Financial Econometric Models

Johannes Degn

04.02.2014

1 Univariate type-ARCH models

2 Multivariate type-ARCH models

2.1

2.1.1 BEKK(1,1,1)

i)

$$H_t = C'C + A'\varepsilon_{t-1}\varepsilon'_{t-1}A + B'H_{t-1}B$$

$$H_t = \begin{pmatrix} c_1 & 0 \\ c_2 & c_3 \end{pmatrix} \begin{pmatrix} c_1 & c_2 \\ 0 & c_3 \end{pmatrix} + \begin{pmatrix} a_1 & 0 \\ 0 & a_2 \end{pmatrix} \begin{pmatrix} \varepsilon_{t-1,1} \\ \varepsilon_{t-1,2} \end{pmatrix} \begin{pmatrix} \varepsilon_{t-1,1} & \varepsilon_{t-1,2} \end{pmatrix} \begin{pmatrix} a_1 & 0 \\ 0 & a_2 \end{pmatrix} +$$
$$\begin{pmatrix} b_1 & 0 \\ 0 & b_2 \end{pmatrix} \begin{pmatrix} h_{t-1,11} & h_{t-1,12} \\ h_{t-1,21} & h_{t-1,22} \end{pmatrix} \begin{pmatrix} b_1 & 0 \\ 0 & b_2 \end{pmatrix}$$

$$H_t = \begin{pmatrix} c_1^2 & c_1c_2 \\ c_1c_2 & c_2^2 + c_3^2 \end{pmatrix} + \begin{pmatrix} a_1^2\varepsilon_{t-1,1}^2 & a_1a_2\varepsilon_{t-1,1}\varepsilon_{t-1,2} \\ a_1a_2\varepsilon_{t-1,1}\varepsilon_{t-1,2} & a_2^2\varepsilon_{t-1,2} \end{pmatrix} + \begin{pmatrix} b_1^2 h_{t-1,11} & b_1b_2 h_{t-1,12} \\ b_1b_2 h_{t-1,21} & b_2^2 h_{t-1,22} \end{pmatrix}$$

$h_{t,11}$, $h_{t,22}$ and $h_{t,12}$ can be read from the respective addition above.

ii) positivity constraints are satisfied as the diagonal elements ($h_{t,11}$ and $h_{t,22}$) are bigger than or equal to 0. TODO: CHECK THIS WHAT IS ASKED!

iii)

Figure 1: Simulated series of a BEKK(1,1,1)

parameters: $A = \begin{pmatrix} 0.5 & 0 \\ 0 & 0.5 \end{pmatrix}$, $B = \begin{pmatrix} 0.5 & 0 \\ 0 & 0.5 \end{pmatrix}$, $C = \begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}$