NAG C Library Function Document

nag_forecast_agarchII (g13fde)

1 Purpose

nag_forecast_agarchII (g13fde) forecasts the conditional variances, $h_t$, $t = 1, \ldots, \tau$ from a type II AGARCH($p,q$) sequence, where $\tau$ is the forecast horizon (see Engle and Ng (1993)).

2 Specification

```c
#include <nag.h>
#include <nagl3.h>

void nag_forecast_agarchII (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 GARCH($p,q$) process can be represented by:

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

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

has been modelled by nag_estimate_agarchII (g13fcc) and the estimated conditional variances and residuals are contained in the arrays ht and et respectively. Then nag_forecast_agarchII 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: **num** – Integer

*Input*

*On entry:* the number of terms in the arrays ht and et from the modelled sequence.

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

2: **nt** – Integer

*Input*

*On entry:* the forecast horizon, $\tau$.

*Constraint:* $\text{nt} > 0$.

3: **p** – Integer

*Input*

*On entry:* the GARCH($p,q$) parameter $p$.

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

4: **q** – Integer

*Input*

*On entry:* the GARCH($p,q$) parameter $q$.

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

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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 \textbf{Error Indicators and Warnings}

\textbf{NE_INT_ARG_LT}

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

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

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

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

\textbf{NE_2_INT_ARG_LT}

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

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

\textbf{NE_ALLOC_FAIL}

Memory allocation failed.

6 \textbf{Further Comments}

6.1 \textbf{Accuracy}

Not applicable.

6.2 \textbf{References}


7 See Also
None.

8 Example
See the example for nag_estimate_agarchII (g13fcc).