













Exponential smoothing is suitable for this case, as the market shrinks and there is seasonality. When there is seasonality, Holt-Winters method can be applied [7].

$$\text{Seasonal factors } S_1 = \frac{Y_1}{\text{average}(Y_1, Y_2, Y_3, \dots, Y_{12})}, S_2 = \frac{Y_2}{\text{average}(Y_1, Y_2, Y_3, \dots, Y_{12})} \quad (1)$$

$$\text{Initial level at 1 year } L_{13} = \frac{Y_{13}}{S_1} \quad (2)$$

$$\text{1 time period } T_{13} = \frac{Y_{13}}{S_1} - \frac{Y_{12}}{S_{12}} \quad (3)$$

$$\text{Level update } L_t = \alpha \frac{Y_t}{S_{t-M}} + (1 - \alpha)(L_{t-1} + T_{t-1}) \quad (4)$$

$$\text{Trend } T_t = \beta(L_t - L_{t-1}) + (1 - \beta)T_{t-1} \quad (5)$$

$$\text{Seasonal factor } S_t = \gamma \frac{Y_t}{L_t} + (1 - \gamma)S_{t-M} \quad (6)$$

$$\text{Forecasts within data set } F_{t+1} = (L_t + T_t) S_{t-M+1} \quad (7)$$

$$\text{Forecasts } F_{t+k} = (L_t + k * T_t) S_{t-M+k} \quad (8)$$

$k$  = number of forecasts into the future

$\alpha, \beta, \gamma$  = smoothing constants

When the method is applied, chart given in Figure 7 is calculated, where  $\alpha, \beta, \gamma$  are calculated as below to minimize the forecast errors.

$$\alpha = 0,314$$

$$\beta = 0,121$$

$$\gamma = 0,559$$

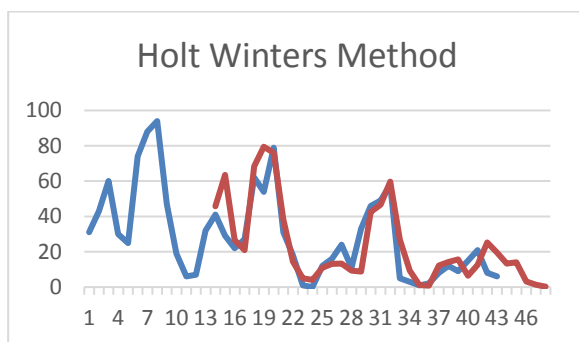


Figure 6. Holt Winter's Method

According to this method, the trend will decline as expected.

## 7 Conclusion

To manage customer demand, appropriate demand planning is essential in efficient supply chain management systems. Statistical forecasting approaches are very effective, particularly when the historical data sets are available. This study aimed to forecast automotive demand for Norway Market. The exponential smoothing method, Holt Winter's method, which is used for seasonal trends. This method is applied for the shrinking market, where the recent data carry the importance and the whole data set showed seasonal fluctuations. The technique used in the study is able to respond efficiently to the market needs in regards of forecast. In practice, this study may serve as a useful benchmark for decision makers while selecting a method for forecasting. Future researches will focus on applying different forecasting to different markets.

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