NAG C Library Function Document

nag_forecast_agarchI (g13fbc)

1 Purpose

nag_forecast_agarchI (g13fbc) forecasts the conditional variances, \( h_t, \, t = 1, \ldots, \tau \) from a type I AGARCH\((p, q)\) sequence, where \( \tau \) is the forecast horizon (see Engle and Ng (1993)).

2 Specification

```c
#include <nag.h>
#include <naggl3.h>

void nag_forecast_agarchI (Integer num, Integer nt, Integer p, Integer q,
             const double theta[], double gamma, double fht[], const double ht[],
             const double et[], NagError *fail)
```

3 Description

Assume the standard \((\gamma = 0)\) GARCH\((p, q)\) process can be represented by:

\[
\epsilon_t | \psi_{t-1} \sim N(0, h_t)
\]

\[
h_t = \alpha_0 + \sum_{i=1}^{q} \alpha_i \epsilon_{t-i}^2 + \sum_{i=1}^{p} \beta_i h_{t-i}, \quad t = 1, \ldots, T.
\]

or type I AGARCH\((p,q)\) process with conditional variance \( h_t \) given by:

\[
h_t = \alpha_0 + \sum_{i=1}^{q} \alpha_i (\epsilon_{t-i} + \gamma)^2 + \sum_{i=1}^{p} \beta_i h_{t-i}, \quad t = 1, \ldots, T.
\]

has been modelled by nag_estimate_agarchI (g13fac) and the estimated conditional variances and residuals are contained in the arrays \( \text{ht} \) and \( \text{et} \) respectively. Then nag_forecast_agarchI will use the last \( \text{max}(p,q) \) elements of the arrays \( \text{ht} \) and \( \text{et} \) to estimate the conditional variance forecasts, \( h_t | \psi_T, \) where \( t = T + 1, \ldots, T + \tau \) and \( \tau \) is the forecast horizon.

4 Parameters

1: \( \text{num} - \text{Integer} \quad \text{Input} \)

\( \text{On entry:} \) the number of terms in the arrays \( \text{ht} \) and \( \text{et} \) from the modelled sequence.

\( \text{Constraint:} \) \( \text{max}(p,q) \leq \text{num}, \text{num} \geq 0. \)

2: \( \text{nt} - \text{Integer} \quad \text{Input} \)

\( \text{On entry:} \) the forecast horizon, \( \tau. \)

\( \text{Constraint:} \) \( \text{nt} > 0. \)

3: \( \text{p} - \text{Integer} \quad \text{Input} \)

\( \text{On entry:} \) the GARCH\((p, q)\) parameter \( p. \)

\( \text{Constraint:} \) \( 0 < \text{max}(p,q) \leq \text{num}, \text{p} \geq 0. \)

4: \( \text{q} - \text{Integer} \quad \text{Input} \)

\( \text{On entry:} \) the GARCH\((p, q)\) parameter \( q. \)

\( \text{Constraint:} \) \( 0 < \text{max}(p,q) \leq \text{num}, \text{q} \geq 1. \)
5: \[ \text{theta}[q+p+1] \] – const double \hspace{1cm} \text{Input}

On entry: the first element contains the coefficient \( \alpha_0 \), the next \( q \) elements contain the coefficients \( \alpha_i \), \( i = 1, \ldots, q \). The remaining \( p \) elements are the coefficients \( \beta_j \), \( j = 1, \ldots, p \).

6: \[ \text{gamma} \] – double \hspace{1cm} \text{Input}

On entry: the asymmetry parameter \( \gamma \) for the GARCH\((p,q)\) sequence.

7: \[ \text{fht}[nt] \] – double \hspace{1cm} \text{Output}

On exit: the forecast values of the conditional variance, \( h_t \), \( t = 1, \ldots, \tau \).

8: \[ \text{ht}[num] \] – const double \hspace{1cm} \text{Input}

On entry: the sequence of past conditional variances for the GARCH\((p,q)\) process, \( h_t \), \( t = 1, \ldots, T \).

9: \[ \text{et}[num] \] – const double \hspace{1cm} \text{Input}

On entry: the sequence of past residuals for the GARCH\((p,q)\) process, \( \epsilon_t \), \( t = 1, \ldots, T \).

10: \[ \text{fail} \] – NagError * \hspace{1cm} \text{Input/Output}

The NAG error parameter (see the Essential Introduction).

5 \hspace{1cm} \text{Error Indicators and Warnings}

\textbf{NE\_INT\_ARG\_LT}

On entry, \text{num} must not be less than 0: \text{num} = \text{value}.

On entry, \text{p} must not be less than 0: \text{p} = \text{value}.

On entry, \text{q} must not be less than 1: \text{q} = \text{value}.

On entry, \text{nt} must not be less than 1: \text{nt} = \text{value}.

\textbf{NE\_2\_INT\_ARG\_LT}

On entry, \text{num} = \text{value} while max(\text{p}, \text{q}) = \text{value}.

These parameters must satisfy \text{num} \geq \text{max}(\text{p}, \text{q}).

\textbf{NE\_ALLOC\_FAIL}

Memory allocation failed.

6 \hspace{1cm} \text{Further Comments}

6.1 \hspace{1cm} \text{Accuracy}

Not applicable.

6.2 \hspace{1cm} \text{References}


7 See Also
None.

8 Example
See the example for nag_estimate_agarchl (g13fac).