

## NAG Library Chapter Contents

### G13 – Time Series Analysis

G13 Chapter Introduction – a description of the Chapter and an overview of the algorithms available

<b>Routine Name</b>	<b>Mark of Introduction</b>	<b>Purpose</b>
G13AAF	9	nagf_tsa_uni_diff Univariate time series, seasonal and non-seasonal differencing
G13ABF	9	nagf_tsa_uni_autocorr Univariate time series, sample autocorrelation function
G13ACF	9	nagf_tsa_uni_autocorr_part Univariate time series, partial autocorrelations from autocorrelations
G13ADF	9	nagf_tsa_uni_arima_prelim Univariate time series, preliminary estimation, seasonal ARIMA model
G13AEF	9	nagf_tsa_uni_arima_estim Univariate time series, estimation, seasonal ARIMA model (comprehensive)
G13AFF	9	nagf_tsa_uni_arima_estim_easy Univariate time series, estimation, seasonal ARIMA model (easy-to-use)
G13AGF	9	nagf_tsa_uni_arima_update Univariate time series, update state set for forecasting
G13AHF	9	nagf_tsa_uni_arima_forecast_state Univariate time series, forecasting from state set
G13AJF	10	nagf_tsa_uni_arima_forcecast Univariate time series, state set and forecasts, from fully specified seasonal ARIMA model
G13AMF	22	nagf_tsa_uni_smooth_exp Univariate time series, exponential smoothing
G13ASF	13	nagf_tsa_uni_arima_resid Univariate time series, diagnostic checking of residuals, following G13AEF or G13AFF
G13AUF	14	nagf_tsa_uni_means Computes quantities needed for range-mean or standard deviation-mean plot
G13AWF	25	nagf_tsa_uni_dickey_fuller_unit Computes (augmented) Dickey–Fuller unit root test statistic
G13BAF	10	nagf_tsa_multi_filter_arima Multivariate time series, filtering (pre-whitening) by an ARIMA model
G13BBF	11	nagf_tsa_multi_filter_transf Multivariate time series, filtering by a transfer function model
G13BCF	10	nagf_tsa_multi_xcorr Multivariate time series, cross-correlations
G13BDF	11	nagf_tsa_multi_transf_prelim Multivariate time series, preliminary estimation of transfer function model
G13BEF	11	nagf_tsa_multi_inputmod_estim Multivariate time series, estimation of multi-input model
G13BGF	11	nagf_tsa_multi_inputmod_update Multivariate time series, update state set for forecasting from multi-input model
G13BHF	11	nagf_tsa_multi_inputmod_forecast_state Multivariate time series, forecasting from state set of multi-input model
G13BJF	11	nagf_tsa_multi_inputmod_forecast Multivariate time series, state set and forecasts from fully specified multi-input model

G13CAF	10	nagf_tsa_uni_spectrum_lag Univariate time series, smoothed sample spectrum using rectangular, Bartlett, Tukey or Parzen lag window
G13CBF	10	nagf_tsa_uni_spectrum_daniell Univariate time series, smoothed sample spectrum using spectral smoothing by the trapezium frequency (Daniell) window
G13CCF	10	nagf_tsa_multi_spectrum_lag Multivariate time series, smoothed sample cross spectrum using rectangular, Bartlett, Tukey or Parzen lag window
G13CDF	10	nagf_tsa_multi_spectrum_daniell Multivariate time series, smoothed sample cross spectrum using spectral smoothing by the trapezium frequency (Daniell) window
G13CEF	10	nagf_tsa_multi_spectrum_bivar Multivariate time series, cross amplitude spectrum, squared coherency, bounds, univariate and bivariate (cross) spectra
G13CFF	10	nagf_tsa_multi_gain_bivar Multivariate time series, gain, phase, bounds, univariate and bivariate (cross) spectra
G13CGF	10	nagf_tsa_multi_noise_bivar Multivariate time series, noise spectrum, bounds, impulse response function and its standard error
G13DBF	11	nagf_tsa_multi_autocorr_part Multivariate time series, multiple squared partial autocorrelations
G13DDF	22	nagf_tsa_multi_varma_estimate Multivariate time series, estimation of VARMA model
G13DJF	15	nagf_tsa_multi_varma_forecast Multivariate time series, forecasts and their standard errors
G13DKF	15	nagf_tsa_multi_varma_update Multivariate time series, updates forecasts and their standard errors
G13DLF	15	nagf_tsa_multi_diff Multivariate time series, differences and/or transforms
G13DMF	15	nagf_tsa_multi_corrmat_cross Multivariate time series, sample cross-correlation or cross-covariance matrices
G13DNF	15	nagf_tsa_multi_corrmat_partlag Multivariate time series, sample partial lag correlation matrices, $\chi^2$ statistics and significance levels
G13DPF	16	nagf_tsa_multi_regmat_partial Multivariate time series, partial autoregression matrices
G13DSF	13	nagf_tsa_multi_varma_diag Multivariate time series, diagnostic checking of residuals, following G13DDF
G13DXF	15	nagf_tsa_uni_arma_roots Calculates the zeros of a vector autoregressive (or moving average) operator
G13EAF	17	nagf_tsa_multi_kalman_sqrt_var Combined measurement and time update, one iteration of Kalman filter, time-varying, square root covariance filter
G13EBF	17	nagf_tsa_multi_kalman_sqrt_invar Combined measurement and time update, one iteration of Kalman filter, time-invariant, square root covariance filter
G13EJF	25	nagf_tsa_kalman_unscented_state_revcom Combined time and measurement update, one iteration of the Unscented Kalman Filter for a nonlinear state space model, with additive noise (reverse communication)
G13EKF	25	nagf_tsa_kalman_unscented_state Combined time and measurement update, one iteration of the Unscented Kalman Filter for a nonlinear state space model, with additive noise

G13FAF	20	nagf_tsa_uni_garch_asym1_estim Univariate time series, parameter estimation for either a symmetric GARCH process or a GARCH process with asymmetry of the form $(\epsilon_{t-1} + \gamma)^2$
G13FBF	20	nagf_tsa_uni_garch_asym1_forecast Univariate time series, forecast function for either a symmetric GARCH process or a GARCH process with asymmetry of the form $(\epsilon_{t-1} + \gamma)^2$
G13FCF	20	nagf_tsa_uni_garch_asym2_estim Univariate time series, parameter estimation for a GARCH process with asymmetry of the form $( \epsilon_{t-1}  + \gamma\epsilon_{t-1})^2$
G13FDF	20	nagf_tsa_uni_garch_asym2_forecast Univariate time series, forecast function for a GARCH process with asymmetry of the form $( \epsilon_{t-1}  + \gamma\epsilon_{t-1})^2$
G13FEF	20	nagf_tsa_uni_garch_GJR_estim Univariate time series, parameter estimation for an asymmetric Glosten, Jagannathan and Runkle (GJR) GARCH process
G13FFF	20	nagf_tsa_uni_garch_GJR_forecast Univariate time series, forecast function for an asymmetric Glosten, Jagannathan and Runkle (GJR) GARCH process
G13FGF	20	nagf_tsa_uni_garch_exp_estim Univariate time series, parameter estimation for an exponential GARCH (EGARCH) process
G13FHF	20	nagf_tsa_uni_garch_exp_forecast Univariate time series, forecast function for an exponential GARCH (EGARCH) process
G13MEF	24	nagf_tsa_inhom_iema Computes the iterated exponential moving average for a univariate inhomogeneous time series
G13MFF	24	nagf_tsa_inhom_iema_all Computes the iterated exponential moving average for a univariate inhomogeneous time series, intermediate results are also returned
G13MGF	24	nagf_tsa_inhom_ma Computes the exponential moving average for a univariate inhomogeneous time series
G13NAF	25	nagf_tsa_cp_pelt Change point detection, using the PELT algorithm
G13NBF	25	nagf_tsa_cp_pelt_user Change points detection using the PELT algorithm, user supplied cost function
G13NDF	25	nagf_tsa_cp_binary Change point detection, using binary segmentation
G13NEF	25	nagf_tsa_cp_binary_user Change point detection, using binary segmentation, user supplied cost function

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