GammaMix Model Results

**Dataset 1:**

Dataset 1 is genereted from 3 different gamma distributions with true values alpha and beta as below:

alpha = [0.2, 32, 5]

beta = [14, 10, 6]

**Estimation result by GammamixEM.R**

lambda: 0.3188884 0.3477780 0.3333335

alpha 0.3246686 5.141610 35.841043

beta 5.6505925 5.839122 9.078564

**Estimation result by MixedGamma.py**

pai:  [0.31888845 0.34777803 0.33333352]

shape:  [ 0.32466865  5.1416101  35.84104272]

scale:  [5.65059248 5.83912247 9.07856361]

**Dataset 2:**

Dataset 2 is genereted from 50 different gamma distributions with true values alpha and beta as below:

shape2 = [2, 32, 5, 24, 9, 40, 44, 3, 7, 69,

7, 3, 50, 44, 50, 35, 79, 11, 34, 28,

13, 20, 27, 70, 90, 28, 36, 35, 42, 92,

34, 108, 32, 115, 73, 80, 150, 70, 200, 142,

160, 117, 120, 105, 150, 130, 163, 142, 174, 138]

scale2 = [14, 10, 6, 60, 20, 5, 53, 40, 34, 69,

8, 9, 43, 40, 24, 56, 21, 42, 24, 64,

12, 32, 49, 81, 19, 53, 80, 43, 17, 43,

82, 49, 109, 180, 100, 81, 150, 98, 63, 122,

156, 133, 80, 105, 115, 130, 121, 144, 190, 125]

**Estimation result by GammamixEM.R**

**$lambda**

[1] 0.02059912 0.01946613 0.01964229 0.02034258 0.02036923 0.01987646 0.01962203 0.01970077 0.02001298

[10] 0.02008988 0.02029148 0.02018979 0.01973655 0.02018972 0.02023583 0.01959151 0.02039967 0.01962020

[19] 0.02005979 0.01991145 0.02010219 0.01995243 0.01984730 0.02021264 0.01978226 0.02004645 0.02012383

[28] 0.01974381 0.02005997 0.02006309 0.02021592 0.01994939 0.01999488 0.01960284 0.01985432 0.02035257

[37] 0.02066976 0.01926910 0.02029213 0.02039535 0.01970798 0.02004748 0.01983996 0.01989873 0.02009082

[46] 0.01977369 0.02001677 0.01906095 0.02066243 0.02042350

**$gamma.pars**

comp.1 comp.2 comp.3 comp.4 comp.5 comp.6 comp.7 comp.8 comp.9

alpha 7.277356 52.4433636 91.5856038 67.2429977 37.876534 157.2745833 383.1645221 354.2909753 236.811422

beta 1.732749 0.4748371 0.4114067 0.8329808 2.549276 0.9103594 0.4618268 0.5952713 1.088202

comp.10 comp.11 comp.12 comp.13 comp.14 comp.15 comp.16 comp.17 comp.18

alpha 187.493724 94.619805 242.777108 433.5705 329.609603 328.681367 1082.892 1850.9611489 2670.8905209

beta 1.755884 4.733703 2.473448 1.6530 2.596824 3.216109 1.122 0.7221204 0.5380054

comp.19 comp.20 comp.21 comp.22 comp.23 comp.24 comp.25 comp.26

alpha 3770.7145729 4886.3721636 4174.0442665 5841.718035 3189.1800036 2147.687462 1656.22482 1157.665396

beta 0.4051722 0.3302094 0.4070836 0.305832 0.5908034 0.937269 1.32002 2.057646

comp.27 comp.28 comp.29 comp.30 comp.31 comp.32 comp.33 comp.34 comp.35

alpha 752.782813 600.89311 537.03147 540.415646 839.641219 1211.265952 1150.596311 1433.675094 1245.701591

beta 3.526765 5.00837 6.51192 7.474091 5.539295 4.293004 4.986314 4.404422 5.562015

comp.36 comp.37 comp.38 comp.39 comp.40 comp.41 comp.42 comp.43 comp.44

alpha 418.95077 391.8842 492.67596 566.07353 693.85566 4616.452994 6461.412553 6695.885099 8230.138491

beta 18.72978 24.1565 22.38517 22.40441 21.45089 3.481213 2.610218 2.623355 2.226113

comp.45 comp.46 comp.47 comp.48 comp.49 comp.50

alpha 4811.212348 4155.637726 3050.141600 2229.63546 402.76215 173.6985

beta 3.980669 4.848636 7.005707 10.24177 63.02751 188.8246

**Estimation result by MixedGamma.py**

pai:  [0.02059912 0.01946613 0.01964229 0.02034258 0.02036923 0.01987645

 0.01962211 0.01970012 0.02001916 0.019983   0.020278   0.0202049

 0.01973797 0.02019503 0.02033285 0.0195874  0.02039969 0.0196202

 0.02005979 0.01991145 0.02010219 0.01995243 0.0198473  0.02021264

 0.01978226 0.02004645 0.02012383 0.01974381 0.02005997 0.02006309

 0.02021592 0.01994939 0.01999488 0.01960284 0.01985432 0.02035257

 0.02066976 0.0192691  0.02029213 0.02039535 0.01970798 0.02004748

 0.01983996 0.01989873 0.02009082 0.01977369 0.02001677 0.01906095

 0.02066243 0.0204235 ]

shape:  [7.27735566e+00 5.24433636e+01 9.15856038e+01 6.72429977e+01

 3.78765340e+01 1.57274583e+02 3.83164522e+02 3.54290975e+02

 2.36811422e+02 1.89723469e+02 9.46362739e+01 2.41077198e+02

 4.33912865e+02 3.31265883e+02 3.24577725e+02 1.08289229e+03

 1.85096115e+03 2.67089052e+03 3.77071457e+03 4.88637216e+03

 4.17404427e+03 5.84171804e+03 3.18918000e+03 2.14768746e+03

 1.65622482e+03 1.15766540e+03 7.52782813e+02 6.00893106e+02

 5.37031467e+02 5.40415646e+02 8.39641219e+02 1.21126595e+03

 1.15059631e+03 1.43367509e+03 1.24570159e+03 4.18950769e+02

 3.91884238e+02 4.92675958e+02 5.66073534e+02 6.93855659e+02

 4.61645299e+03 6.46141255e+03 6.69588510e+03 8.23013849e+03

 4.81121235e+03 4.15563773e+03 3.05014160e+03 2.22963546e+03

 4.02762153e+02 1.73698512e+02]

scale:  [  1.73274901   0.47483705   0.41140668   0.83298079   2.54927566

   0.91035942   0.46182685   0.59527128   1.08820201   **1.73404423**

   4.72470392   2.48821962   1.65032614   2.58125145   3.25513881

   1.12200022   0.72212036   0.5380054    0.40517217   0.33020941

   0.40708359   0.30583203   0.59080343   0.93726898   1.32002015

   2.05764599   3.52676491   5.00837001   6.5119196    7.47409089

   5.53929543   4.29300398   4.98631363   4.40442156   5.56201541

  18.72977845  24.15650256  22.38517181  22.40440611  21.45089062

   3.48121263   2.6102176    2.62335534   2.22611303   3.98066877

   4.84863629   7.00570655  10.24176934  63.02751082 188.82461273]

Observation: 当数据集中的gamma分布个数大于20左右，会出现alpha值很高，beta值很低的预测结果。

**Dataset 3**

Dataset 3 is genereted from 100 different gamma distributions with true values alpha and beta as below:

shape3 = [7, 12, 4, 15, 20, 25, 29, 39, 35, 24,

43, 49, 52, 42, 45, 51, 32, 62, 33, 46,

12, 58, 53, 35, 60, 67, 65, 69, 85, 40,

39, 71, 83, 29, 24, 81, 72, 93, 64, 43,

92, 100, 105, 107, 130, 111, 130, 132, 142, 124,

127, 152, 157, 112, 160, 198, 173, 112, 154, 172,

143, 149, 144, 152, 132, 120, 183, 177, 180, 163,

173, 190, 192, 212, 221, 133, 254, 243, 184, 145,

210, 214, 264, 221, 242, 200, 213, 215, 223, 249,

201, 24, 84, 95, 47, 152, 23, 42, 21, 14]

scale3 = [47, 18, 5, 35, 26, 25, 46, 32, 14, 24,

64, 12, 52, 24, 32, 36, 23, 72, 64, 31,

200, 120, 43, 54, 94, 12, 45, 85, 27, 23,

53, 70, 23, 34, 43, 60, 23, 65, 41, 94,

54, 33, 42, 51, 22, 12, 42, 33, 42, 12,

40, 91, 44, 85, 12, 40, 143, 149, 144, 152,

25, 14, 22, 40, 171, 32, 12, 21, 141, 124,

24, 64, 15, 94, 40, 44, 33, 27, 69, 164,

121, 102, 224, 67, 0.4, 32, 0.9, 73, 123, 98,

542, 121, 123, 54, 139, 125, 134, 124, 18, 19]

**Estimation result by GammamixEM.R**

**$lambda**

[1] 0.010005087 0.010387157 0.009843381 0.009901370 0.009948626 0.009965157 0.010019783 0.010080955

[9] 0.009854621 0.009981148 0.010026142 0.010000161 0.009880287 0.010039226 0.009945302 0.010047879

[17] 0.009896234 0.010284695 0.009979428 0.009896957 0.010123510 0.010086735 0.009824005 0.010022902

[25] 0.009987830 0.009892429 0.010073831 0.010017105 0.010103826 0.009852558 0.010025775 0.009931011

[33] 0.010069587 0.009944509 0.010068801 0.009963885 0.010009361 0.009982932 0.009893399 0.010216646

[41] 0.009888972 0.009951528 0.010031466 0.009972539 0.010157719 0.009936079 0.010079748 0.009999863

[49] 0.009769981 0.010123165 0.009811031 0.010157129 0.010003496 0.010006411 0.009922261 0.009959485

[57] 0.010085051 0.010008181 0.009972600 0.009935018 0.010145389 0.010121850 0.009776346 0.010186282

[65] 0.009844264 0.010087151 0.009933407 0.010036972 0.009953428 0.010146664 0.009873213 0.009897455

[73] 0.010106646 0.010021271 0.009954603 0.010033532 0.009758494 0.009897344 0.010438089 0.009953895

[81] 0.009948625 0.010088957 0.009939125 0.009840394 0.010191037 0.010206278 0.009935282 0.009755116

[89] 0.010101129 0.010056908 0.009766105 0.010117851 0.009949480 0.010059593 0.009950766 0.009878030

[97] 0.009101330 0.011101743 0.009999999 0.010000001

**$gamma.pars**

comp.1 comp.2 comp.3 comp.4 comp.5 comp.6 comp.7 comp.8 comp.9

alpha 3.335184 236.4853187 61.290741 574.720641 174.910376 255.478158 430.5561636 752.8924431 1301.8230747

beta 5.916738 0.4027043 2.726134 0.350206 1.407717 1.215797 0.8699894 0.5758417 0.3712921

comp.10 comp.11 comp.12 comp.13 comp.14 comp.15 comp.16 comp.17

alpha 1592.501093 1958.2278347 1788.3836999 1776.322570 2083.2056147 1410.8390606 1971.0636886 1801.2518887

beta 0.332576 0.2933124 0.3477884 0.378937 0.3491456 0.5596052 0.4337887 0.5145005

comp.18 comp.19 comp.20 comp.21 comp.22 comp.23 comp.24

alpha 1662.8425076 1796.6413844 2114.1905267 3640.5644117 4972.1182814 6546.1498542 6529.0998772

beta 0.6088525 0.6134486 0.5623829 0.3484168 0.2694833 0.2143287 0.2242923

comp.25 comp.26 comp.27 comp.28 comp.29 comp.30 comp.31 comp.32

alpha 4162.7140857 4778.5015526 5974.4054673 5724.94373 1.069707e+04 9851.1017606 1.085534e+04 1.052588e+04

beta 0.3692189 0.3386286 0.2836953 0.30991 1.731205e-01 0.1942701 1.827727e-01 1.945415e-01

comp.33 comp.34 comp.35 comp.36 comp.37 comp.38 comp.39

alpha 1.020127e+04 1.254319e+04 1.158475e+04 1.040047e+04 8858.6068057 6988.8827826 8971.9060249

beta 2.077766e-01 1.742876e-01 1.949584e-01 2.243359e-01 0.2727628 0.3601005 0.2911749

comp.40 comp.41 comp.42 comp.43 comp.44 comp.45 comp.46

alpha 9834.1871676 1.515815e+04 1.151490e+04 9883.5514260 9565.4453979 8386.9260415 1.026842e+04

beta 0.2754559 1.847691e-01 2.501526e-01 0.3008126 0.3214067 0.3801735 3.216289e-01

comp.47 comp.48 comp.49 comp.50 comp.51 comp.52 comp.53

alpha 9207.3490573 7887.8393263 8154.8645207 8694.7478732 1.320924e+04 11789.539815 7571.7010605

beta 0.3715295 0.4507805 0.4519912 0.4393918 2.992069e-01 0.345689 0.5585541

comp.54 comp.55 comp.56 comp.57 comp.58 comp.59 comp.60

alpha 1.486257e+04 1.432089e+04 1.331840e+04 1.494678e+04 1.749177e+04 2.035616e+04 2.198501e+04

beta 2.942016e-01 3.141429e-01 3.475604e-01 3.185785e-01 2.796566e-01 2.465237e-01 2.334907e-01

comp.61 comp.62 comp.63 comp.64 comp.65 comp.66 comp.67

alpha 1.729538e+04 2.270541e+04 2.747898e+04 32680.532264 2.823186e+04 2.675058e+04 2.726719e+04

beta 3.043902e-01 2.376376e-01 2.006418e-01 0.172193 2.034795e-01 2.190179e-01 2.193488e-01

comp.68 comp.69 comp.70 comp.71 comp.72 comp.73 comp.74 comp.75

alpha 2.273493e+04 2.040758e+04 1.868072e+04 1.698323e+04 9583.7341669 5465.823961 3684.88030 3945.176419

beta 2.691033e-01 3.068729e-01 3.434051e-01 3.878084e-01 0.7084433 1.290573 2.01675 1.996889

comp.76 comp.77 comp.78 comp.79 comp.80 comp.81 comp.82 comp.83

alpha 3552.484043 3640.722503 1917.521120 650.90835 1414.424456 2908.953905 2155.279799 2896.609418

beta 2.340102 2.422723 4.910005 16.10487 8.422322 4.401691 6.384763 5.096531

comp.84 comp.85 comp.86 comp.87 comp.88 comp.89 comp.90 comp.91

alpha 2544.591299 1612.61695 2285.887526 4272.705925 7859.96399 7117.185297 10194.770417 14448.514703

beta 6.162176 10.49025 8.014544 4.561769 2.59276 2.980607 2.161857 1.571831

comp.92 comp.93 comp.94 comp.95 comp.96 comp.97 comp.98 comp.99

alpha 17760.021541 16155.306173 14336.426430 23773.133918 9712.970811 8644.607510 683.88809 215.6249

beta 1.315588 1.484741 1.720594 1.066318 2.686517 3.134552 42.27858 271.5367

comp.100

alpha 168.4032

beta 646.2579

**Estimation result by MixedGamma.py**

pai:  [0.01000509 0.01038716 0.00984338 0.00990137 0.00994863 0.00996516

 0.0100198  0.01008079 0.00985625 0.00992666 0.0100261  0.01000371

 0.00987814 0.01003732 0.00999976 0.01004691 0.00989631 0.01028469

 0.00997943 0.00989696 0.01012351 0.01008674 0.00982401 0.0100229

 0.00998783 0.00989243 0.01007383 0.01001711 0.01010383 0.00985256

 0.01002577 0.00993101 0.01006959 0.00994451 0.0100688  0.00996389

 0.01000936 0.00998293 0.0098934  0.01021665 0.00988897 0.00995153

 0.01003147 0.00997254 0.01015772 0.00993608 0.01007975 0.00999986

 0.00976998 0.01012316 0.00981103 0.01015713 0.0100035  0.01000641

 0.00992226 0.00995948 0.01008505 0.01000818 0.0099726  0.00993502

 0.01014539 0.01012185 0.00977635 0.01018628 0.00984426 0.01008715

 0.00993341 0.01003697 0.00995343 0.01014666 0.00987321 0.00989745

 0.01010665 0.01002127 0.0099546  0.01003353 0.00975849 0.00989734

 0.01043809 0.0099539  0.00994863 0.01008896 0.00993912 0.00984039

 0.01019104 0.01020628 0.00993528 0.00975512 0.01010113 0.01005691

 0.00976611 0.01011785 0.00994948 0.01005959 0.00995077 0.00987803

 0.00910133 0.01110174 0.01       0.01      ]

shape:  [3.33518388e+00 2.36485319e+02 6.12907405e+01 5.74720641e+02

 1.74910376e+02 2.55478158e+02 4.30556164e+02 7.52892443e+02

 1.30182307e+03 1.60748452e+03 1.95695562e+03 1.78322788e+03

 1.77718106e+03 2.08355562e+03 1.39767913e+03 1.97106369e+03

 1.80125189e+03 1.66284251e+03 1.79664138e+03 2.11419053e+03

 3.64056441e+03 4.97211828e+03 6.54614985e+03 6.52909988e+03

 4.16271409e+03 4.77850155e+03 5.97440547e+03 5.72494373e+03

 1.06970711e+04 9.85110176e+03 1.08553369e+04 1.05258764e+04

 1.02012684e+04 1.25431933e+04 1.15847471e+04 1.04004702e+04

 8.85860681e+03 6.98888278e+03 8.97190602e+03 9.83418717e+03

 1.51581526e+04 1.15149050e+04 9.88355143e+03 9.56544540e+03

 8.38692604e+03 1.02684181e+04 9.20734906e+03 7.88783933e+03

 8.15486452e+03 8.69474787e+03 1.32092397e+04 1.17895398e+04

 7.57170106e+03 1.48625723e+04 1.43208911e+04 1.33183983e+04

 1.49467825e+04 1.74917672e+04 2.03561601e+04 2.19850130e+04

 1.72953751e+04 2.27054146e+04 2.74789824e+04 3.26805323e+04

 2.82318595e+04 2.67505768e+04 2.72671948e+04 2.27349333e+04

 2.04075832e+04 1.86807225e+04 1.69832285e+04 9.58373417e+03

 5.46582396e+03 3.68488030e+03 3.94517642e+03 3.55248404e+03

 3.64072250e+03 1.91752112e+03 6.50908345e+02 1.41442446e+03

 2.90895390e+03 2.15527980e+03 2.89660942e+03 2.54459130e+03

 1.61261695e+03 2.28588753e+03 4.27270593e+03 7.85996399e+03

 7.11718530e+03 1.01947704e+04 1.44485147e+04 1.77600215e+04

 1.61553062e+04 1.43364264e+04 2.37731339e+04 9.71297081e+03

 8.64460751e+03 6.83888088e+02 2.15624862e+02 1.68403224e+02]

scale:  [5.91673777e+00 4.02704314e-01 2.72613405e+00 3.50206025e-01

 1.40771682e+00 1.21579703e+00 8.69989384e-01 5.75841652e-01

 3.71292070e-01 3.29405294e-01 2.93389332e-01 3.48653616e-01

 3.78598301e-01 3.48959150e-01 5.64749059e-01 4.33788676e-01

 5.14500498e-01 6.08852502e-01 6.13448637e-01 5.62382866e-01

 3.48416781e-01 2.69483256e-01 2.14328682e-01 2.24292257e-01

 3.69218864e-01 3.38628563e-01 2.83695258e-01 3.09910025e-01

 1.73120498e-01 1.94270071e-01 1.82772678e-01 1.94541521e-01

 2.07776632e-01 1.74287595e-01 1.94958441e-01 2.24335853e-01

 2.72762838e-01 3.60100503e-01 2.91174855e-01 2.75455868e-01

 1.84769095e-01 2.50152616e-01 3.00812606e-01 3.21406731e-01

 3.80173462e-01 3.21628874e-01 3.71529548e-01 4.50780450e-01

 4.51991243e-01 4.39391767e-01 2.99206883e-01 3.45689028e-01

 5.58554146e-01 2.94201635e-01 3.14142949e-01 3.47560437e-01

 3.18578508e-01 2.79656559e-01 2.46523716e-01 2.33490684e-01

 3.04390239e-01 2.37637595e-01 2.00641783e-01 1.72192959e-01

 2.03479529e-01 2.19017939e-01 2.19348763e-01 2.69103325e-01

 3.06872853e-01 3.43405110e-01 3.87808406e-01 7.08443286e-01

 1.29057266e+00 2.01675019e+00 1.99688943e+00 2.34010232e+00

 2.42272252e+00 4.91000532e+00 1.61048730e+01 8.42232153e+00

 4.40169054e+00 6.38476326e+00 5.09653145e+00 6.16217551e+00

 1.04902469e+01 8.01454365e+00 4.56176934e+00 2.59275969e+00

 2.98060694e+00 2.16185710e+00 1.57183055e+00 1.31558757e+00

 1.48474125e+00 1.72059359e+00 1.06631792e+00 2.68651690e+00

 3.13455172e+00 4.22785809e+01 2.71536705e+02 6.46257912e+02]

验证结果： 三组数据（3个gamma分布，50个gamma分布，100个 gamma分布），通过gammamixEM.R与MixedGamma.py对参数的估计结果一样。