

## R FUNCTIONS FOR TIME SERIES ANALYSIS

Here are some helpful R functions for time series analysis. They belong from *stats*, *tseries*, *ast* and *lmtest* packages and grouped by their goal.

### INPUT

*cycle()*: gives the positions in the cycle of each observation (stats)  
*deltat()*: returns the time interval between observations (stats)  
*end()*: extracts and encodes the times the last observation were taken (stats)  
*frequency()*: returns the number of samples per unit time (stats)  
*read.ts()*: reads a time series file (tseries)  
*start()*: extracts and encodes the times the first observation were taken (stats)  
*time()*: creates the vector of times at which a time series was sampled (stats)  
*ts()*: creates time-series objects (stats)  
*window()*: is a generic function which extracts the subset of the object 'x' observed between the times 'start' and 'end'. If a frequency is specified, the series is then re-sampled at the new frequency (stats)

### TS DECOMPOSITION

*decompose()*: decomposes a time series into seasonal, trend and irregular components using moving averages. Deals with additive or multiplicative seasonal component (stats)  
*filter()*: linear filtering on a time series (stats)  
*HoltWinters()*: computes Holt-Winters Filtering of a given time series (stats)  
*sfilter()*: removes seasonal fluctuation using a simple moving average (ast)  
*spectrum()*: estimates the spectral density of a time series (stats)  
*stl()*: decomposes a time series into seasonal, trend and irregular components using 'loess' (stats)  
*tsr()*: decomposes a time series into trend, seasonal and irregular. Deals with additive and multiplicative components (ast)

### TESTS

*adf.test()*: computes the Augmented Dickey-Fuller test for the null that 'x' has a unit root (tseries)  
*Box.test()*: computes the Box-Pierce or Ljung-Box test statistic for examining the null hypothesis of independence in a given time series (stats)  
*bds.test()*: computes and prints the BDS test statistic for the null that 'x' is a series of i.i.d. random variables (tseries)  
*bptest()*: performs the Breusch-Pagan test for heteroskedasticity of residuals (lmtest)  
*dwtest()*: performs the Durbin-Watson test for autocorrelation of residuals (lmtest)  
*jarque.bera.test()*: Jarque-Bera test for normality (tseries)  
*kpss.test()*: computes KPSS test for stationarity (tseries)  
*shapiro.test()*: Shapiro-Wilk Normality Test (stats)

### STOCHASTIC MODELS

*ar()*: fits an autoregressive time series model to the data, by default selecting the complexity by AIC (stats)  
*arima()*: fits an ARIMA model to a univariate time series (stats)  
*arima.sim()*: simulate from an ARIMA model (stats)  
*arma()*: fits an ARMA model to a univariate time series by conditional least squares (tseries)  
*garch()*: fits a Generalized Autoregressive Conditional Heteroscedastic GARCH(p, q) time series model to the data by computing the maximum-likelihood estimates of the conditionally normal model (tseries)

### GRAPHICS

*lag.plot*: plots time series against lagged versions of themselves. Helps visualizing "auto-dependence" even when auto-correlations vanish (stats)  
*monthplot()*: plots a seasonal (or other) subseries of a time series (stats)  
*plot.ts()*: plotting time-series objects (stats)  
*seaplot()*: plotting seasonal sub-series or profile (ast)

*seqplot.ts()*: plots a two time series on the same plot frame (tseries)

*tsdiag()*: a generic function to plot time-series diagnostics (stats)

*ts.plot()*: plots several time series on a common plot. Unlike 'plot.ts' the series can have a different time bases, but they should have the same frequency (stats)

## MISCELLANEOUS

*acf()*, *pacf()*, *ccf()*: the function 'acf' computes (and by default plots) estimates of the autocovariance or autocorrelation function. Function 'pacf' is the function used for the partial autocorrelations. Function 'ccf' computes the cross-correlation or cross-covariance of two univariate series (stats)

*diff.ts()*: returns suitably lagged and iterated differences (stats)

*lag()*: computes a lagged version of a time series, shifting the time base back by a given number of observations (stats)