

ISyE 3103 Supply Chain Modeling: Transportation and Logistics
Spring 2006

Time Series Extrapolation Forecasting Formulas

p-Period Moving Average Model

$$f_{t+1;t} = \frac{\sum_{i=t-p+1}^t D_i}{p} = f_{t+\tau;t}$$

Exponential Smoothing Model with Smoothing Parameter α

$$f_{t+1;t} = \alpha D_t + (1 - \alpha)f_{t;t-1} = f_{t+\tau;t}$$

Holt's Method (Double Exponential Smoothing) with Parameters α and β

$$\begin{aligned}\hat{a}_t &= \alpha D_t + (1 - \alpha)(\hat{a}_{t-1} + \hat{b}_{t-1}) \\ \hat{b}_t &= \beta(\hat{a}_t - \hat{a}_{t-1}) + (1 - \beta)\hat{b}_{t-1} \\ f_{t+1;t} &= \hat{a}_t + \hat{b}_t \\ f_{t+\tau;t} &= \hat{a}_t + \hat{b}_t\tau\end{aligned}$$

Winters' Method (Triple Exponential Smoothing) with Parameters α , β , and γ

$$\begin{aligned}\hat{a}_t &= \alpha \frac{D_t}{\hat{I}_{t-m}} + (1 - \alpha)(\hat{a}_{t-1} + \hat{b}_{t-1}) \\ \hat{b}_t &= \beta(\hat{a}_t - \hat{a}_{t-1}) + (1 - \beta)\hat{b}_{t-1} \\ \hat{I}_t &= \gamma \frac{D_t}{\hat{a}_t} + (1 - \gamma)\hat{I}_{t-m} \\ f_{t+1;t} &= (\hat{a}_t + \hat{b}_t)\hat{I}_{t+1-m} \\ f_{t+\tau;t} &= (\hat{a}_t + \hat{b}_t\tau)\hat{I}_{t+\tau-m}\end{aligned}$$

Mean Square Error (MSE) $MSE = \frac{\sum_{i=1}^n e_i^2}{n}$

Root Mean Square Error (RMSE) $RMSE = \sqrt{MSE}$

Mean Absolute Deviation (MAD) $MAD = \frac{\sum_{i=1}^n |e_i|}{n}$

Mean Absolute Percent Error (MAPE) $MAPE = \frac{\sum_{i=1}^n \frac{|e_i|}{D_i}}{n}$