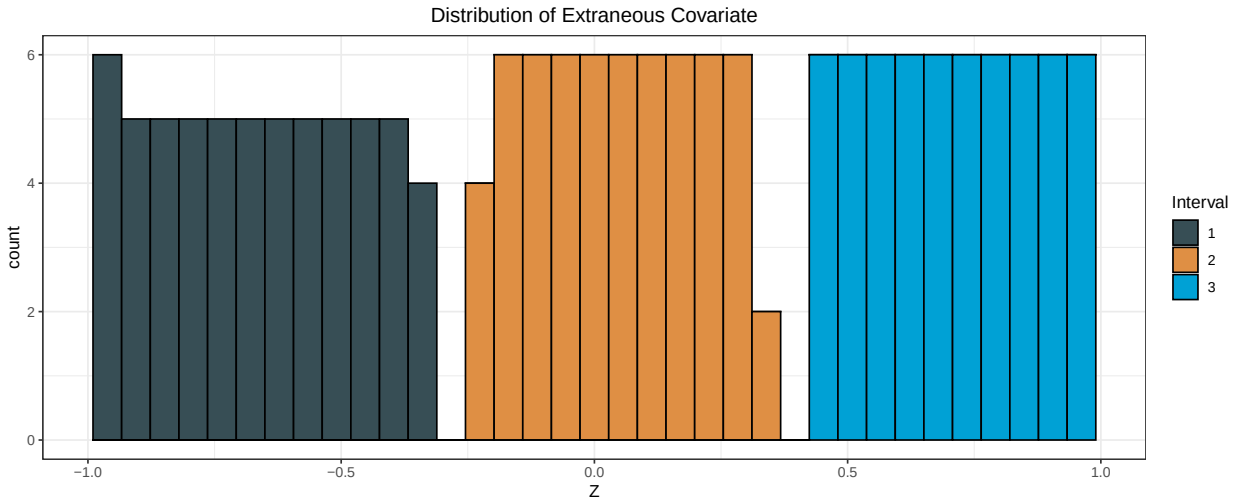
MAPE Updates, v1

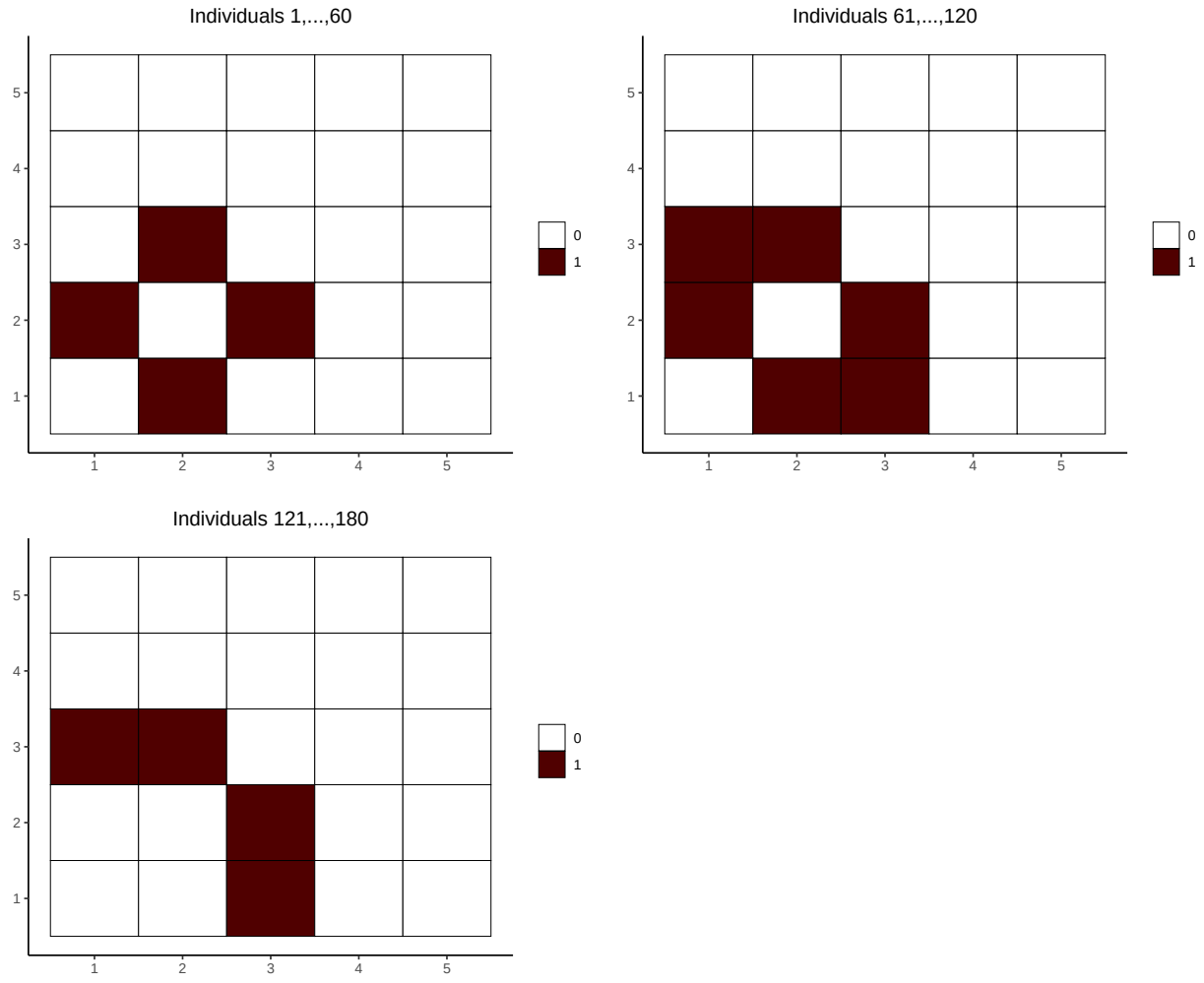
Overview

In this implementation of `covdepGE`, the variance hyperparameters for each model are optimized during each CAVI iteration using MAPE. The value of the prior inclusion probability for each variable is chosen from a grid of the following values:

$$\pi \in \{0.450, 0.295, 0.193, 0.127, 0.083, 0.054, 0.036, 0.023, 0.015, 0.010\}$$

The data is the usual continuous example with the distribution of the extraneous covariate and the true precision matrices as below.





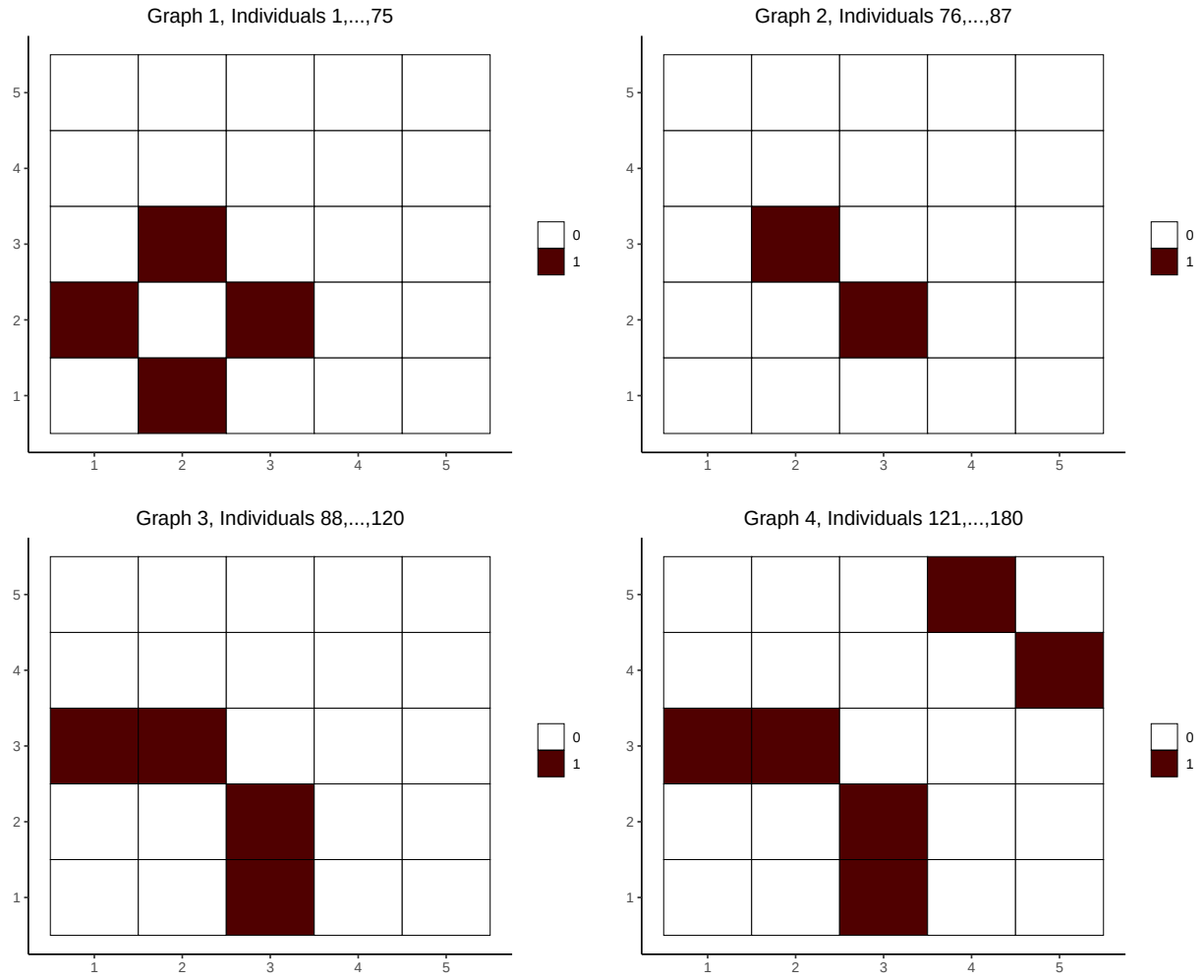
The results of a less flexible graphical modeling method are also presented.

Graphical Modeling Results

The graphs produced by the MAPE updated `covdepGE` and the alternative method are very similar.

MAPE updated `covdepGE`

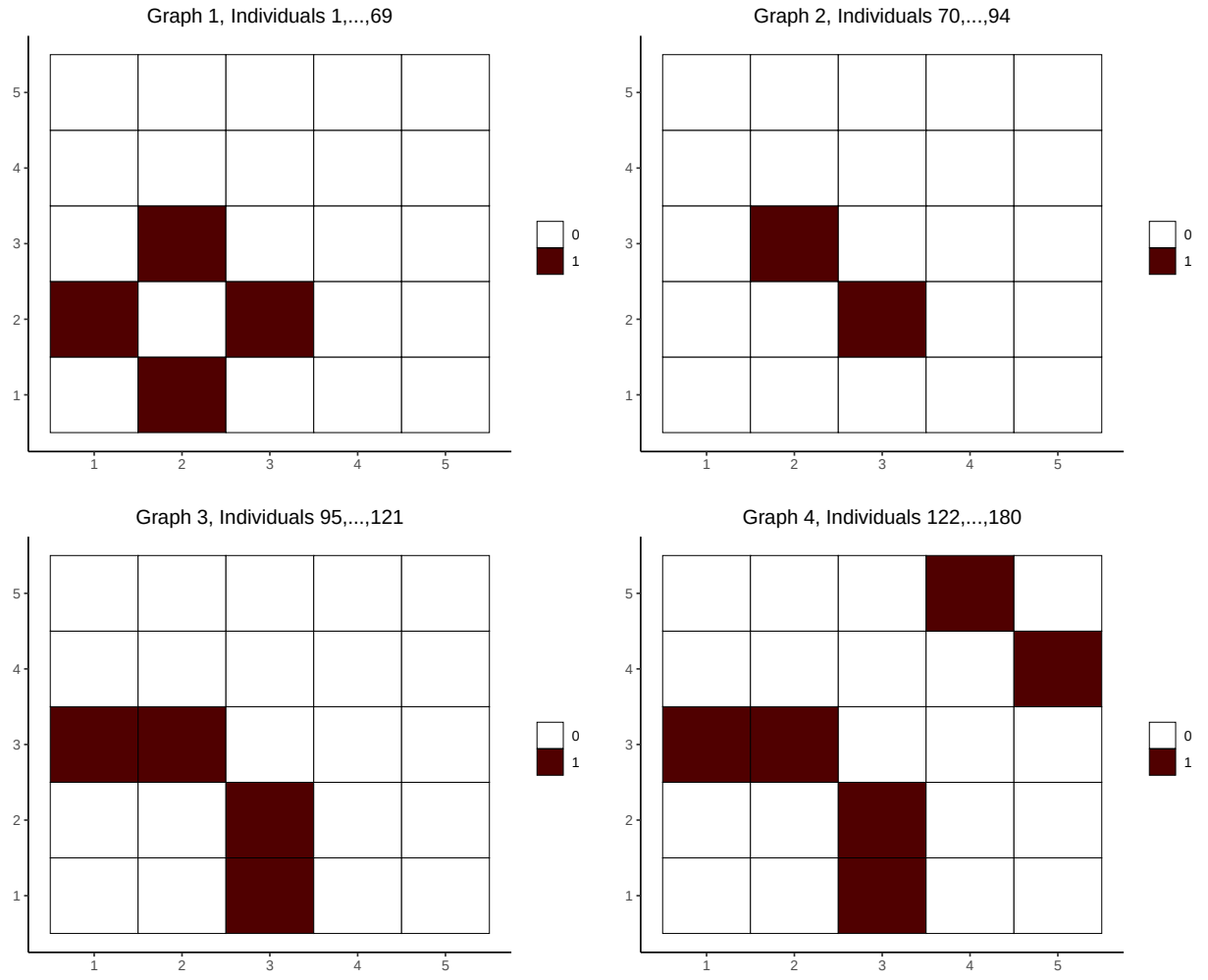
```
##   |                                                                      |
```



Alternative `covdepGE`

In the alternative method, the slab variance is chosen by maximizing ELBO over a grid and the error term variance and prior inclusion probabilities are selected using `varbvs`. π is simply the mean over a grid generated a priori by `varbvs`, while `sigma^2` is the mean over a range of `sigma^2` fit to the data for each grid point in the grid of π values.

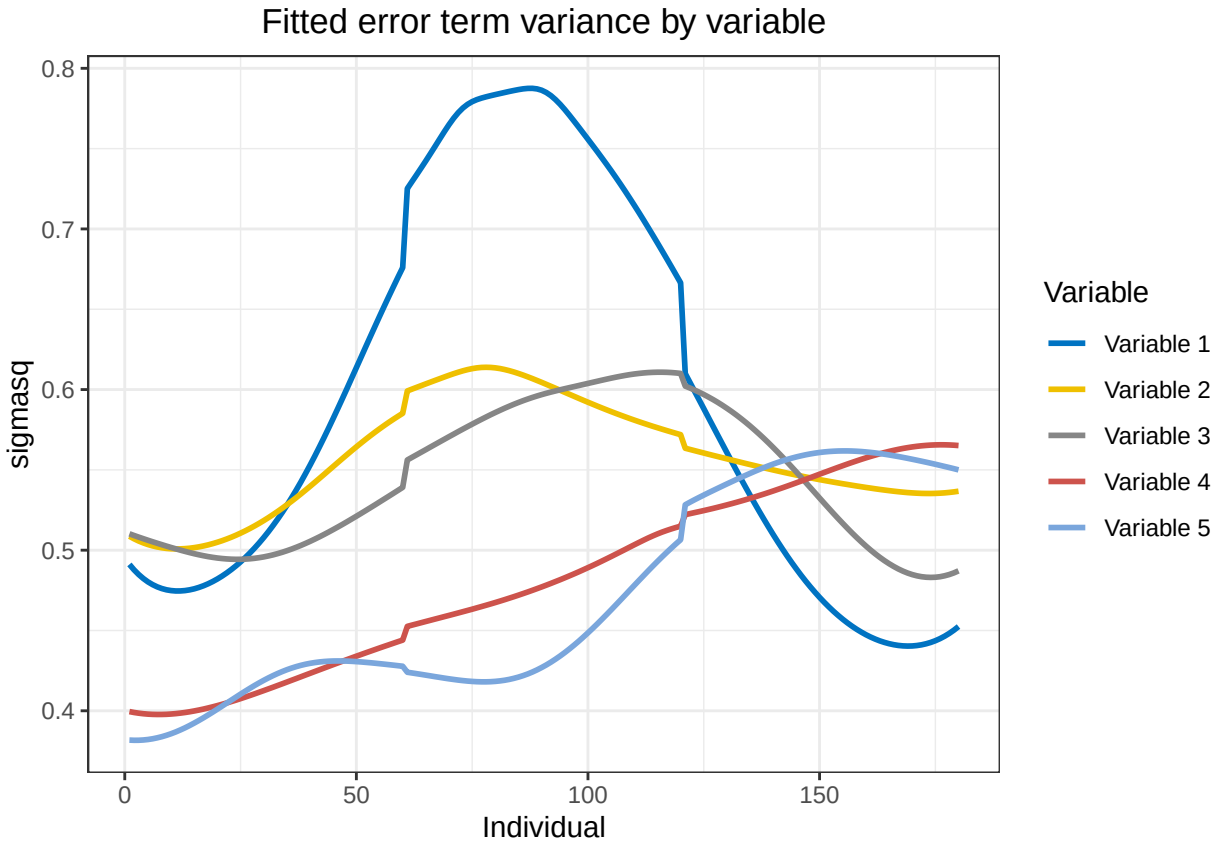
```
##   |                                                                      |
```

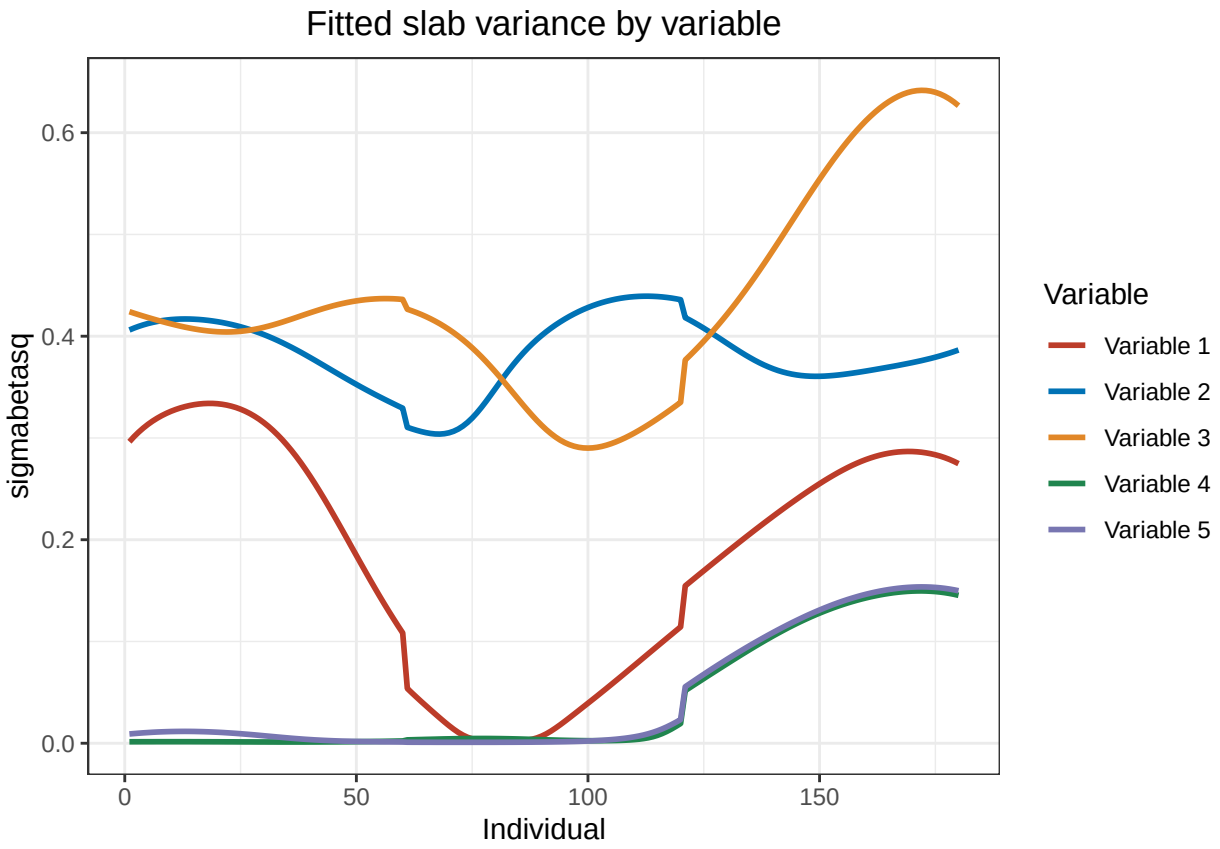


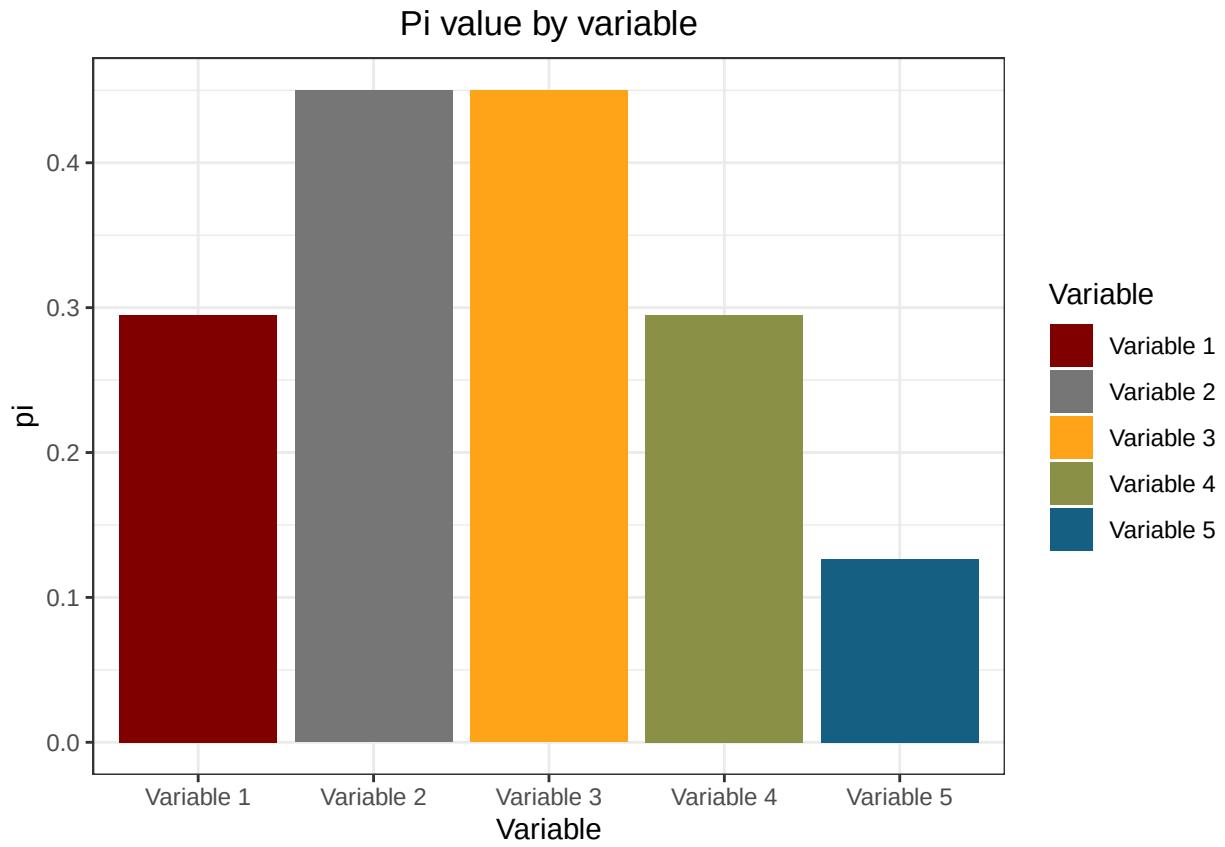
Hyperparameter Analysis

Below is a visualization of the fitted variance hyperparameter values by individual, as well as the prior inclusion probabilities values chosen for each variable. Note that although the variance hyperparameters are fit for each individual, the prior inclusion probabilities are chosen for each variable by maximizing the sum of the ELBO across all individuals.

Observe that for variables 1, 2 and 3, the chosen value of π is greater than for variables 4 and 5. This is presumably because the conditional dependencies in the data involve variables 1, 2 and 3. However, since the conditional dependencies only involve a subset of the individuals, it could be beneficial to optimize π for each individual. That is, since, for example, the (1, 3) entry is non-zero only for individuals 61,. . . ,180, choosing π by maximizing ELBO on the individual level could allow for a greater π for these individuals, and a lesser π for individuals 1,. . . ,60.


Fitted error term variance by variable
sigmasq
0.8
0.7
0.6
0.5
0.4
0
50
100
150
Individual
Variable
Variable 1
Variable 2
Variable 3
Variable 4
Variable 5


Fitted slab variance by variable
sigmabetasq
0.0
0.2
0.4
0.6
0
50
100
150
Individual
Variable
Variable 1
Variable 2
Variable 3
Variable 4
Variable 5



Finally, the raw hyperparameter values are included.

```
## $pi
## Variable 1 Variable 2 Variable 3 Variable 4 Variable 5
##     0.2948     0.4500     0.4500     0.2948     0.1265
##
## $sigmasq
##         Variable 1 Variable 2 Variable 3 Variable 4 Variable 5
##    [1,]     0.4911     0.5087     0.5102     0.3995     0.3818
##    [2,]     0.4878     0.5071     0.5091     0.3990     0.3816
##    [3,]     0.4849     0.5057     0.5081     0.3985     0.3817
##    [4,]     0.4824     0.5045     0.5072     0.3982     0.3818
##    [5,]     0.4803     0.5035     0.5062     0.3979     0.3821
##    [6,]     0.4786     0.5027     0.5053     0.3978     0.3826
##    [7,]     0.4772     0.5020     0.5043     0.3977     0.3832
##    [8,]     0.4761     0.5015     0.5034     0.3977     0.3839
##    [9,]     0.4753     0.5011     0.5025     0.3978     0.3847
##   [10,]     0.4748     0.5009     0.5017     0.3980     0.3857
##   [11,]     0.4746     0.5008     0.5008     0.3982     0.3868
##   [12,]     0.4746     0.5008     0.5000     0.3986     0.3881
##   [13,]     0.4748     0.5010     0.4992     0.3989     0.3894
##   [14,]     0.4753     0.5012     0.4985     0.3994     0.3908
##   [15,]     0.4759     0.5016     0.4978     0.3999     0.3924
##   [16,]     0.4768     0.5021     0.4971     0.4005     0.3940
##   [17,]     0.4778     0.5026     0.4965     0.4011     0.3957
##   [18,]     0.4791     0.5033     0.4960     0.4018     0.3974
```

```
##  [19,]    0.4805    0.5041    0.4955    0.4025    0.3992
##  [20,]    0.4821    0.5049    0.4951    0.4032    0.4010
##  [21,]    0.4839    0.5059    0.4948    0.4040    0.4029
##  [22,]    0.4858    0.5069    0.4945    0.4049    0.4048
##  [23,]    0.4879    0.5081    0.4944    0.4057    0.4067
##  [24,]    0.4902    0.5093    0.4943    0.4066    0.4085
##  [25,]    0.4927    0.5106    0.4943    0.4076    0.4104
##  [26,]    0.4954    0.5120    0.4944    0.4085    0.4122
##  [27,]    0.4982    0.5135    0.4946    0.4095    0.4140
##  [28,]    0.5012    0.5150    0.4949    0.4105    0.4157
##  [29,]    0.5045    0.5167    0.4953    0.4115    0.4174
##  [30,]    0.5079    0.5184    0.4958    0.4126    0.4190
##  [31,]    0.5115    0.5202    0.4964    0.4136    0.4205
##  [32,]    0.5153    0.5221    0.4971    0.4147    0.4219
##  [33,]    0.5193    0.5241    0.4979    0.4157    0.4232
##  [34,]    0.5235    0.5261    0.4987    0.4168    0.4244
##  [35,]    0.5279    0.5283    0.4996    0.4179    0.4256
##  [36,]    0.5325    0.5304    0.5007    0.4190    0.4266
##  [37,]    0.5374    0.5327    0.5018    0.4201    0.4275
##  [38,]    0.5424    0.5350    0.5029    0.4212    0.4283
##  [39,]    0.5475    0.5373    0.5042    0.4222    0.4290
##  [40,]    0.5529    0.5397    0.5055    0.4233    0.4296
##  [41,]    0.5584    0.5422    0.5069    0.4244    0.4300
##  [42,]    0.5641    0.5446    0.5083    0.4255    0.4304
##  [43,]    0.5700    0.5471    0.5097    0.4266    0.4307
##  [44,]    0.5759    0.5496    0.5113    0.4277    0.4309
##  [45,]    0.5820    0.5521    0.5128    0.4287    0.4310
##  [46,]    0.5882    0.5546    0.5144    0.4298    0.4310
##  [47,]    0.5945    0.5571    0.5161    0.4309    0.4310
##  [48,]    0.6008    0.5595    0.5177    0.4319    0.4309
##  [49,]    0.6072    0.5620    0.5194    0.4330    0.4308
##  [50,]    0.6136    0.5643    0.5211    0.4340    0.4306
##  [51,]    0.6201    0.5667    0.5229    0.4350    0.4304
##  [52,]    0.6265    0.5690    0.5246    0.4361    0.4302
##  [53,]    0.6329    0.5712    0.5264    0.4371    0.4299
##  [54,]    0.6392    0.5734    0.5282    0.4381    0.4296
##  [55,]    0.6455    0.5755    0.5300    0.4391    0.4293
##  [56,]    0.6518    0.5776    0.5318    0.4401    0.4290
##  [57,]    0.6579    0.5796    0.5336    0.4411    0.4287
##  [58,]    0.6640    0.5815    0.5354    0.4421    0.4284
##  [59,]    0.6700    0.5834    0.5373    0.4430    0.4281
##  [60,]    0.6759    0.5852    0.5391    0.4440    0.4277
##  [61,]    0.7251    0.5991    0.5562    0.4526    0.4240
##  [62,]    0.7294    0.6003    0.5578    0.4533    0.4236
##  [63,]    0.7337    0.6014    0.5594    0.4541    0.4231
##  [64,]    0.7380    0.6025    0.5610    0.4549    0.4227
##  [65,]    0.7424    0.6035    0.5626    0.4556    0.4222
##  [66,]    0.7469    0.6046    0.5642    0.4564    0.4217
##  [67,]    0.7514    0.6057    0.5658    0.4571    0.4213
##  [68,]    0.7560    0.6068    0.5674    0.4579    0.4208
##  [69,]    0.7606    0.6078    0.5691    0.4586    0.4203
##  [70,]    0.7649    0.6089    0.5707    0.4594    0.4199
##  [71,]    0.7689    0.6099    0.5722    0.4602    0.4195
##  [72,]    0.7724    0.6108    0.5738    0.4609    0.4191
```

```
##  [73,]     0.7753     0.6117     0.5754     0.4617     0.4188
##  [74,]     0.7775     0.6124     0.5769     0.4625     0.4185
##  [75,]     0.7792     0.6130     0.5785     0.4633     0.4183
##  [76,]     0.7805     0.6135     0.5800     0.4641     0.4181
##  [77,]     0.7815     0.6138     0.5815     0.4649     0.4180
##  [78,]     0.7823     0.6139     0.5829     0.4657     0.4180
##  [79,]     0.7830     0.6138     0.5843     0.4666     0.4181
##  [80,]     0.7836     0.6135     0.5857     0.4674     0.4183
##  [81,]     0.7843     0.6131     0.5871     0.4683     0.4186
##  [82,]     0.7849     0.6125     0.5884     0.4692     0.4190
##  [83,]     0.7856     0.6118     0.5896     0.4701     0.4195
##  [84,]     0.7862     0.6109     0.5908     0.4710     0.4202
##  [85,]     0.7867     0.6100     0.5920     0.4720     0.4210
##  [86,]     0.7872     0.6090     0.5931     0.4730     0.4219
##  [87,]     0.7875     0.6079     0.5941     0.4740     0.4230
##  [88,]     0.7875     0.6068     0.5951     0.4750     0.4241
##  [89,]     0.7872     0.6057     0.5960     0.4761     0.4255
##  [90,]     0.7863     0.6045     0.5969     0.4771     0.4269
##  [91,]     0.7849     0.6033     0.5977     0.4782     0.4285
##  [92,]     0.7830     0.6020     0.5984     0.4793     0.4303
##  [93,]     0.7805     0.6008     0.5992     0.4805     0.4322
##  [94,]     0.7776     0.5995     0.5998     0.4816     0.4342
##  [95,]     0.7743     0.5983     0.6005     0.4828     0.4363
##  [96,]     0.7708     0.5970     0.6012     0.4840     0.4385
##  [97,]     0.7671     0.5958     0.6018     0.4853     0.4409
##  [98,]     0.7634     0.5946     0.6025     0.4865     0.4433
##  [99,]     0.7596     0.5933     0.6032     0.4878     0.4459
## [100,]     0.7558     0.5921     0.6038     0.4891     0.4485
## [101,]     0.7520     0.5909     0.6045     0.4905     0.4513
## [102,]     0.7482     0.5897     0.6052     0.4918     0.4541
## [103,]     0.7443     0.5886     0.6058     0.4932     0.4569
## [104,]     0.7403     0.5874     0.6065     0.4946     0.4599
## [105,]     0.7363     0.5863     0.6071     0.4960     0.4628
## [106,]     0.7321     0.5852     0.6077     0.4975     0.4659
## [107,]     0.7279     0.5841     0.6083     0.4989     0.4689
## [108,]     0.7236     0.5830     0.6088     0.5004     0.4719
## [109,]     0.7192     0.5820     0.6093     0.5019     0.4750
## [110,]     0.7148     0.5810     0.6097     0.5034     0.4781
## [111,]     0.7102     0.5800     0.6100     0.5048     0.4811
## [112,]     0.7055     0.5790     0.6103     0.5062     0.4841
## [113,]     0.7008     0.5781     0.6106     0.5076     0.4871
## [114,]     0.6961     0.5771     0.6107     0.5089     0.4901
## [115,]     0.6913     0.5762     0.6108     0.5101     0.4930
## [116,]     0.6864     0.5753     0.6108     0.5113     0.4958
## [117,]     0.6815     0.5745     0.6107     0.5123     0.4986
## [118,]     0.6765     0.5736     0.6106     0.5132     0.5013
## [119,]     0.6715     0.5727     0.6104     0.5141     0.5040
## [120,]     0.6664     0.5719     0.6101     0.5149     0.5065
## [121,]     0.6099     0.5635     0.6022     0.5221     0.5283
## [122,]     0.6045     0.5627     0.6010     0.5227     0.5298
## [123,]     0.5990     0.5620     0.5997     0.5234     0.5314
## [124,]     0.5936     0.5612     0.5984     0.5240     0.5329
## [125,]     0.5881     0.5605     0.5969     0.5247     0.5343
## [126,]     0.5826     0.5598     0.5954     0.5253     0.5357
```

```
## [127,]    0.5771    0.5590    0.5938    0.5260    0.5371
## [128,]    0.5716    0.5583    0.5920    0.5267    0.5385
## [129,]    0.5662    0.5576    0.5902    0.5274    0.5399
## [130,]    0.5607    0.5569    0.5883    0.5282    0.5413
## [131,]    0.5553    0.5561    0.5863    0.5290    0.5426
## [132,]    0.5499    0.5554    0.5842    0.5297    0.5439
## [133,]    0.5446    0.5547    0.5820    0.5306    0.5453
## [134,]    0.5394    0.5540    0.5797    0.5314    0.5466
## [135,]    0.5342    0.5533    0.5773    0.5323    0.5478
## [136,]    0.5291    0.5526    0.5748    0.5331    0.5491
## [137,]    0.5241    0.5519    0.5722    0.5340    0.5503
## [138,]    0.5191    0.5513    0.5695    0.5350    0.5514
## [139,]    0.5143    0.5506    0.5667    0.5359    0.5525
## [140,]    0.5097    0.5499    0.5639    0.5369    0.5536
## [141,]    0.5051    0.5493    0.5610    0.5379    0.5546
## [142,]    0.5007    0.5486    0.5580    0.5389    0.5556
## [143,]    0.4964    0.5480    0.5549    0.5399    0.5565
## [144,]    0.4922    0.5474    0.5518    0.5409    0.5573
## [145,]    0.4883    0.5468    0.5486    0.5420    0.5581
## [146,]    0.4844    0.5462    0.5454    0.5430    0.5588
## [147,]    0.4807    0.5456    0.5422    0.5441    0.5594
## [148,]    0.4772    0.5450    0.5390    0.5451    0.5599
## [149,]    0.4738    0.5445    0.5357    0.5462    0.5604
## [150,]    0.4706    0.5439    0.5325    0.5473    0.5608
## [151,]    0.4676    0.5434    0.5292    0.5484    0.5612
## [152,]    0.4647    0.5429    0.5260    0.5494    0.5614
## [153,]    0.4620    0.5424    0.5229    0.5505    0.5616
## [154,]    0.4594    0.5419    0.5197    0.5516    0.5617
## [155,]    0.4570    0.5414    0.5167    0.5526    0.5618
## [156,]    0.4548    0.5409    0.5137    0.5536    0.5618
## [157,]    0.4527    0.5404    0.5108    0.5546    0.5617
## [158,]    0.4508    0.5400    0.5079    0.5556    0.5616
## [159,]    0.4490    0.5395    0.5052    0.5566    0.5614
## [160,]    0.4474    0.5391    0.5026    0.5575    0.5612
## [161,]    0.4459    0.5386    0.5001    0.5584    0.5609
## [162,]    0.4447    0.5382    0.4978    0.5592    0.5605
## [163,]    0.4435    0.5378    0.4956    0.5600    0.5602
## [164,]    0.4426    0.5374    0.4935    0.5608    0.5597
## [165,]    0.4418    0.5371    0.4916    0.5615    0.5593
## [166,]    0.4412    0.5367    0.4899    0.5622    0.5588
## [167,]    0.4407    0.5364    0.4883    0.5628    0.5583
## [168,]    0.4404    0.5361    0.4869    0.5633    0.5578
## [169,]    0.4403    0.5359    0.4858    0.5638    0.5572
## [170,]    0.4404    0.5357    0.4848    0.5643    0.5566
## [171,]    0.4406    0.5355    0.4840    0.5647    0.5560
## [172,]    0.4411    0.5354    0.4835    0.5650    0.5554
## [173,]    0.4417    0.5353    0.4832    0.5652    0.5548
## [174,]    0.4426    0.5353    0.4830    0.5654    0.5541
## [175,]    0.4436    0.5354    0.4832    0.5655    0.5535
## [176,]    0.4449    0.5355    0.4835    0.5656    0.5528
## [177,]    0.4464    0.5357    0.4841    0.5656    0.5521
## [178,]    0.4482    0.5360    0.4848    0.5655    0.5514
## [179,]    0.4502    0.5363    0.4859    0.5654    0.5507
## [180,]    0.4525    0.5367    0.4871    0.5651    0.5500
```

```
##
## $sigmabetasq
##        Variable 1 Variable 2 Variable 3 Variable 4 Variable 5
##   [1,]     0.2963     0.4061     0.4241     0.0014     0.0091
##   [2,]     0.3013     0.4080     0.4226     0.0015     0.0095
##   [3,]     0.3057     0.4097     0.4212     0.0015     0.0099
##   [4,]     0.3097     0.4111     0.4198     0.0015     0.0102
##   [5,]     0.3133     0.4124     0.4184     0.0015     0.0105
##   [6,]     0.3166     0.4136     0.4170     0.0015     0.0108
##   [7,]     0.3194     0.4145     0.4157     0.0015     0.0110
##   [8,]     0.3220     0.4153     0.4145     0.0015     0.0112
##   [9,]     0.3242     0.4159     0.4133     0.0015     0.0114
##  [10,]     0.3262     0.4163     0.4121     0.0015     0.0115
##  [11,]     0.3280     0.4167     0.4110     0.0015     0.0116
##  [12,]     0.3295     0.4169     0.4099     0.0015     0.0116
##  [13,]     0.3308     0.4169     0.4089     0.0015     0.0116
##  [14,]     0.3319     0.4169     0.4080     0.0015     0.0116
##  [15,]     0.3327     0.4167     0.4071     0.0015     0.0116
##  [16,]     0.3333     0.4164     0.4064     0.0015     0.0115
##  [17,]     0.3338     0.4160     0.4057     0.0015     0.0114
##  [18,]     0.3340     0.4155     0.4052     0.0015     0.0112
##  [19,]     0.3339     0.4149     0.4047     0.0014     0.0110
##  [20,]     0.3336     0.4143     0.4044     0.0014     0.0108
##  [21,]     0.3331     0.4135     0.4042     0.0014     0.0106
##  [22,]     0.3323     0.4126     0.4041     0.0014     0.0103
##  [23,]     0.3313     0.4116     0.4042     0.0014     0.0100
##  [24,]     0.3299     0.4105     0.4044     0.0014     0.0097
##  [25,]     0.3283     0.4093     0.4048     0.0013     0.0093
##  [26,]     0.3263     0.4079     0.4053     0.0013     0.0090
##  [27,]     0.3240     0.4065     0.4060     0.0013     0.0086
##  [28,]     0.3214     0.4050     0.4067     0.0013     0.0082
##  [29,]     0.3185     0.4034     0.4077     0.0013     0.0078
##  [30,]     0.3151     0.4016     0.4087     0.0012     0.0074
##  [31,]     0.3115     0.3998     0.4098     0.0012     0.0070
##  [32,]     0.3074     0.3978     0.4111     0.0012     0.0065
##  [33,]     0.3030     0.3958     0.4124     0.0012     0.0061
##  [34,]     0.2983     0.3936     0.4138     0.0012     0.0057
##  [35,]     0.2932     0.3914     0.4153     0.0012     0.0053
##  [36,]     0.2877     0.3891     0.4168     0.0012     0.0049
##  [37,]     0.2819     0.3867     0.4184     0.0012     0.0046
##  [38,]     0.2757     0.3842     0.4199     0.0012     0.0042
##  [39,]     0.2692     0.3817     0.4215     0.0012     0.0039
##  [40,]     0.2625     0.3791     0.4230     0.0012     0.0036
##  [41,]     0.2554     0.3765     0.4245     0.0012     0.0033
##  [42,]     0.2481     0.3738     0.4260     0.0012     0.0031
##  [43,]     0.2406     0.3711     0.4273     0.0013     0.0028
##  [44,]     0.2329     0.3685     0.4287     0.0013     0.0026
##  [45,]     0.2251     0.3658     0.4299     0.0013     0.0024
##  [46,]     0.2171     0.3631     0.4311     0.0014     0.0023
##  [47,]     0.2090     0.3604     0.4321     0.0014     0.0021
##  [48,]     0.2009     0.3578     0.4331     0.0014     0.0020
##  [49,]     0.1927     0.3552     0.4340     0.0015     0.0019
##  [50,]     0.1845     0.3526     0.4347     0.0015     0.0018
##  [51,]     0.1764     0.3501     0.4354     0.0016     0.0017
```

```
##  [52,]     0.1683     0.3476     0.4359     0.0016     0.0016
##  [53,]     0.1603     0.3452     0.4363     0.0017     0.0015
##  [54,]     0.1525     0.3428     0.4367     0.0018     0.0015
##  [55,]     0.1447     0.3405     0.4369     0.0018     0.0014
##  [56,]     0.1371     0.3381     0.4370     0.0019     0.0014
##  [57,]     0.1297     0.3359     0.4369     0.0020     0.0013
##  [58,]     0.1224     0.3336     0.4368     0.0021     0.0013
##  [59,]     0.1153     0.3314     0.4365     0.0022     0.0012
##  [60,]     0.1084     0.3293     0.4361     0.0022     0.0012
##  [61,]     0.0538     0.3104     0.4265     0.0033     0.0010
##  [62,]     0.0494     0.3089     0.4249     0.0034     0.0010
##  [63,]     0.0452     0.3075     0.4232     0.0035     0.0010
##  [64,]     0.0410     0.3063     0.4214     0.0037     0.0010
##  [65,]     0.0369     0.3052     0.4193     0.0038     0.0010
##  [66,]     0.0329     0.3044     0.4172     0.0039     0.0010
##  [67,]     0.0289     0.3039     0.4148     0.0040     0.0009
##  [68,]     0.0249     0.3038     0.4123     0.0041     0.0009
##  [69,]     0.0210     0.3042     0.4095     0.0042     0.0009
##  [70,]     0.0173     0.3051     0.4066     0.0043     0.0009
##  [71,]     0.0138     0.3066     0.4035     0.0044     0.0009
##  [72,]     0.0107     0.3088     0.4001     0.0045     0.0009
##  [73,]     0.0080     0.3117     0.3965     0.0046     0.0009
##  [74,]     0.0059     0.3153     0.3927     0.0046     0.0009
##  [75,]     0.0043     0.3196     0.3886     0.0047     0.0009
##  [76,]     0.0033     0.3245     0.3843     0.0047     0.0009
##  [77,]     0.0026     0.3300     0.3798     0.0047     0.0009
##  [78,]     0.0022     0.3360     0.3751     0.0047     0.0009
##  [79,]     0.0019     0.3421     0.3702     0.0047     0.0009
##  [80,]     0.0017     0.3485     0.3650     0.0046     0.0009
##  [81,]     0.0017     0.3548     0.3598     0.0046     0.0010
##  [82,]     0.0017     0.3610     0.3544     0.0045     0.0010
##  [83,]     0.0017     0.3670     0.3489     0.0044     0.0010
##  [84,]     0.0019     0.3728     0.3434     0.0043     0.0010
##  [85,]     0.0021     0.3782     0.3379     0.0042     0.0010
##  [86,]     0.0025     0.3834     0.3324     0.0041     0.0010
##  [87,]     0.0031     0.3882     0.3271     0.0039     0.0011
##  [88,]     0.0040     0.3927     0.3220     0.0038     0.0011
##  [89,]     0.0053     0.3968     0.3171     0.0037     0.0011
##  [90,]     0.0070     0.4008     0.3124     0.0035     0.0012
##  [91,]     0.0092     0.4044     0.3082     0.0034     0.0012
##  [92,]     0.0119     0.4079     0.3043     0.0032     0.0013
##  [93,]     0.0149     0.4111     0.3009     0.0031     0.0014
##  [94,]     0.0181     0.4141     0.2979     0.0030     0.0014
##  [95,]     0.0215     0.4169     0.2954     0.0029     0.0015
##  [96,]     0.0250     0.4195     0.2934     0.0028     0.0016
##  [97,]     0.0286     0.4219     0.2919     0.0027     0.0017
##  [98,]     0.0321     0.4242     0.2908     0.0026     0.0019
##  [99,]     0.0357     0.4263     0.2902     0.0026     0.0020
## [100,]     0.0393     0.4282     0.2900     0.0025     0.0022
## [101,]     0.0429     0.4300     0.2903     0.0025     0.0024
## [102,]     0.0466     0.4316     0.2908     0.0025     0.0026
## [103,]     0.0502     0.4330     0.2917     0.0025     0.0029
## [104,]     0.0539     0.4343     0.2929     0.0025     0.0032
## [105,]     0.0576     0.4354     0.2944     0.0026     0.0035
```

```
## [106,]    0.0613    0.4364    0.2961    0.0027    0.0039
## [107,]    0.0651    0.4373    0.2980    0.0028    0.0044
## [108,]    0.0689    0.4379    0.3001    0.0030    0.0049
## [109,]    0.0726    0.4385    0.3024    0.0032    0.0055
## [110,]    0.0764    0.4389    0.3048    0.0035    0.0063
## [111,]    0.0802    0.4392    0.3074    0.0040    0.0071
## [112,]    0.0841    0.4393    0.3101    0.0046    0.0081
## [113,]    0.0879    0.4393    0.3129    0.0053    0.0093
## [114,]    0.0917    0.4392    0.3158    0.0064    0.0106
## [115,]    0.0955    0.4390    0.3188    0.0078    0.0122
## [116,]    0.0992    0.4386    0.3219    0.0095    0.0140
## [117,]    0.1030    0.4381    0.3251    0.0115    0.0160
## [118,]    0.1068    0.4375    0.3283    0.0139    0.0183
## [119,]    0.1106    0.4367    0.3317    0.0166    0.0207
## [120,]    0.1143    0.4359    0.3350    0.0194    0.0232
## [121,]    0.1547    0.4182    0.3766    0.0517    0.0555
## [122,]    0.1584    0.4158    0.3810    0.0547    0.0586
## [123,]    0.1621    0.4133    0.3856    0.0576    0.0617
## [124,]    0.1658    0.4106    0.3903    0.0606    0.0647
## [125,]    0.1695    0.4078    0.3951    0.0635    0.0677
## [126,]    0.1732    0.4050    0.4001    0.0665    0.0707
## [127,]    0.1769    0.4021    0.4052    0.0694    0.0737
## [128,]    0.1806    0.3991    0.4104    0.0723    0.0766
## [129,]    0.1842    0.3961    0.4159    0.0752    0.0795
## [130,]    0.1879    0.3931    0.4214    0.0781    0.0824
## [131,]    0.1915    0.3901    0.4272    0.0810    0.0852
## [132,]    0.1951    0.3872    0.4330    0.0838    0.0880
## [133,]    0.1987    0.3843    0.4391    0.0867    0.0908
## [134,]    0.2023    0.3815    0.4452    0.0895    0.0935
## [135,]    0.2058    0.3788    0.4515    0.0922    0.0962
## [136,]    0.2094    0.3763    0.4580    0.0950    0.0988
## [137,]    0.2129    0.3739    0.4645    0.0977    0.1014
## [138,]    0.2163    0.3717    0.4712    0.1004    0.1039
## [139,]    0.2198    0.3697    0.4780    0.1030    0.1065
## [140,]    0.2232    0.3679    0.4848    0.1056    0.1089
## [141,]    0.2266    0.3663    0.4918    0.1081    0.1114
## [142,]    0.2299    0.3649    0.4987    0.1105    0.1138
## [143,]    0.2332    0.3637    0.5058    0.1129    0.1161
## [144,]    0.2365    0.3628    0.5128    0.1153    0.1184
## [145,]    0.2397    0.3620    0.5198    0.1175    0.1206
## [146,]    0.2429    0.3614    0.5268    0.1198    0.1228
## [147,]    0.2460    0.3609    0.5338    0.1219    0.1249
## [148,]    0.2491    0.3607    0.5407    0.1239    0.1270
## [149,]    0.2521    0.3606    0.5475    0.1259    0.1290
## [150,]    0.2550    0.3606    0.5542    0.1278    0.1310
## [151,]    0.2579    0.3608    0.5608    0.1297    0.1328
## [152,]    0.2607    0.3610    0.5673    0.1315    0.1346
## [153,]    0.2634    0.3614    0.5736    0.1331    0.1364
## [154,]    0.2660    0.3619    0.5797    0.1348    0.1380
## [155,]    0.2684    0.3624    0.5856    0.1363    0.1396
## [156,]    0.2708    0.3630    0.5914    0.1377    0.1412
## [157,]    0.2730    0.3636    0.5968    0.1391    0.1426
## [158,]    0.2751    0.3643    0.6021    0.1404    0.1439
## [159,]    0.2770    0.3650    0.6071    0.1416    0.1452
```

```
## [160,]    0.2788    0.3658    0.6118    0.1428    0.1464
## [161,]    0.2804    0.3665    0.6162    0.1439    0.1475
## [162,]    0.2818    0.3673    0.6203    0.1448    0.1485
## [163,]    0.2831    0.3681    0.6241    0.1457    0.1495
## [164,]    0.2841    0.3689    0.6275    0.1465    0.1503
## [165,]    0.2850    0.3697    0.6307    0.1473    0.1511
## [166,]    0.2857    0.3705    0.6334    0.1479    0.1517
## [167,]    0.2863    0.3714    0.6358    0.1485    0.1523
## [168,]    0.2866    0.3722    0.6378    0.1489    0.1528
## [169,]    0.2867    0.3731    0.6394    0.1493    0.1531
## [170,]    0.2867    0.3741    0.6406    0.1495    0.1534
## [171,]    0.2864    0.3750    0.6413    0.1496    0.1536
## [172,]    0.2860    0.3760    0.6416    0.1497    0.1536
## [173,]    0.2854    0.3771    0.6415    0.1496    0.1536
## [174,]    0.2845    0.3782    0.6408    0.1494    0.1534
## [175,]    0.2835    0.3794    0.6397    0.1490    0.1531
## [176,]    0.2822    0.3806    0.6381    0.1486    0.1527
## [177,]    0.2807    0.3820    0.6360    0.1480    0.1522
## [178,]    0.2790    0.3834    0.6333    0.1473    0.1516
## [179,]    0.2770    0.3849    0.6302    0.1464    0.1508
## [180,]    0.2747    0.3865    0.6265    0.1453    0.1499
```