

# NAG Fortran Library Chapter Contents

## G13 – Time Series Analysis

**Note:** please refer to the Users' Note for your implementation to check that a routine is available.

### G13 Chapter Introduction

| <b>Routine Name</b> | <b>Mark of Introduction</b> | <b>Purpose</b>                                                                                                                |
|---------------------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| G13AAF              | 9                           | Univariate time series, seasonal and non-seasonal differencing                                                                |
| G13ABF              | 9                           | Univariate time series, sample autocorrelation function                                                                       |
| G13ACF              | 9                           | Univariate time series, partial autocorrelations from autocorrelations                                                        |
| G13ADF              | 9                           | Univariate time series, preliminary estimation, seasonal ARIMA model                                                          |
| G13AEF              | 9                           | Univariate time series, estimation, seasonal ARIMA model (comprehensive)                                                      |
| G13AFF              | 9                           | Univariate time series, estimation, seasonal ARIMA model (easy-to-use)                                                        |
| G13AGF              | 9                           | Univariate time series, update state set for forecasting                                                                      |
| G13AHF              | 9                           | Univariate time series, forecasting from state set                                                                            |
| G13AJF              | 10                          | Univariate time series, state set and forecasts, from fully specified seasonal ARIMA model                                    |
| G13ASF              | 13                          | Univariate time series, diagnostic checking of residuals, following G13AEF or G13AFF                                          |
| G13AUF              | 14                          | Computes quantities needed for range-mean or standard deviation-mean plot                                                     |
| G13BAF              | 10                          | Multivariate time series, filtering (pre-whitening) by an ARIMA model                                                         |
| G13BBF              | 11                          | Multivariate time series, filtering by a transfer function model                                                              |
| G13BCF              | 10                          | Multivariate time series, cross-correlations                                                                                  |
| G13BDF              | 11                          | Multivariate time series, preliminary estimation of transfer function model                                                   |
| G13BEF              | 11                          | Multivariate time series, estimation of multi-input model                                                                     |
| G13BGF              | 11                          | Multivariate time series, update state set for forecasting from multi-input model                                             |
| G13BHF              | 11                          | Multivariate time series, forecasting from state set of multi-input model                                                     |
| G13BJF              | 11                          | Multivariate time series, state set and forecasts from fully specified multi-input model                                      |
| G13CAF              | 10                          | Univariate time series, smoothed sample spectrum using rectangular, Bartlett, Tukey or Parzen lag window                      |
| G13CBF              | 10                          | Univariate time series, smoothed sample spectrum using spectral smoothing by the trapezium frequency (Daniell) window         |
| G13CCF              | 10                          | Multivariate time series, smoothed sample cross spectrum using rectangular, Bartlett, Tukey or Parzen lag window              |
| G13CDF              | 10                          | Multivariate time series, smoothed sample cross spectrum using spectral smoothing by the trapezium frequency (Daniell) window |
| G13CEF              | 10                          | Multivariate time series, cross amplitude spectrum, squared coherency, bounds, univariate and bivariate (cross) spectra       |
| G13CFF              | 10                          | Multivariate time series, gain, phase, bounds, univariate and bivariate (cross) spectra                                       |
| G13CGF              | 10                          | Multivariate time series, noise spectrum, bounds, impulse response function and its standard error                            |
| G13DBF              | 11                          | Multivariate time series, multiple squared partial autocorrelations                                                           |
| G13DCF              | 12                          | Multivariate time series, estimation of VARMA model                                                                           |
| G13DJF              | 15                          | Multivariate time series, forecasts and their standard errors                                                                 |
| G13DKF              | 15                          | Multivariate time series, updates forecasts and their standard errors                                                         |
| G13DLF              | 15                          | Multivariate time series, differences and/or transforms                                                                       |
| G13DMF              | 15                          | Multivariate time series, sample cross-correlation or cross-covariance matrices                                               |
| G13DNF              | 15                          | Multivariate time series, sample partial lag correlation matrices, $\chi^2$ statistics and significance levels                |
| G13DPF              | 16                          | Multivariate time series, partial autoregression matrices                                                                     |

|        |    |                                                                                                                                                               |
|--------|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| G13DSF | 13 | Multivariate time series, diagnostic checking of residuals, following G13DCF                                                                                  |
| G13DXF | 15 | Calculates the zeros of a vector autoregressive (or moving average) operator                                                                                  |
| G13EAF | 17 | Combined measurement and time update, one iteration of Kalman filter, time-varying, square root covariance filter                                             |
| G13EBF | 17 | Combined measurement and time update, one iteration of Kalman filter, time-invariant, square root covariance filter                                           |
| G13FAF | 20 | 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 | 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 | Univariate time series, parameter estimation for a GARCH process with asymmetry of the form $( \epsilon_{t-1}  + \gamma\epsilon_{t-1})^2$                     |
| G13FDF | 20 | Univariate time series, forecast function for a GARCH process with asymmetry of the form $( \epsilon_{t-1}  + \gamma\epsilon_{t-1})^2$                        |
| G13FEF | 20 | Univariate time series, parameter estimation for an asymmetric Glosten, Jagannathan and Runkle (GJR) GARCH process                                            |
| G13FFF | 20 | Univariate time series, forecast function for an asymmetric Glosten, Jagannathan and Runkle (GJR) GARCH process                                               |
| G13FGF | 20 | Univariate time series, parameter estimation for an exponential GARCH (EGARCH) process                                                                        |
| G13FHF | 20 | Univariate time series, forecast function for an exponential GARCH (EGARCH) process                                                                           |

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