8
	Tue 66	317	63.4	2.6
	Wed 64	326	65.2	-1.2
	Thu 58		xx	xx
	Fri 68		xx	xx

Removing Irragular movements

Week	mon	Tue	Wed	Thu	Fri
01	xx	xx	-2.2	-9.4	0.4
02	11.0	2.2	-3.8	-9.4	0.4
03	8.8	2.6	-1.2	xx	xx
Total	19.8	4.8	-7.2	-18.2	0.8
Average	9.9	2.4	-2.4	-9.4	0.4

Adjusted Equal to zero

$$\frac{+0.9}{5} = +0.18$$

5

$$\text{Mon:} = 9.9 - 0.18 = 9.72$$

$$\text{Tue:} = 2.4 - 0.18 = 2.22$$

$$\text{Wed:} = -2.4 - 0.18 = -2.58$$

$$\text{Thu:} = -9.4 - 0.18 = -9.58$$

$$\text{Fri:} = 0.4 - 0.18 = 0.22$$

Seasonal Index for each day

$$\text{Monday} = 9.72$$

$$\text{Tuesday} = 2.22$$

$$\text{Wednesday} = -2.58$$

$$\text{Thursday} = -9.58$$

$$\text{Friday} = 0.22$$

Exercise.

Calculate seasonal index for each quarter

Year	Q ₁	Q ₂	Q ₃	Q ₄
2018	19	31	62	11
2019	20	32	65	17
2020	24	39	78	20