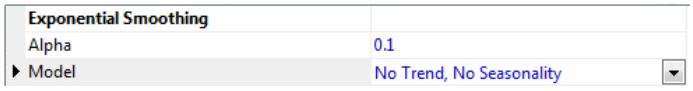
Exponential Smoothing

The **EXPONENTIAL SMOOTHING** command computes exponentially weighted averages and provides short-term forecasts for a time series.

How To

- ✓ Run the **STATISTICS->TIME SERIES -> EXPONENTIAL SMOOTHING** command.
- ✓ Select a variable with time series.
- ✓ Select the exponential smoothing method and model - simple, Holt's, Holt-Winters. (v6.5)
- ✓ Optionally, in the **ADVANCED OPTIONS**, change the value of smoothing factor α (default value: 0.1) and select a model with trend or seasonality.



Smoothing factor is also called damping factor. When α is close to 1, dampening is quick and when α is close to 0, dampening is slow. *Please note: default value of smoothing factor in the Analysis Toolpak from the Microsoft Excel package is 0.3*.

Results

Table with measures of accuracy (MAPE, MAD, MSD), table and chart with original and smoothed time series are generated.

Single exponential smoothing

The simplest form of exponential smoothing is given by the formulas:

$s_0 = \bar{x}$
$s_t = \alpha x_{t-1} + (1-\alpha)s_{t-1}$
where α is the smoothing factor, $0 < \alpha < 1$.
In other words, the smoothed statistic s_t is a simple weighted average of the previous observation x_{t-1} and the previous smoothed statistic s_{t-1}.

Measures of accuracy

Mean absolute percentage error (MAPE) – measures the size of the error in percentage terms. For example, if the MAPE is 10, on average the forecast is off by 10%.

$$MAPE = \frac{100\%}{N}\sum\frac{|Actual - Forecast|}{Actual}$$

MEAN ABSOLUTE DEVIATION (MAD) is the average of the absolute deviations from a mean. It measures accuracy in the data units.

$$MAD = \frac{1}{N}\sum |Actual - Forecast|$$

MEAN SQUARED DEVIATION (MSD) – measures the average of the squares of the errors. It is a more sensitive measure of an unusually large forecast error than MAD.

$$MSD = \frac{1}{N}\sum (Actual - Forecast)^2$$