NAG C Library Function Document

nag_generate_agarchI (g05hkc)

1 Purpose

nag_generate_agarchI (g05hkc) generates a given number of terms of a type I AGARCH(\(p, q\)) process (see Engle and Ng (1993)).

2 Specification

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

void nag_generate_agarchI (Integer num, Integer p, Integer q,
                           const double theta[], double gamma, double ht[], double et[],
                           Nag_Garch_Fcall_Type fcall, double rvec[], NagError *fail)
```

3 Description

A type I AGARCH(\(p, q\)) process can be represented by:

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

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

Here \(T\) is the number of observations in the sequence, \(\epsilon_t\) is the observed value of the GARCH(\(p, q\)) process at time \(t\), \(h_t\) is the conditional variance at time \(t\), and \(\psi_t\) the information set of all information up to time \(t\). Symmetric GARCH(\(p, q\)) sequences are generated when \(\gamma\) is zero, otherwise asymmetric GARCH(\(p, q\)) sequences are generated with \(\gamma\) specifying the amount by which positive (or negative) shocks are to be enhanced.

4 Parameters

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

   \textit{On entry:} the number of terms in the sequence, \(T\).

   \textit{Constraints:}
   
   \textbf{num} \geq 1,
   
   \textbf{num} > \textbf{p} + \textbf{q} + 1.

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

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

   \textit{Constraint:} \textbf{p} \geq 0.

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

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

   \textit{Constraint:} \textbf{q} \geq 1.

4: \textbf{theta[|q+p+1]} – const double \hspace{1cm} \textit{Input}

   \textit{On entry:} the first element contains the coefficient \(\alpha_0\), the next \textbf{q} elements contain the coefficients \(\alpha_i, \quad i = 1, \ldots, q\). The remaining \textbf{p} elements are the coefficients \(\beta_j, \quad j = 1, \ldots, p\).
gamma – double

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

ht[num] – double

On exit: the conditional variances $h_t$, $t = 1,\ldots,T$ for the GARCH($p,q$) sequence.

et[num] – double

On exit: the observations $\epsilon_t$, $t = 1,\ldots,T$ for the GARCH($p,q$) sequence.

fcall – Nag_Garch_Fcall_Type

On entry: if fcall = Nag_Garch_Fcall_True then a new sequence is to be generated, 
else if fcall = Nag_Garch_Fcall_False a given sequence is to be continued using the information 
in rvec.

rvec[2*(p+q+1)] – double

On entry: the array contains information required to continue a sequence 
if fcall = Nag_Garch_Fcall_False.

On exit: contains information that can be used in a subsequent call of nag_generate_agarchl, with 
fcall = Nag_Garch_Fcall_False.

fail – NagError *

The NAG error parameter (see the Essential Introduction).

5 Error Indicators and Warnings

NE_BAD_PARAM

On entry, parameter fcall had an illegal value.

NE_INT_ARG_LT

On entry, p must not be less than 0: p = <value>.
On entry, q must not be less than 1: q = <value>.
On entry, num must not be less than 1: num = <value>.
On entry, num = <value> while p+q+1 = <value>
These parameters must satisfy num $\geq$ p+q+1.

6 Further Comments

6.1 Accuracy

Not applicable.

6.2 References


7 See Also
None.

8 Example
See the example for nag_estimate_agarch1 (g13fac).