NAG C Library Function Document

nag_forecast_garchGJR (g13fxc)

1 Purpose

nag_forecast_garchGJR (g13fxc) forecasts the conditional variances, \( h_t, t = 1, \ldots, \tau \) from a GJR GARCH\((p, q)\) sequence, where \( \tau \) is the forecast horizon (see Glosten, et al. (1993)).

2 Specification

```c
#include <nag.h>
#include <nagf11.h>

void nag_forecast_garchGJR (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:

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

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

where \( S_t = 1, \) if \( \epsilon_t < 0, \) and \( S_t = 0, \) if \( \epsilon_t \geq 0 \) has been modelled by nag_estimate_garchGJR (g13fec) and the estimated conditional variances and residuals are contained in the arrays \( \mathbf{ht} \) and \( \mathbf{et} \) respectively. Then nag_forecast_garchGJR will use the last \( \max(p,q) \) elements of the arrays \( \mathbf{ht} \) and \( \mathbf{et} \) 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. \textbf{num} – Integer \hspace{1cm} Input

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

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

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

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

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

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

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

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

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

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

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

5. \textbf{theta[q+p+1]} – const double \hspace{1cm} Input

   On entry: the first element contains the coefficient \( \alpha_\text{p}, \) 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, $h_t$, $t = 1, \ldots, T$.

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** = \textless value\textgreater.

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

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

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

**NE_2_INT_ARG_LT**

*On entry,* **num** = \textless value\textgreater while $\max(p, q)$ = \textless value\textgreater.

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_agarchII (g13fcc).