NAG C Library Function Document

nag_forecast_garchGJR (g13ffc)

1 Purpose

nag_forecast_garchGJR (g13ffc) forecasts the conditional variances, h_t, $t = 1, \ldots, \tau$ from a GJR GARCH(p, q) sequence, where τ is the forecast horizon (see Glosten, *et al.* (1993)).

2 Specification

```
#include <nag.h>
#include <nagg13.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 **ht**[] and **et**[] respectively. Then nag_forecast_garchGJR 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 τ 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**[]) $\leq$ **num**[], **num**[] ≥ 0.

2: **nt** – Integer *Input*

On entry: the forecast horizon, τ.

Constraint: **nt**[] > 0.

3: **p** – Integer *Input*

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

Constraint: $0 <$ max(**p**[],**q**[]) $\leq$ **num**[], **p**[] ≥ 0.

4: **q** – Integer *Input*

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

Constraint: $0 <$ max(**p**[],**q**[]) $\leq$ **num**[], **q**[] ≥ 1.

5: **theta[q+p+1]** – const double *Input*

On entry: the first element contains the coefficient α_o, the next **q**[] elements contain the coefficients α_i, $i = 1, \ldots, q$. The remaining **p**[] elements are the coefficients β_j, $j = 1, \ldots, p$.

6: **gamma** – double *Input*

On entry: the asymmetry parameter γ 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, ϵ_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

Engle R (1982) Autoregressive Conditional Heteroskedasticity with Estimates of the Variance of United Kingdom Inflation *Econometrica* **50** 987–1008

Bollerslev T (1986) Generalised Autoregressive Conditional Heteroskedasticity *Journal of Econometrics* **31** 307–327

Engle R and Ng V (1993) Measuring and Testing the Impact of News on Volatility *Journal of Finance* **48** 1749–1777

Hamilton J (1994) *Time Series Analysis* Princeton University Press

Glosten L, Jagannathan R and Runkle D (1993) Relationship between the Expected Value and the Volatility of Nominal Excess Return on Stocks *Journal of Finance* **48** 1779–1801

7 See Also

None.

8 Example

See the example for nag_estimate_agarchII (g13fcc).