Adjusted Exponential Smoothing Method

In this method, trend adjustment factor is added to exponential smoothing forecast. Its formula is

$$AF_{t+1} = F_{t+1} + T_{t+1}$$

T = exponentially smoothed trend factor

$$T_{t+1} = \beta(F_{t+1} - F_t) + (1-\beta)T_t$$

T_t = Trend factor for the current period

β = Smoothing constant for trend

Like α, the values of β lies between 0 and 1. Like α, the value of β is subjectively decided. Value of β closer to one signifies the strong reaction to trend. Value closer to 0 signifies dampening or smoothing out of trend.

For the first year, trend factor is assumed 0.

Assuming β also equal to 0.3,

$$T_2 = 0.3(37-37) + (0.7 \times 0) = 0$$

$$T_3 = 0.3(37.90-37) + (0.7 \times 0) = (0.3 \times 0.9) = 0.27$$

$$AF_3 = F_3 + T_3 = 37.90 + 0.27 = 38.17$$

$$T_4 = 0.3(38.83-37.90) + (0.7 \times 0.27)$$

$$= (0.3 \times 93) + (0.189) = (0.279 + 0.189) = 0.468$$

$$AF_4 = F_4 + T_4 = 38.83 + 0.47 = 39.30$$

Period	Month	Demand (D_t)	F_{t+1}	T_{t+1}	AF_{t+1}
1	Jan	37	37	0	37
2	Feb	40	37	0	37
3	Mar	41	37.90	0.27	38.17
4	Apr	37	38.83	0.47	39.30
5	May	45	38.28		
6	Jun	50	40.29		
7	Jul	43	43.20		
8	Aug	47	43.14		
9	Sep	56	44.30		
10	Oct	52	47.81		
11	Nov	55	49.06		
12	Dec	54	50.84		
13	Jan		51.79		

Regression Analysis

$$Y = a + bX$$

Simple linear equation. Y is dependent variable and X is independent variable. a = Value of intercept. b - slope of regression line. b is coefficient. It explains the % change in dependent variable Y with 1% change in independent variable X. In this case, Demand is dependent variable (Y) and time is independent variable (X).

Period (X)	Demand (Y)	X^2	XY
1	37	1	37
2	40	4	80
3	41	9	123
4	37	16	148
5	45	25	225
6	50	36	300
7	43	49	301
8	47	64	376
9	56	81	504
10	52	100	520
11	55	121	605
12	54	144	648
$\Sigma X = 78$	$\Sigma Y = 557$	$\Sigma x^2 = 650$	$\Sigma XY = \cancel{3909}$ 3867

$\bar{X} = \frac{\Sigma X}{n} = \frac{78}{12} = 6.5$

$\frac{\Sigma Y}{n} = \frac{557}{12}$, $\bar{Y} = 46.41$

$$b = \frac{\Sigma XY - n\bar{X}\bar{Y}}{\Sigma x^2 - n(\bar{X})^2}$$

$$= \frac{3867 - 12 \times 6.5 \times 46.41}{650 - (12 \times 6.5 \times 6.5)}$$

$$= \frac{3867 - 3620}{650 - 507}$$

$$= \frac{247}{143} = 1.72$$

$$a = \bar{Y} - b\bar{X}$$

$$= 46.47 - (1.72 \times 6.5)$$

$$= 46.47 - 11.18 = 35.29$$

$$Y = 35.29 + 1.72X$$

$$Y_{13} = 35.29 + (1.72 \times 13)$$

$$= 35.29 + 22.36 = \boxed{57.65}$$