NAG Library Function Document

nag_forecast_agarchII (g13fdc)

1 Purpose

nag_forecast_agarchII (g13fdc) 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 <nagg13.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 (g13fdc) 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 References


5 Arguments

1: num – Integer
   
   *Input*
   
   *On entry:* the number of terms in the arrays `ht` and `et` from the modelled sequence.
   
   *Constraint:* \( \max(p,q) \leq \text{num}. \)

2: nt – Integer
   
   *Input*
   
   *On entry:* \( \tau \), the forecast horizon.
   
   *Constraint:* \( \text{nt} > 0. \)
3:  \( p \) – Integer  
    *Input*
    
    *On entry:* the GARCH\((p, q)\) argument \( p \).
    
    *Constraint:* \( 0 < \max(p, q) \leq \text{num}, p \geq 0 \).

4:  \( q \) – Integer  
    *Input*
    
    *On entry:* the GARCH\((p, q)\) argument \( q \).
    
    *Constraint:* \( 0 < \max(p, q) \leq \text{num}, q \geq 1 \).

5:  \( \text{theta}[q + p + 1] \) – const double  
    *Input*
    
    *On entry:* the first element must contain the coefficient \( \alpha_0 \) and the next \( q \) elements must contain the coefficients \( \alpha_i \), for \( i = 1, 2, \ldots, q \). The remaining \( p \) elements must contain the coefficients \( \beta_j \), for \( j = 1, 2, \ldots, p \).

6:  \( \text{gamma} \) – double  
    *Input*
    
    *On entry:* the asymmetry argument \( \gamma \) for the GARCH\((p, q)\) sequence.

7:  \( \text{fht}[\text{nt}] \) – double  
    *Output*
    
    *On exit:* the forecast values of the conditional variance, \( h_t \), for \( t = 1, 2, \ldots, \tau \).

8:  \( \text{ht}[\text{num}] \) – const double  
    *Input*
    
    *On entry:* the sequence of past conditional variances for the GARCH\((p, q)\) process, \( h_t \), for \( t = 1, 2, \ldots, T \).

9:  \( \text{et}[\text{num}] \) – const double  
    *Input*
    
    *On entry:* the sequence of past residuals for the GARCH\((p, q)\) process, \( \epsilon_t \), for \( t = 1, 2, \ldots, T \).

10:  \( \text{fail} \) – NagError*  
    *Input/Output*
    
    The NAG error argument (see Section 3.6 in the Essential Introduction).

6  **Error Indicators and Warnings**

**NE_2_INT_ARG_LT**

*On entry,* \( \text{num} = \langle \text{value} \rangle \) while \( \max(p, q) = \langle \text{value} \rangle \). These arguments must satisfy \( \text{num} \geq \max(p, q) \).

**NE_ALLOC_FAIL**

Dynamic memory allocation failed.

**NE_INT_ARG_LT**

*On entry,* \( \text{nt} = \langle \text{value} \rangle \).

*Constraint:* \( \text{nt} \geq 1 \).

*On entry,* \( \text{num} = \langle \text{value} \rangle \).

*Constraint:* \( \text{num} \geq 0 \).

*On entry,* \( p = \langle \text{value} \rangle \).

*Constraint:* \( p \geq 0 \).

*On entry,* \( q = \langle \text{value} \rangle \).

*Constraint:* \( q \geq 1 \).
7  Accuracy
Not applicable.

8  Parallelism and Performance
Not applicable.

9  Further Comments
None.

10 Example
See the example for nag_estimate_agarchII (g13fcc).