Differences

DIFFERENCES command computes the differenced series for selected time series. Differencing can help stabilize the mean of a time series by removing changes in the level, and so eliminating trend and seasonality (Hyndman and Athanasopoulos, 2014). A differenced series has *k* fewer values than the original series, where *k* is the *differencing order*.

How To

✓ Run**: STATISTICS->TIME SERIES -> DIFFERENCES…**

✓ Select one or multiple variables with time series.

✓ If the **REMOVE MEAN** option is checked ***the sample mean is first subtracted from the series before the differencing.***

✓ Optionally, change the lag for differencing (**DIFFERENCING LAG** option) or use the **DIFFERENCES OF ORDER** option to apply differencing more than one time.

For example, to get the second-order differences set the **REPEAT DIFFERENCING OPERATION** *(differencing order)* option to two (2) and the **DIFFERENCING LAG** option to one (1).

Results

The differenced series of order *n* is computed for each input time series.

The difference operator is defined as $\Delta = 1 - L^k$, where L^k is the lag operator defined as $L^k x_t = x_{t-k}$. Then the series of first differences can be written as follow: $\Delta x_t = \left(1 - L^k\right)x_t = x_t - x_{t-k}$; and the differences of order *n,* produced by the command, can be written as follow: $\Delta^n x_t = \left(1 - L^k\right)^n x_t = x_t - x_{t-k}$.

References

Hyndman, R. J., Athanasopoulos, G. (2014). Forecasting: principles and practice, OTexts: Melbourne, Australia.

Enders, W. (2004). "Stationary Time-Series Models". Applied Econometric Time Series (Second ed.). New York: Wiley.