Homework 2 / 2014-17831 / JaeWon Kim

1. AIC and BIC values

```
> print(mle_summary, 5)
       par1  par2  par3 K m_loglik    r2     AIC     BIC
POW1  0.434    NA    NA 1  247.360 0.910 496.721 496.800
POW2  0.985 0.424    NA 2  247.336 0.912 498.673 498.832
EXP1  0.110    NA    NA 1  273.857 0.347 549.714 549.793
EXP2  0.747 0.063    NA 2  252.055 0.790 508.111 508.270
EXPOW 0.985 0.000 0.424 3  247.336 0.912 500.673 500.911
HYP1  0.227    NA    NA 1  254.208 0.738 510.416 510.495
HYP2  0.824 0.128    NA 2  249.884 0.849 503.768 503.927
```

Summary table with $\Delta AIC, \Delta BIC$ values

```
> mle_summary
       par1  par2  par3 K m_loglik    r2     AIC     BIC  d_AIC  d_BIC
POW1  0.434    NA    NA 1  247.360 0.910 496.721 496.800  0.000  0.000
POW2  0.985 0.424    NA 2  247.336 0.912 498.673 498.832  1.952  2.032
EXP1  0.110    NA    NA 1  273.857 0.347 549.714 549.793 52.993 52.993
EXP2  0.747 0.063    NA 2  252.055 0.790 508.111 508.270 11.390 11.470
EXPOW 0.985 0.000 0.424 3  247.336 0.912 500.673 500.911  3.952  4.111
HYP1  0.227    NA    NA 1  254.208 0.738 510.416 510.495 13.695 13.695
HYP2  0.824 0.128    NA 2  249.884 0.849 503.768 503.927  7.047  7.127
```

In the previous analysis of the models from Homework1, the EXPOW and POW2 models seemed to fit the data best, with the POW1 model as a close runner-up. However, the POW1 model has the lowest AIC value, with the POW2 and EXPOW models coming close. This is because POW1 is a single parameter models while POW2 and EXPOW have two and three parameters, respectively. In other words, the criterion values rewarded POW1 for its simplicity. But because the maximum number of parameters from any model is no more than three, there is not any huge deviation from the r2 analysis. Overall, it could reasonably be deduced that POW1 model is the best model considering its effectiveness and simplicity.

2. 1) ra_prospect for a single subject

```
> print(mle_summary)
             rho   tau lambda K m_loglik     AIC     BIC
ra_prospect 1.02 1.007  0.783 3   68.679 143.358 137.358
```

2. 2) ra_prospect for all subjects

```
> print(mle_summary)
               rho   tau lambda -loglik     AIC     BIC
ra_prospect_1 1.020 1.007  0.783  68.679 143.358 137.358
ra_prospect_2 0.693 4.742  2.475  18.467  42.934  36.934
ra_prospect_3 0.794 1.035  1.077  81.019 168.037 162.037
ra_prospect_4 0.866 3.130  0.982  43.795  93.589  87.589
ra_prospect_5 0.962 2.347  1.409  41.195  88.390  82.390
```

2. 3)

ra_prospect and ra_noLA (fewer iterations, with local minima problem)

```
> print(mle_summary)
         model subjID   rho   tau lambda m_loglik     AIC     BIC
1  ra_prospect      2 1.020 1.007  0.783   68.679 143.358 137.358
2  ra_prospect      3 0.693 4.742  2.475   18.467  42.934  36.934
3  ra_prospect      4 0.794 1.035  1.077   81.019 168.037 162.037
4  ra_prospect      6 0.866 3.130  0.982   43.795  93.589  87.589
5  ra_prospect      7 0.962 2.347  1.409   41.195  88.390  82.390
6       ra_noLA      2 0.991 0.748     NA   74.481 152.963 148.963
7       ra_noLA      3 0.556 1.467     NA   89.643 183.286 179.286
8       ra_noLA      4 0.808 1.081     NA   81.401 166.802 162.802
9       ra_noLA      6 0.867 3.049     NA   43.891  91.783  87.783
10      ra_noLA      7 0.971 1.354     NA   58.177 120.354 116.354
```

ra_prospect and ra_noLA (local minima problem fixed)

```
> print(mle_summary)
         model subjID   rho   tau lambda m_loglik     AIC     BIC   d_AIC   d_BIC
1  ra_prospect      2 1.020 1.007  0.783   68.679 143.358 137.358 100.424 100.424
2  ra_prospect      3 0.693 4.742  2.475   18.467  42.934  36.934   0.000   0.000
3  ra_prospect      4 0.794 1.035  1.077   81.019 168.037 162.037 125.103 125.103
4  ra_prospect      6 0.866 3.130  0.982   43.795  93.589  87.589  50.655  50.655
5  ra_prospect      7 0.962 2.347  1.409   41.195  88.390  82.390  45.456  45.456
6       ra_noLA      2 0.991 0.748     NA   74.481 152.963 148.963 110.029 112.029
7       ra_noLA      3 0.000 2.280     NA   43.274  90.548  86.548  47.614  49.614
8       ra_noLA      4 0.808 1.081     NA   81.401 166.802 162.802 123.868 125.868
9       ra_noLA      6 0.867 3.049     NA   43.891  91.783  87.783  48.849  50.849
10      ra_noLA      7 0.971 1.354     NA   58.177 120.354 116.354  77.420  79.420
```

2. 4)

Summary of AIC and BIC values for each model

```
> summary(mle_summary$AIC[which(mle_summary$model == "ra_prospect")])
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  42.93   88.39   93.59  107.26  143.36  168.04
> summary(mle_summary$AIC[which(mle_summary$model == "ra_noLA")])
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  90.55   91.78  120.35  124.49  152.96  166.80
> summary(mle_summary$BIC[which(mle_summary$model == "ra_prospect")])
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  36.93   82.39   87.59  101.26  137.36  162.04
> summary(mle_summary$BIC[which(mle_summary$model == "ra_noLA")])
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  86.55   87.78  116.35  120.49  148.96  162.80
```

The risk aversion model with delta (a.k.a. ra_prospect) seems to be the better model based on AIC and BIC values. Both the mean and median values of AIC and BIC are lower for the ra_prospect model. The maximum value of the AIC is slightly larger on the ra_prospect model, but the difference is negligible.