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 <nagl13.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:

$$\varepsilon_t | \psi_{t-1} \sim N(0, h_t)$$

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

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

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

has been modelled by nag_estimate_agarchI (g13fac) and the estimated conditional variances and residuals are contained in the arrays $ht$ and $et$ respectively. Then nag_forecast_agarchI will use the last $\max(p, q)$ elements of the arrays $ht$ and $et$ 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: \hspace{1cm} \textbf{num – Integer} \hspace{1cm} \textit{Input}

\textit{On entry:} the number of terms in the arrays $ht$ and $et$ from the modelled sequence.

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

2: \hspace{1cm} \textbf{nt – Integer} \hspace{1cm} \textit{Input}

\textit{On entry:} the forecast horizon, $\tau$.

\textit{Constraint:} $\textbf{nt} > 0$.

3: \hspace{1cm} \textbf{p – Integer} \hspace{1cm} \textit{Input}

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

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

4: \hspace{1cm} \textbf{q – Integer} \hspace{1cm} \textit{Input}

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

\textit{Constraint:} $0 < \max(p, q) \leq \textbf{num}$, $q \geq 1$. 

[NP3491/6]
5: theta[q+p+1] – const double
   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: gamma – double
   Input
   On entry: the asymmetry parameter $\gamma$ for the GARCH$(p, q)$ sequence.

7: fht[nt] – double
   Output
   On exit: the forecast values of the conditional variance, $h_t, t = 1, \ldots, \tau$.

8: ht[num] – const double
   Input
   On entry: the sequence of past conditional variances for the GARCH$(p, q)$ process, $h_t, t = 1, \ldots, T$.

9: et[num] – const double
   Input
   On entry: the sequence of past residuals for the GARCH$(p, q)$ process, $\epsilon_t, t = 1, \ldots, T$.

10: fail – NagError *
    Input/Output
    The NAG error parameter (see the Essential Introduction).

5 Error Indicators and Warnings

NE_INT_ARG_LT
   On entry, num must not be less than 0: num = <value>.
   On entry, p must not be less than 0: p = <value>.
   On entry, q must not be less than 1: q = <value>.
   On entry, nt must not be less than 1: nt = <value>.

NE_2_INT_ARG_LT
   On entry, num = <value> while max(p.q) = <value>.
   These parameters must satisfy num $\geq$ max(p.q).

NE_ALLOC_FAIL
   Memory allocation failed.

6 Further Comments

6.1 Accuracy
   Not applicable.

6.2 References
7  See Also
None.

8  Example
See the example for nag_estimate_agarchl (g13fac).