summary(fit.mle.eGARCH.norm)

[1] "Specification Type: Markov-Switching"

[1] "Specification Name: eGARCH\_normal\_sym eGARCH\_normal\_sym"

[1] "Number of parameters in each variance model: 4 4"

[1] "Number of parameters in each distribution: 0 0"

[1] "Default parameters:"

alpha0\_1 alpha1\_1 alpha2\_1 beta\_1 alpha0\_2 alpha1\_2

[1,] 0.01 0.2 -0.1 0.8 0.01 0.2

alpha2\_2 beta\_2 P P

[1,] -0.1 0.8 0.5 0.5

[1] "DEoptim initialization: FALSE"

[1] "Fitted Parameters:"

alpha0\_1 alpha1\_1 alpha2\_1 beta\_1

[1,] -0.1536965 0.1037973 0.008161393 0.983881

alpha0\_2 alpha1\_2 alpha2\_2 beta\_2 P

[1,] -0.0001035878 0.1200077 -0.1289592 0.9999 0.02830583

P

[1,] 0.1624292

[1] "Transition matrix:"

t = 1 t = 2

t + 1 = 1 0.02830583 0.1624292

t + 1 = 2 0.97169417 0.8375708

[1] "Stable probabilities:"

Stable probabilities

State 1 0.1432201

State 2 0.8567799

[1] "Unconditional volatility:"

State 1 State 2

[1,] 0.008501234 0.5957506

Log-kernel: -6715.055

AIC: 13568.83

BIC: 13631.96

summary(fit.bayes.eGARCH.norm)

[1] "Specification Type: Markov-Switching"

[1] "Specification Name: eGARCH\_normal\_sym eGARCH\_normal\_sym"

[1] "Number of parameters in each variance model: 4 4"

[1] "Number of parameters in each distribution: 0 0"

[1] "Default parameters:"

alpha0\_1 alpha1\_1 alpha2\_1 beta\_1 alpha0\_2 alpha1\_2

[1,] 0.01 0.2 -0.1 0.8 0.01 0.2

alpha2\_2 beta\_2 P P

[1,] -0.1 0.8 0.5 0.5

[1] "Bayesian posterior mean:"

alpha0\_1 alpha1\_1 alpha2\_1 beta\_1

-0.007372006 0.123013187 -0.111806929 0.997798944

alpha0\_2 alpha1\_2 alpha2\_2 beta\_2

0.471758548 0.601797367 0.081444221 0.907136164

P P

0.970822554 0.889291422

[1] "Posterior variance-covariance matrix"

alpha0\_1 alpha1\_1 alpha2\_1

alpha0\_1 5.538759e-06 -2.027856e-07 5.219419e-06

alpha1\_1 -2.027856e-07 1.432857e-04 -1.389943e-05

alpha2\_1 5.219419e-06 -1.389943e-05 8.238552e-05

beta\_1 -1.088902e-06 -3.232265e-06 -1.637875e-06

alpha0\_2 3.927179e-04 2.225455e-04 4.664724e-06

alpha1\_2 2.628109e-04 8.826034e-05 1.234684e-04

alpha2\_2 4.240922e-05 -1.327781e-04 -5.620235e-04

beta\_2 -7.068014e-05 -6.713943e-05 3.463852e-05

P 3.702723e-05 -7.815678e-06 -4.298072e-06

P -5.150491e-05 4.297253e-05 -3.763909e-05

beta\_1 alpha0\_2 alpha1\_2

alpha0\_1 -1.088902e-06 3.927179e-04 2.628109e-04

alpha1\_1 -3.232265e-06 2.225455e-04 8.826034e-05

alpha2\_1 -1.637875e-06 4.664724e-06 1.234684e-04

beta\_1 1.203892e-06 -1.454899e-04 -9.581802e-05

alpha0\_2 -1.454899e-04 9.791304e-02 5.727087e-02

alpha1\_2 -9.581802e-05 5.727087e-02 1.067582e-01

alpha2\_2 3.472360e-05 4.248180e-02 1.276941e-02

beta\_2 2.771021e-05 -2.199649e-02 -4.971056e-04

P -6.414951e-06 4.097277e-03 2.725931e-03

P 1.189427e-05 -2.342237e-03 2.427654e-03

alpha2\_2 beta\_2 P

alpha0\_1 4.240922e-05 -7.068014e-05 3.702723e-05

alpha1\_1 -1.327781e-04 -6.713943e-05 -7.815678e-06

alpha2\_1 -5.620235e-04 3.463852e-05 -4.298072e-06

beta\_1 3.472360e-05 2.771021e-05 -6.414951e-06

alpha0\_2 4.248180e-02 -2.199649e-02 4.097277e-03

alpha1\_2 1.276941e-02 -4.971056e-04 2.725931e-03

alpha2\_2 1.485425e-01 -1.148003e-02 1.391077e-03

beta\_2 -1.148003e-02 7.775302e-03 -7.566730e-04

P 1.391077e-03 -7.566730e-04 4.705170e-04

P -4.236240e-03 8.629226e-04 -5.482233e-04

P

alpha0\_1 -5.150491e-05

alpha1\_1 4.297253e-05

alpha2\_1 -3.763909e-05

beta\_1 1.189427e-05

alpha0\_2 -2.342237e-03

alpha1\_2 2.427654e-03

alpha2\_2 -4.236240e-03

beta\_2 8.629226e-04

P -5.482233e-04

P 1.032472e-02

[1] "Posterior mean transition matrix:"

t = 1 t = 2

t + 1 = 1 0.97082255 0.8892914

t + 1 = 2 0.02917745 0.1107086

[1] "Posterior mean stable probabilities:"

Stable probabilities

State 1 0.96823251

State 2 0.03176749

[1] "Posterior mean unconditional volatility:"

State 1 State 2

[1,] 0.1873734 12.68037

Acceptance rate: 1

AIC: 13476.24

BIC: 13539.36

DIC: 13514.8

summary(fit.mle.eGARCH.t)

[1] "Specification Type: Markov-Switching"

[1] "Specification Name: eGARCH\_student\_sym eGARCH\_student\_sym"

[1] "Number of parameters in each variance model: 4 4"

[1] "Number of parameters in each distribution: 1 1"

[1] "Default parameters:"

alpha0\_1 alpha1\_1 alpha2\_1 beta\_1 nu\_1 alpha0\_2

[1,] 0.01 0.2 -0.1 0.8 10 0.01

alpha1\_2 alpha2\_2 beta\_2 nu\_2 P P

[1,] 0.2 -0.1 0.8 10 0.5 0.5

[1] "DEoptim initialization: FALSE"

[1] "Fitted Parameters:"

alpha0\_1 alpha1\_1 alpha2\_1 beta\_1 nu\_1

[1,] -0.01820463 0.1640658 -0.09318699 0.9979706 8.370854

alpha0\_2 alpha1\_2 alpha2\_2 beta\_2 nu\_2

[1,] -3.833378e-05 0.08521384 -0.1404954 0.9998999 21.845

P P

[1,] 0.400555 1

[1] "Transition matrix:"

t = 1 t = 2

t + 1 = 1 0.400555 1.000000e+00

t + 1 = 2 0.599445 2.220446e-16

[1] "Stable probabilities:"

Stable probabilities

State 1 0.6252169

State 2 0.3747831

[1] "Unconditional volatility:"

State 1 State 2

[1,] 0.01127506 0.825716

Log-kernel: -6723.883

AIC: 13423.05

BIC: 13498.8

summary(fit.bayes.eGARCH.t)

[1] "Specification Type: Markov-Switching"

[1] "Specification Name: eGARCH\_student\_sym eGARCH\_student\_sym"

[1] "Number of parameters in each variance model: 4 4"

[1] "Number of parameters in each distribution: 1 1"

[1] "Default parameters:"

alpha0\_1 alpha1\_1 alpha2\_1 beta\_1 nu\_1 alpha0\_2

[1,] 0.01 0.2 -0.1 0.8 10 0.01

alpha1\_2 alpha2\_2 beta\_2 nu\_2 P P

[1,] 0.2 -0.1 0.8 10 0.5 0.5

[1] "Bayesian posterior mean:"

alpha0\_1 alpha1\_1 alpha2\_1 beta\_1

-1.354032595 0.265354182 0.094537974 0.669928535

nu\_1 alpha0\_2 alpha1\_2 alpha2\_2

10.980202387 -0.003303394 0.133877038 -0.117963988

beta\_2 nu\_2 P P

0.998080044 10.987509213 0.068776440 0.040702136

[1] "Posterior variance-covariance matrix"

alpha0\_1 alpha1\_1 alpha2\_1

alpha0\_1 5.009249e-01 -2.216663e-02 -2.597262e-02

alpha1\_1 -2.216663e-02 2.662924e-02 1.733408e-02

alpha2\_1 -2.597262e-02 1.733408e-02 2.033160e-02

beta\_1 1.472417e-01 4.255165e-03 -4.100605e-03

nu\_1 -7.749758e-01 2.185678e-02 2.619391e-02

alpha0\_2 2.922807e-04 -4.005081e-05 -3.300447e-05

alpha1\_2 -1.042112e-04 -2.184951e-04 -1.283795e-04

alpha2\_2 -7.588169e-04 2.351694e-04 2.022057e-04

beta\_2 8.961358e-05 -1.227040e-05 -1.259611e-05

nu\_2 3.392333e-01 5.260335e-03 -6.179106e-04

P -1.268909e-02 1.992660e-03 9.136726e-04

P 1.020920e-02 -9.553621e-04 -8.897338e-04

beta\_1 nu\_1 alpha0\_2

alpha0\_1 1.472417e-01 -7.749758e-01 2.922807e-04

alpha1\_1 4.255165e-03 2.185678e-02 -4.005081e-05

alpha2\_1 -4.100605e-03 2.619391e-02 -3.300447e-05

beta\_1 6.864108e-02 -2.048050e-01 6.969189e-05

nu\_1 -2.048050e-01 2.384763e+00 -3.562248e-04

alpha0\_2 6.969189e-05 -3.562248e-04 2.026125e-06

alpha1\_2 -1.608321e-04 -1.994544e-05 1.324350e-06

alpha2\_2 -1.667829e-04 5.627097e-04 1.641980e-06

beta\_2 3.705438e-05 -6.957458e-05 4.555885e-07

nu\_2 1.200030e-01 7.331166e-02 4.742989e-04

P -4.517153e-03 2.519526e-02 -3.389060e-05

P 2.713063e-03 -1.296460e-02 1.997872e-05

alpha1\_2 alpha2\_2 beta\_2

alpha0\_1 -1.042112e-04 -7.588169e-04 8.961358e-05

alpha1\_1 -2.184951e-04 2.351694e-04 -1.227040e-05

alpha2\_1 -1.283795e-04 2.022057e-04 -1.259611e-05

beta\_1 -1.608321e-04 -1.667829e-04 3.705438e-05

nu\_1 -1.994544e-05 5.627097e-04 -6.957458e-05

alpha0\_2 1.324350e-06 1.641980e-06 4.555885e-07

alpha1\_2 1.718392e-04 -3.241656e-05 -8.711183e-07

alpha2\_2 -3.241656e-05 1.071543e-04 -4.676805e-07

beta\_2 -8.711183e-07 -4.676805e-07 6.669562e-07

nu\_2 -5.505035e-04 -7.364063e-04 1.766206e-04

P -6.255777e-05 8.321044e-05 -9.354681e-06

P 6.290710e-06 -5.960588e-05 6.666475e-06

nu\_2 P P

alpha0\_1 0.3392333248 -1.268909e-02 1.020920e-02

alpha1\_1 0.0052603347 1.992660e-03 -9.553621e-04

alpha2\_1 -0.0006179106 9.136726e-04 -8.897338e-04

beta\_1 0.1200029967 -4.517153e-03 2.713063e-03

nu\_1 0.0733116637 2.519526e-02 -1.296460e-02

alpha0\_2 0.0004742989 -3.389060e-05 1.997872e-05

alpha1\_2 -0.0005505035 -6.255777e-05 6.290710e-06

alpha2\_2 -0.0007364063 8.321044e-05 -5.960588e-05

beta\_2 0.0001766206 -9.354681e-06 6.666475e-06

nu\_2 1.5040906598 -1.722689e-02 1.302936e-02

P -0.0172268913 6.041794e-03 -9.343792e-04

P 0.0130293632 -9.343792e-04 6.077590e-04

[1] "Posterior mean transition matrix:"

t = 1 t = 2

t + 1 = 1 0.06877644 0.04070214

t + 1 = 2 0.93122356 0.95929786

[1] "Posterior mean stable probabilities:"

Stable probabilities

State 1 0.04187783

State 2 0.95812217

[1] "Posterior mean unconditional volatility:"

State 1 State 2

[1,] 0.1285908 0.4230442

Acceptance rate: 0.999

AIC: 13461.73

BIC: 13537.48

DIC: 13952.09