# NAG Library Chapter Contents

# G13 – Time Series Analysis

G13 Chapter Introduction

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

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|---|---|---|
| G13BGF | 11 | nagf_tsa_multi_inputmod_update<br>Multivariate time series, update state set for forecasting from multi-input model |
| G13BHF | 11 | nagf_tsa_multi_inputmod_forecast_state<br>Multivariate time series, forecasting from state set of multi-input model |
| G13BJF | 11 | nagf_tsa_multi_inputmod_forecast<br>Multivariate time series, state set and forecasts from fully specified multi-input model |
| G13CAF | 10 | nagf_tsa_uni_spectrum_lag<br>Univariate time series, smoothed sample spectrum using rectangular, Bartlett, Tukey or Parzen lag window |
| G13CBF | 10 | nagf_tsa_uni_spectrum_daniell<br>Univariate time series, smoothed sample spectrum using spectral smoothing by the trapezium frequency (Daniell) window |
| G13CCF | 10 | nagf_tsa_multi_spectrum_lag<br>Multivariate time series, smoothed sample cross spectrum using rectangular, Bartlett, Tukey or Parzen lag window |
| G13CDF | 10 | nagf_tsa_multi_spectrum_daniell<br>Multivariate time series, smoothed sample cross spectrum using spectral smoothing by the trapezium frequency (Daniell) window |
| G13CEF | 10 | nagf_tsa_multi_spectrum_bivar<br>Multivariate time series, cross amplitude spectrum, squared coherency, bounds, univariate and bivariate (cross) spectra |
| G13CFF | 10 | nagf_tsa_multi_gain_bivar<br>Multivariate time series, gain, phase, bounds, univariate and bivariate (cross) spectra |
| G13CGF | 10 | nagf_tsa_multi_noise_bivar<br>Multivariate time series, noise spectrum, bounds, impulse response function and its standard error |
| G13DBF | 11 | nagf_tsa_multi_autocorr_part<br>Multivariate time series, multiple squared partial autocorrelations |
| G13DDF | 22 | nagf_tsa_multi_varma_estimate<br>Multivariate time series, estimation of VARMA model |
| G13DJF | 15 | nagf_tsa_multi_varma_forecast<br>Multivariate time series, forecasts and their standard errors |
| G13DKF | 15 | nagf_tsa_multi_varma_update<br>Multivariate time series, updates forecasts and their standard errors |
| G13DLF | 15 | nagf_tsa_multi_diff<br>Multivariate time series, differences and/or transforms |
| G13DMF | 15 | nagf_tsa_multi_corrmat_cross<br>Multivariate time series, sample cross-correlation or cross-covariance matrices |
| G13DNF | 15 | nagf_tsa_multi_corrmat_partlag<br>Multivariate time series, sample partial lag correlation matrices, $\chi^2$ statistics and significance levels |
| G13DPF | 16 | nagf_tsa_multi_regmat_partial<br>Multivariate time series, partial autoregression matrices |
| G13DSF | 13 | nagf_tsa_multi_varma_diag<br>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 |
| 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 |