summary(fit.mle.sGARCH.norm)

[1] "Specification Type: Markov-Switching"

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

[1] "Number of parameters in each variance model: 3 3"

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

[1] "Default parameters:"

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

[1,] 0.1 0.1 0.8 0.1 0.1 0.8

P P

[1,] 0.5 0.5

[1] "DEoptim initialization: FALSE"

[1] "Fitted Parameters:"

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

[1,] 0.0001000006 0.03353021 0.8620589 0.04785477

alpha1\_2 beta\_2 P P

[1,] 0.102212 0.8914154 2.091869e-09 0.2987135

[1] "Transition matrix:"

t = 1 t = 2

t + 1 = 1 2.091869e-09 0.2987135

t + 1 = 2 1.000000e+00 0.7012865

[1] "Stable probabilities:"

Stable probabilities

State 1 0.2300073

State 2 0.7699927

[1] "Unconditional volatility:"

State 1 State 2

[1,] 0.03094772 2.740325

Log-kernel: -6782.071

AIC: 13731.89

BIC: 13782.39

summary(fit.bayes.sGARCH.norm)

[1] "Specification Type: Markov-Switching"

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

[1] "Number of parameters in each variance model: 3 3"

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

[1] "Default parameters:"

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

[1,] 0.1 0.1 0.8 0.1 0.1 0.8

P P

[1,] 0.5 0.5

[1] "Bayesian posterior mean:"

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

0.002766704 0.045800087 0.853090976 0.060109921

alpha1\_2 beta\_2 P P

0.106779587 0.886418909 0.098309162 0.386772871

[1] "Posterior variance-covariance matrix"

alpha0\_1 alpha1\_1 beta\_1

alpha0\_1 1.031046e-05 8.893168e-06 -6.801823e-05

alpha1\_1 8.893168e-06 2.380354e-04 -3.417637e-04

beta\_1 -6.801823e-05 -3.417637e-04 1.937591e-03

alpha0\_2 -4.862401e-06 5.344564e-05 2.314134e-04

alpha1\_2 -1.471108e-06 -2.256695e-05 1.358304e-04

beta\_2 1.660475e-06 2.320995e-05 -1.328350e-04

P -1.904389e-05 4.508366e-04 1.191734e-03

P -4.066674e-05 9.009470e-04 1.725885e-03

alpha0\_2 alpha1\_2 beta\_2

alpha0\_1 -4.862401e-06 -1.471108e-06 1.660475e-06

alpha1\_1 5.344564e-05 -2.256695e-05 2.320995e-05

beta\_1 2.314134e-04 1.358304e-04 -1.328350e-04

alpha0\_2 2.186031e-04 1.197960e-04 -1.263218e-04

alpha1\_2 1.197960e-04 1.535505e-04 -1.514418e-04

beta\_2 -1.263218e-04 -1.514418e-04 1.555888e-04

P 7.489460e-04 1.440715e-04 -1.228419e-04

P 1.214991e-03 3.302138e-04 -3.170313e-04

P P

alpha0\_1 -1.904389e-05 -4.066674e-05

alpha1\_1 4.508366e-04 9.009470e-04

beta\_1 1.191734e-03 1.725885e-03

alpha0\_2 7.489460e-04 1.214991e-03

alpha1\_2 1.440715e-04 3.302138e-04

beta\_2 -1.228419e-04 -3.170313e-04

P 7.068447e-03 6.501781e-03

P 6.501781e-03 1.274639e-02

[1] "Posterior mean transition matrix:"

t = 1 t = 2

t + 1 = 1 0.09830916 0.3867729

t + 1 = 2 0.90169084 0.6132271

[1] "Posterior mean stable probabilities:"

Stable probabilities

State 1 0.3001814

State 2 0.6998186

[1] "Posterior mean unconditional volatility:"

State 1 State 2

[1,] 0.1654195 2.972834

Acceptance rate: 1

AIC: 13700.34

BIC: 13750.84

DIC: 14268.34

summary(fit.mle.sGARCH.t)

[1] "Specification Type: Markov-Switching"

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

[1] "Number of parameters in each variance model: 3 3"

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

[1] "Default parameters:"

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

[1,] 0.1 0.1 0.8 10 0.1 0.1

beta\_2 nu\_2 P P

[1,] 0.8 10 0.5 0.5

[1] "DEoptim initialization: FALSE"

[1] "Fitted Parameters:"

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

[1,] 1e-04 0.06495534 0.8914844 3.737987 0.04696757

alpha1\_2 beta\_2 nu\_2 P P

[1,] 0.1034929 0.8882088 23.79728 8.645083e-08 0.3789106

[1] "Transition matrix:"

t = 1 t = 2

t + 1 = 1 8.645083e-08 0.3789106

t + 1 = 2 9.999999e-01 0.6210894

[1] "Stable probabilities:"

Stable probabilities

State 1 0.2747899

State 2 0.7252101

[1] "Unconditional volatility:"

State 1 State 2

[1,] 0.04791318 2.379043

Log-kernel: -6781.874

AIC: 13614.89

BIC: 13678.02

summary(fit.bayes.sGARCH.t)

[1] "Specification Type: Markov-Switching"

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

[1] "Number of parameters in each variance model: 3 3"

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

[1] "Default parameters:"

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

[1,] 0.1 0.1 0.8 10 0.1 0.1

beta\_2 nu\_2 P P

[1,] 0.8 10 0.5 0.5

[1] "Bayesian posterior mean:"

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

0.10321249 0.08180844 0.67612909 10.46160372

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

0.04216231 0.09714201 0.89316391 11.98340664

P P

0.27718153 0.22235924

[1] "Posterior variance-covariance matrix"

alpha0\_1 alpha1\_1 beta\_1

alpha0\_1 0.0882721073 0.0022350516 -0.0429515429

alpha1\_1 0.0022350516 0.0045624928 -0.0033150214

beta\_1 -0.0429515429 -0.0033150214 0.0663172507

nu\_1 -0.1157504884 0.0146372359 0.3298348812

alpha0\_2 -0.0021130520 -0.0001388165 0.0030802797

alpha1\_2 -0.0002856302 -0.0001468395 0.0005481475

beta\_2 0.0003413743 0.0001308596 -0.0005872563

nu\_2 -0.2347010867 -0.0046056599 0.4641742700

P 0.0007231934 0.0062594527 -0.0030889338

P -0.0186284206 -0.0007599869 0.0357169785

nu\_1 alpha0\_2 alpha1\_2

alpha0\_1 -0.11575049 -0.0021130520 -0.0002856302

alpha1\_1 0.01463724 -0.0001388165 -0.0001468395

beta\_1 0.32983488 0.0030802797 0.0005481475

nu\_1 9.80817782 0.0479675249 0.0131656247

alpha0\_2 0.04796752 0.0004328113 0.0001545842

alpha1\_2 0.01316562 0.0001545842 0.0001998339

beta\_2 -0.01349685 -0.0001835063 -0.0001937120

nu\_2 10.26738429 0.0657729264 0.0160118687

P 0.08512160 -0.0001752541 -0.0006403715

P 0.62021382 0.0039737432 0.0009286885

beta\_2 nu\_2 P

alpha0\_1 0.0003413743 -0.234701087 0.0007231934

alpha1\_1 0.0001308596 -0.004605660 0.0062594527

beta\_1 -0.0005872563 0.464174270 -0.0030889338

nu\_1 -0.0134968516 10.267384289 0.0851216031

alpha0\_2 -0.0001835063 0.065772926 -0.0001752541

alpha1\_2 -0.0001937120 0.016011869 -0.0006403715

beta\_2 0.0002101470 -0.019038980 0.0005142288

nu\_2 -0.0190389804 17.831354776 -0.0018453026

P 0.0005142288 -0.001845303 0.0685219223

P -0.0009733343 0.822951057 -0.0053104384

P

alpha0\_1 -0.0186284206

alpha1\_1 -0.0007599869

beta\_1 0.0357169785

nu\_1 0.6202138232

alpha0\_2 0.0039737432

alpha1\_2 0.0009286885

beta\_2 -0.0009733343

nu\_2 0.8229510574

P -0.0053104384

P 0.0519355958

[1] "Posterior mean transition matrix:"

t = 1 t = 2

t + 1 = 1 0.2771815 0.2223592

t + 1 = 2 0.7228185 0.7776408

[1] "Posterior mean stable probabilities:"

Stable probabilities

State 1 0.2352565

State 2 0.7647435

[1] "Posterior mean unconditional volatility:"

State 1 State 2

[1,] 0.6529838 2.085494

Acceptance rate: 0.998

AIC: 13620.08

BIC: 13683.21

DIC: 13992.02