ECON 423 - Naive Forecast Lab

Naive forecasting methods are useful tools to forecasters. These forecasts are easy to calculate and provide a convenient benchmark for other more complicated forecasting methods. They also do not require any judgement on the part of a forecaster.

Naive forecasts are based on simple arithmetic formulas applied to economic data. These formula's are sometimes called "rules of thumb."

Goals

1. Understand how to calculate naive forecasts
2. Understand differences in naive forecasting methods
3. Replicate Table 10.3
4. Replicate Figure 10.1

Data

Table 10.2 contains data on aggregate new car sales and average new car prices from 1971 to 1991. The sales variable is measured in thousands of new cars sold in each year and the price variable is an index based in 1982-1984=100.

Procedures

In the following steps, X_t refers to the data series being forecast and X_t^* refers to the forecasted value.

1. Plot the car sales data on Table 10.2; describe the behavior of this series in terms of a standard time-series decomposition:
   (a) Secular trend
   (b) Seasonal variation
   (c) Cyclical variation
   (d) Irregular component
2. Calculate a *no change forecast* of new car sales for the period 1992-1999

$$X_t^* = X_{t-1}$$

3. Calculate a *same change forecast* of new car sales for the period 1992-1999

$$\begin{aligned} \Delta X_t^* &= \Delta X_{t-1} \\ X_t^* - X_{t-1} &= X_{t-1} - X_{t-2} \\ X_t^* &= 2X_{t-1} - X_{t-2} \end{aligned}$$

4. Calculate a *same ratio forecast* of new car sales for the period 1992-1999

$$\begin{aligned} \frac{X_t^*}{X_{t-1}} &= \frac{X_{t-1}}{X_{t-2}} \\ X_t^* &= X_{t-1}\left(\frac{X_{t-1}}{X_{t-2}}\right) \end{aligned}$$

5. Calculate a *partial adjustment same change forecast* of new car sales for the period 1992-1999

$$\begin{aligned}
\Delta X_t^* &= \rho \Delta X_{t-1} \\
X_t^* - X_{t-1} &= \rho(X_{t-1} - X_{t-2}) \\
X_t^* &= \rho(X_{t-1} - X_{t-2}) + X_{t-1} \\
X_t^* &= \rho X_{t-1} - \rho X_{t-2} + X_{t-1} \\
X_t^* &= (1+\rho)X_{t-1} - \rho X_{t-2}
\end{aligned}$$

Note that the same change model is a special case of the partial adjustment model where $\rho = 1$. The same change model is a "full adjustment" model.

Moving Average Methods

Moving average forecasts are simple to implement but move beyond the rigid time paths associated with naive forecasting methods. The general form of a moving average forecast of variable X is

$$X_t^* = \frac{1}{n}\sum_{i=1}^{n} X_{t-i}.$$

In this case, the forecast for period t is based on the average value of X over the past n periods. An alternative procedure would be a *centered moving average*

$$X_{t-j}^* = \frac{1}{n}\sum_{i=-n/2}^{n/2} X_{t-j+i}.$$

Moving average forecasts require the forecaster to choose n, the *order* of the moving average. If $n = 10$ is selected, for example, then the forecast is called a MA(10) forecast.

6. Calculate a *MA(4) forecast* of new car sales for the period 1992-1999

$$\begin{aligned}
X_t^* &= \frac{1}{4}\sum_{i=1}^{4} X_{t-i} \\
X_t^* &= \frac{X_{t-1} + X_{t-2} + X_{t-3} + X_{t-4}}{4}
\end{aligned}$$

7. Plot the *no change forecast*, *same change forecast*, *same ratio forecast* and *MA(4) forecast* on the same axes.