MCAR simulation-folder5

7/27/2017

Method summary: update β NOT conditioned on b_i, impute the initial value of missing X_{it} using linear interpolation and update missing X_{it} using M-H algorithm.

Part 1: running time

```
##run n_iter=10000 iterations
time
```

```
##    user   system  elapsed
## 1796.540  145.913 1951.983
```

Part 2: evaluate the method of imputing initial value of missing X_{it}

```
maxdiff.ini.X  ##maximum difference
```

```
## [1] 3.912702
```

```
mindiff.ini.X  ##minimum difference
```

```
## [1] -4.002502
```

Part 3: MCMC results

Posterior mean

```
burnin=5000
(posterior.mean.eta=apply(eta_keep[-(1:burnin),],2, mean))
```

```
## [1]  0.000000  2.174937  1.078429 -0.535411
```

```
(posterior.mean.M=apply(M_keep[-(1:burnin),],2, mean))
```

```
## [1]  0.0000000  0.5987410  1.2007638 -0.5952996
```

```
(posterior.mean.v=apply(v_keep[-(1:burnin),],2, mean))
```

```
## [1]  0.5109337 -0.3068202
```

```
(posterior.mean.beta=apply(beta_keep[-(1:burnin),],2, mean))
```

```
## [1] -0.4285408  0.4839829
```

```
(posterior.mean.sgmr2=mean(sgmr2_keep[-(1:burnin)]))
```

```
## [1] 1.770385
```

```
(posterior.mean.sgm2=mean(sgm2_keep[-(1:burnin)]))
```

```
## [1] 1.355806
```

```
(posterior.mean.E=mean(E_keep[-(1:burnin)]))
```

```
## [1] 1.704223
```

Difference between mean of multiple imputed X and their true value

```
##mean of imputed X
MI.mean.X=apply(X_keep[-(1:burnin),], 2, mean)
##difference with the true X
(diff=MI.mean.X-(SVXYR$X)[R_sim==0])
```

```
##   [1]  1.978556594 -1.759081352 -0.093753079  0.352511336 -0.482223527
##   [6]  0.339792665  0.294462752  1.522317200 -1.518486748  1.045116668
##  [11]  1.593605843  1.433866150 -0.368523841 -1.145363052  1.242799180
##  [16] -1.528084991  0.202733293  1.225900565 -0.936797031  0.393420260
##  [21] -0.267985428 -0.761235762 -1.125600553 -1.498508143  1.245362463
##  [26]  0.381801282 -0.478323592 -0.058035384 -1.890067630 -1.864091204
##  [31]  2.311324504 -1.304936650  1.515098944  0.650084866  1.430284990
##  [36] -0.544091747  0.744408041 -1.463550220  0.300067342  1.289887777
##  [41]  0.511679408 -1.153117745 -2.282204239  0.780031774  0.043264770
##  [46] -1.812602130 -0.279487354  0.227701362 -1.695873450  0.008751696
##  [51] -1.008716766  0.492385549 -1.872351149 -1.055554645  0.008408408
##  [56] -1.775395971  0.062102377 -1.109904167  1.105735193 -1.205228210
##  [61] -3.389131445  0.119893151  0.791266505  0.015204292 -0.555991751
##  [66]  0.774636446 -1.201383864 -0.509060791 -0.154195897  0.597548589
##  [71]  0.967988803  0.900387776  0.574685695  0.070195684  0.291387251
##  [76]  1.481310126 -0.662246986  0.049704427  0.030808849  1.075324353
##  [81]  0.442015416 -1.174197007  0.496645205  2.276779095 -1.479393684
##  [86] -0.275568503 -1.991815163 -0.839467834 -0.092746504 -0.032078536
##  [91] -1.495429523  0.568726975  1.268902519 -0.064236501 -0.824639846
##  [96] -0.624198015 -1.005181885  1.190171050 -1.381735574  0.031066598
## [101]  0.139919333 -0.817032370 -1.509420748  1.608613563  0.144115218
## [106]  0.680734129  0.283249767 -1.267230562 -0.313315207  0.282025877
## [111]  0.328940688 -0.058952443  0.274804242 -0.181730023  0.521383309
## [116] -0.100048148 -0.513293329 -0.303566425  0.760911357 -0.979935737
## [121] -0.158070306 -0.152500506 -0.393838662  1.309572815 -0.622283996
## [126] -1.144061262 -0.124955013  0.874347534 -0.209753136  1.111485008
## [131] -1.048237559  0.077479335 -0.716518550  0.108170792 -1.607306638
## [136] -2.289157772  0.353536221 -0.058308906 -0.529120262 -0.244650803
## [141] -1.784288184 -0.762092388 -0.515801050  1.593070651 -0.353333976
## [146]  0.053281483 -0.201985044 -1.667256977 -0.483342199 -1.156385649
## [151] -1.287211431 -0.319036017  0.520271899  0.485489080 -0.624048210
## [156] -1.011649976  1.925170391  0.839585760 -0.274715727  0.847161635
## [161] -0.136108866 -0.071780598  0.443455400 -0.903792138 -0.080029058
## [166]  1.017564981  0.818891733  1.092646708  0.625205061  0.624299663
## [171] -1.189586938 -1.125004404 -1.488463893 -1.297841519 -0.806046592
## [176] -1.121079729 -2.110276038  0.684651383  0.515922539 -2.004536716
## [181]  1.017733581  0.476579500  5.079266658  4.930881764  0.712302597
## [186]  1.254410326 -0.165223334 -0.248087704  0.362782582  0.380485928
## [191] -0.673440786 -0.781154158  0.464273231  1.327773595  1.337914700
## [196]  1.721705440  1.038395342  0.260998211 -1.208675977  2.090513658
## [201]  0.617900778  1.242187648 -0.992580569 -1.164749622  0.408002600
## [206] -0.704134386  1.648000673  1.546224618 -0.800395387 -0.443445630
## [211] -0.754915150  0.886765638  0.497944286  0.363794627 -0.381048915
## [216]  0.148718247 -1.429325714  1.157278167 -1.051509092 -0.547088557
## [221]  0.890949863 -0.334633604 -2.102144976 -1.888153639 -0.122086115
## [226] -0.559591766 -0.314373441 -0.541498056  1.259333823  0.725493319
## [231]  1.335629594  0.727401840 -0.789976500  2.610199816  0.806427031
## [236] -2.074727949  0.615276485 -0.194044810  0.622729634  1.569175673
## [241] -0.567511077  0.844514719  0.798468377  1.521276385  1.247087759
## [246] -0.278795010 -0.224417696 -0.214234038  0.819383538  0.556863241
## [251]  1.039605870  1.103325185  0.874446463  0.511755181  0.737067982
## [256] -0.418432724  0.834005985  0.397623279 -0.008551062  1.143721366
## [261] -0.085872039  2.061773759  0.871800419  1.291643449  0.696798436
## [266]  0.136753153  1.661530026  1.146074686  0.646881642  1.309242167
```

```
## [271] -1.698625385  0.313668673 -0.053126939  0.345442509  0.708912860
## [276] -1.254102538  0.003483414  1.089185464 -0.726322135 -1.189354011
## [281]  1.001846865 -2.014135185  0.001093340 -0.863216110 -0.767732105
## [286] -1.197072374  0.113967610  0.546619460 -1.350611902 -0.720751699
## [291]  1.131178019 -0.200527475 -1.596608587 -0.090418835  0.476608965
## [296] -0.166731016  0.061843378 -0.130513893 -0.714903925  0.237927770
## [301] -0.272928973  0.042711676  0.172595842  0.569556767  0.822585617
## [306] -1.941368924 -0.167905418  0.460581430 -0.887316600 -0.437295788
## [311]  0.455286340 -0.209207758 -1.141091507 -1.619853371  1.527915266
## [316] -1.129526255 -0.247302290  0.655871513 -0.135340527 -1.187653194
## [321] -0.672682008  0.249786203 -1.147078736  0.450431355  2.262058312
## [326]  0.243649112  0.237502222  1.939312479  1.905114804  1.723591770
## [331] -0.480762364  0.778750865 -0.117912523 -1.287540198 -0.266082179
## [336]  0.258333591  1.842826509  1.044425069  0.568970692  1.072875052
## [341]  1.407959928  0.192339307 -0.960967250  0.331375650 -1.633145789
## [346]  0.694766206  1.243211923 -1.310226407 -1.786502044  1.156244922
## [351]  0.260946668 -1.631412430  0.657281530  1.433545718 -1.516701755
## [356] -1.110703545 -0.463093963  1.503999497  0.008809662 -1.262631748
## [361]  0.315038528  1.494252617 -0.413205738 -0.482986485 -0.732841752
## [366]  0.389325085  0.528946984 -0.353645282  2.343870907 -0.149678467
## [371] -0.532961267 -0.897032107 -0.190307830 -0.726921488 -1.063608064
## [376] -1.418411853  1.753599439 -1.732290914  0.089075398  1.429541659
## [381]  0.835465009  1.366722441  1.022218335  0.873796497 -1.828011881
## [386] -0.431780217 -0.752539192  0.694114498 -0.158349096  1.021286010
## [391]  1.932177758 -0.736157324  0.584305770 -0.002718923  0.670512260
## [396]  2.018154422  1.309395820  0.311922141  0.566325499  0.999061722
## [401]  0.862934420  1.162628435  0.848412835  0.005633572 -0.348669943
## [406]  2.153713517  0.728345497 -1.141892326 -0.275091951  1.090630033
## [411] -0.242807051  1.774468534  1.158061965 -0.524604316 -0.413705620
## [416]  0.180867615  0.362133756 -1.087690119  1.030724834 -1.717262013
## [421]  0.403876034 -0.126472595  0.187630840  0.134667764  0.080339138
## [426]  0.848118736 -0.857881296  0.283896320  0.776481914  1.749723981
## [431] -2.548769596  0.948488068 -0.043617607 -1.462312326 -1.610252333
## [436]  0.522378552  1.452405612 -0.519974322 -0.288122725 -0.010610041
## [441] -0.880731132  1.166180147  0.052744900 -0.128170885  0.595158905
## [446]  0.760937038  1.429275800  1.057918190 -0.753470279  1.917147454
## [451] -1.884365181 -1.716362090  1.067136177 -0.334651451  0.386920869
## [456]  0.696219433  0.816234106  2.270964844 -0.075810955  1.503785658
## [461]  0.429384225  0.144734327 -0.603577030 -0.934349083
```

```r
min(diff)
```

```
## [1] -3.389131
```

```r
max(diff)
```

```
## [1] 5.079267
```

Classification probability

```r
classification_prob_table=matrix(0, K, n)
for(l in 1:K){
  classification_prob_table[l,]=apply(c_keep[-(1:burnin),], 2, function(x) length(which(x==l))/(n_iter-l
}
classification_prob_table
```

```
##      [,1] [,2] [,3] [,4] [,5]   [,6] [,7] [,8] [,9] [,10] [,11] [,12]
```

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```
## [1,]    0    0    0    0    0 0.0000    0    1    0    0    1    0
## [2,]    1    0    0    1    1 0.1278    0    0    0    0    0    0
## [3,]    0    0    1    0    0 0.8722    1    0    1    1    0    1
## [4,]    0    1    0    0    0 0.0000    0    0    0    0    0    0
##      [,13] [,14] [,15] [,16]  [,17] [,18] [,19] [,20]  [,21] [,22] [,23]
## [1,]     0     1     0     0 0.6154     0     0     0 0.0000     0     0
## [2,]     1     0     1     0 0.1732     1     0     0 0.0354     0     0
## [3,]     0     0     0     0 0.0184     0     1     0 0.9646     0     0
## [4,]     0     0     0     1 0.1930     0     0     1 0.0000     1     1
##      [,24] [,25] [,26] [,27] [,28] [,29] [,30] [,31] [,32] [,33] [,34]
## [1,]     0     0     0     1     0     0     0     0     1     0     0
## [2,]     0     1     0     0     0     1     1     0     0     0     1
## [3,]     1     0     0     0     1     0     0     1     0     1     0
## [4,]     0     0     1     0     0     0     0     0     0     0     0
##      [,35] [,36] [,37] [,38] [,39] [,40] [,41] [,42]  [,43] [,44] [,45]
## [1,]     0     0     0     0     0     0     0     0 0.7566     0     0
## [2,]     1     1     0     0     1     1     1     0 0.1588     0     0
## [3,]     0     0     1     1     0     0     0     0 0.0012     1     0
## [4,]     0     0     0     0     0     0     0     1 0.0834     0     1
##      [,46] [,47]  [,48] [,49] [,50] [,51] [,52] [,53] [,54] [,55] [,56]
## [1,]     1     0 0.7300     1     0     0     0     0     0     0     1
## [2,]     0     0 0.2416     0     0     0     0     0     0     0     0
## [3,]     0     1 0.0198     0     0     0     0     1     1     0     0
## [4,]     0     0 0.0086     0     1     1     1     0     0     1     0
##      [,57] [,58] [,59] [,60]  [,61] [,62] [,63] [,64] [,65] [,66] [,67]
## [1,]     0     0     0     1 0.0146     0     1     0     0     1     0
## [2,]     0     1     1     0 0.0000     1     0     0     1     0     0
## [3,]     0     0     0     0 0.0000     0     0     1     0     0     0
## [4,]     1     0     0     0 0.9854     0     0     0     0     0     1
##      [,68] [,69] [,70] [,71] [,72] [,73] [,74] [,75] [,76] [,77] [,78]
## [1,]     0     0     0     0     0     0     1     0     0     0     0
## [2,]     1     0     1     1     0     0     0     1     0     0     1
## [3,]     0     0     0     0     0     0     0     0     0     0     0
## [4,]     0     1     0     0     1     1     0     0     1     1     0
##      [,79] [,80] [,81] [,82] [,83] [,84] [,85] [,86] [,87] [,88] [,89]
## [1,]     0     0     0     0     0     0     0     0     1     0     0
## [2,]     0     0     1     0     0     0     1     0     0     1     0
## [3,]     1     1     0     0     0     0     0     1     0     0     0
## [4,]     0     0     0     1     1     1     0     0     0     0     1
##      [,90] [,91] [,92] [,93] [,94] [,95] [,96]  [,97] [,98] [,99] [,100]
## [1,]     0     0     0     0     1     0     0 0.0134     0     0      1
## [2,]     1     0     0     1     0     1     1 0.9770     0     1      0
## [3,]     0     0     0     0     0     0     0 0.0096     0     0      0
## [4,]     0     1     1     0     0     0     0 0.0000     1     0      0
```
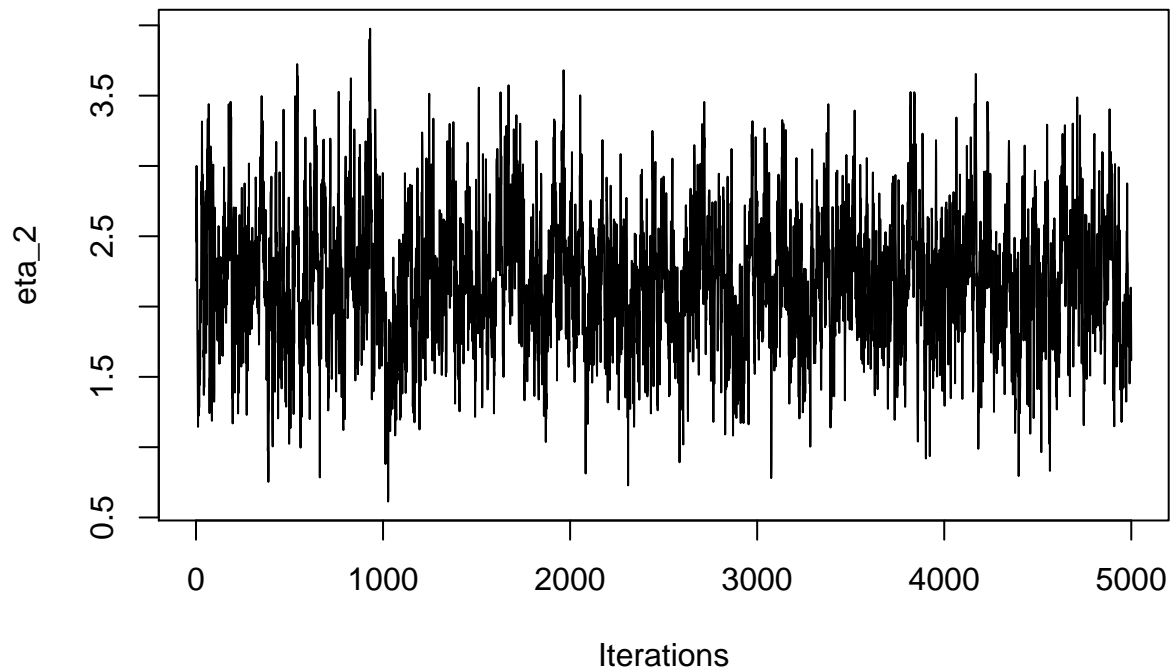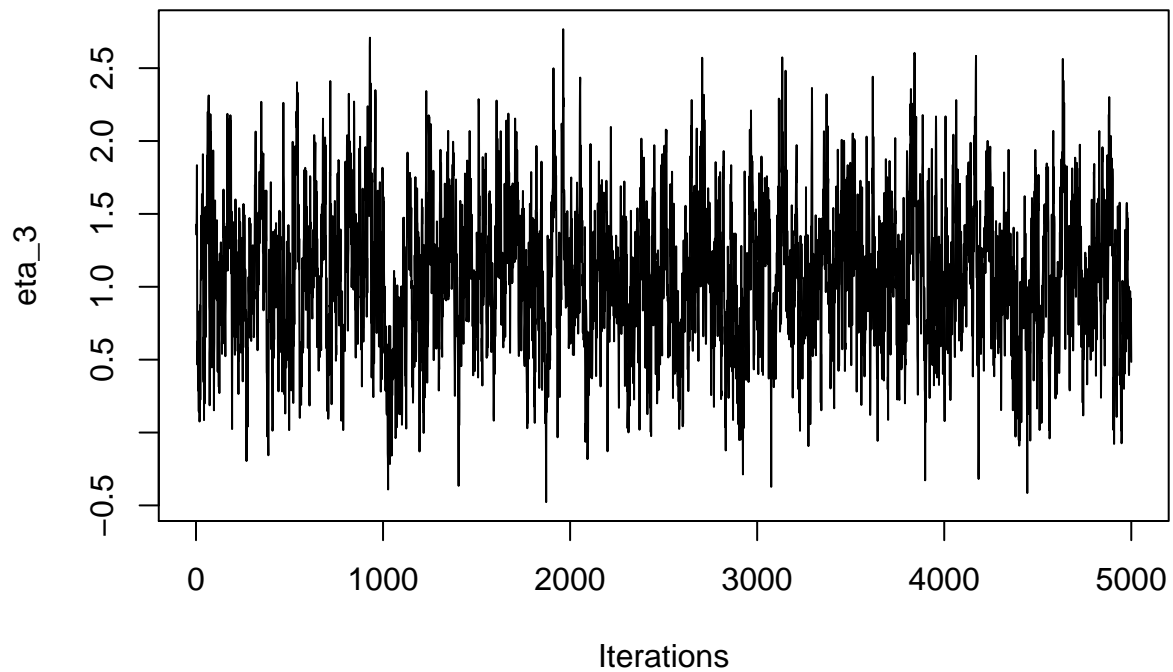
Part 4: traceplots

```
##traceplots after burn-in
##ture value of eta2 is 0.5
traceplot(x=as.mcmc(eta_keep[-(1:burnin),2]), ylab="eta_2")
```
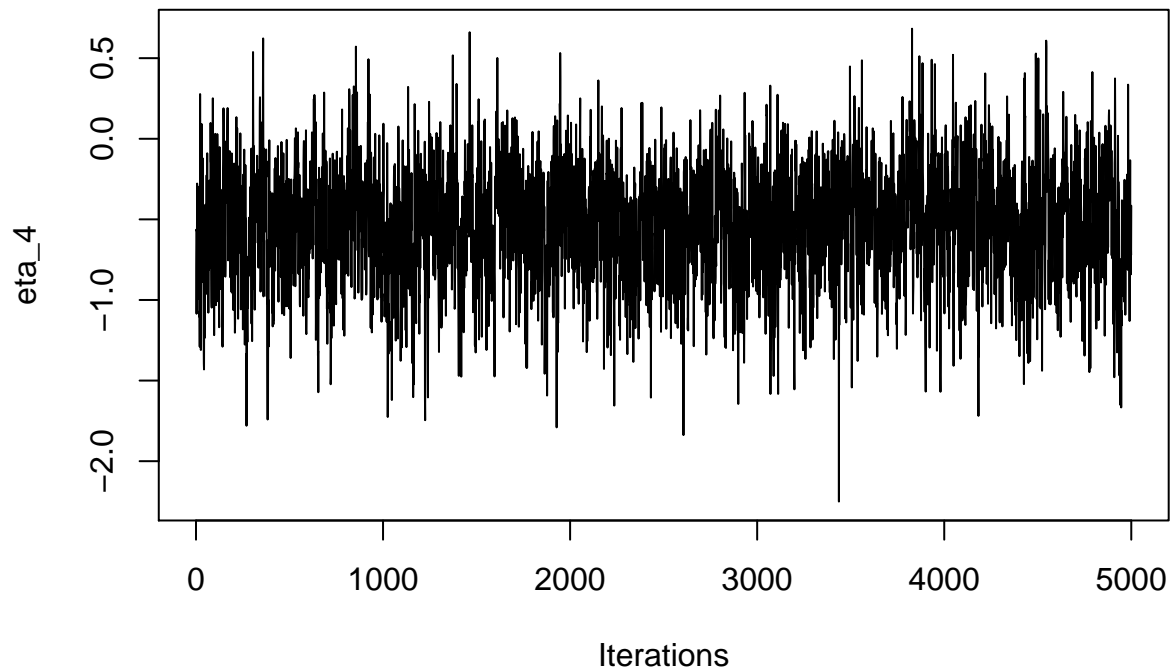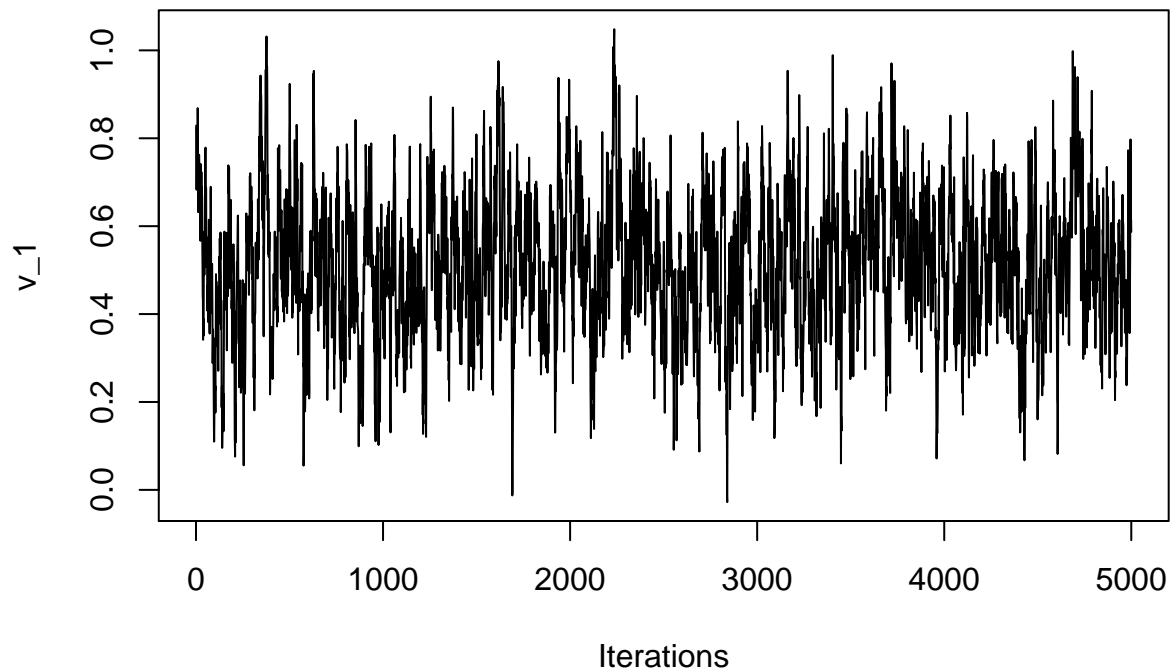
```
##true value of eta3 is 1.5
traceplot(x=as.mcmc(eta_keep[-(1:burnin),3]), ylab="eta_3")
```
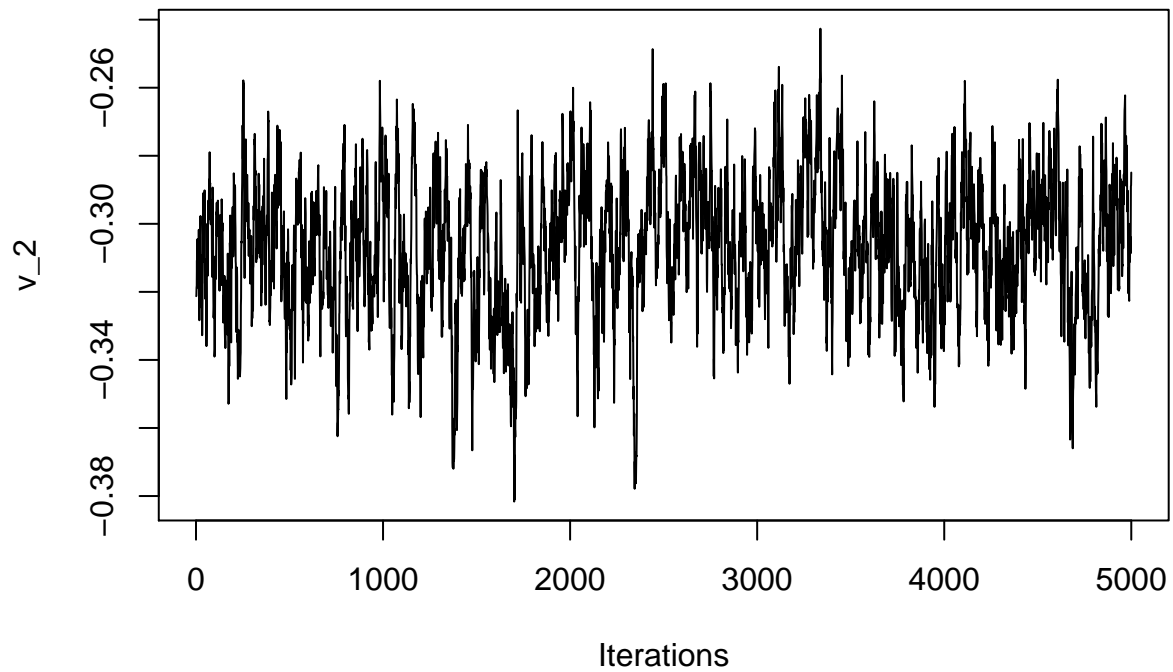


```
##true value of eta4 is 1
traceplot(x=as.mcmc(eta_keep[-(1:burnin),4]), ylab="eta_4")
```
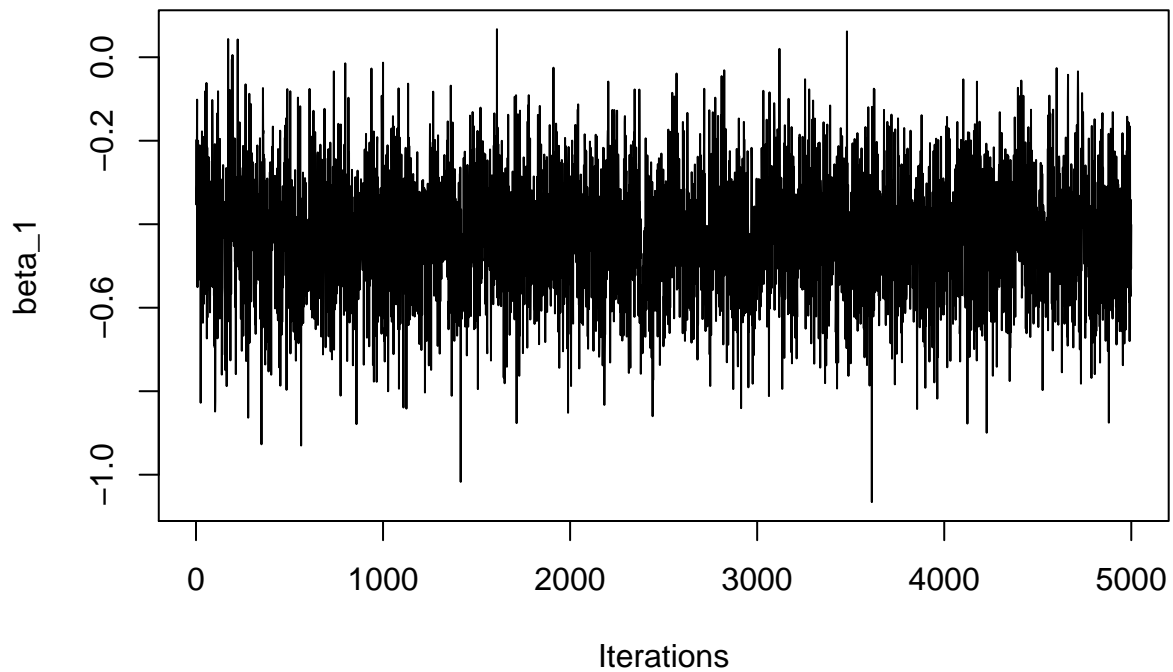
```
##true value of v1 is 0.5
traceplot(x=as.mcmc(v_keep[-(1:burnin),1]), ylab="v_1")
```
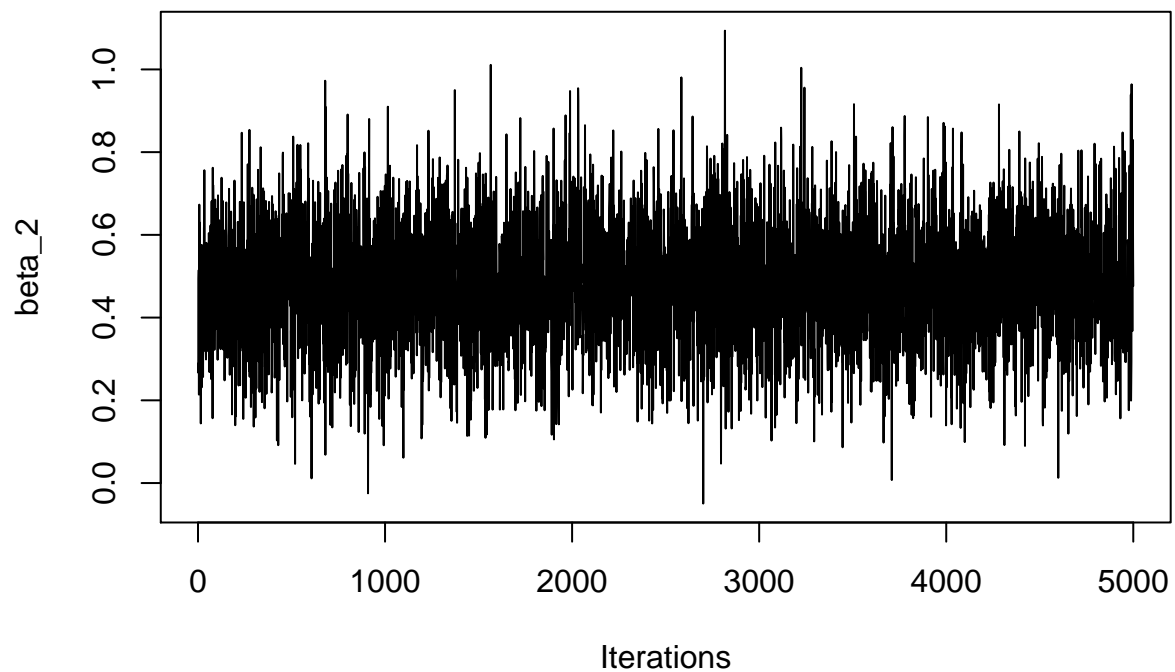


```
##true value of v2 is -0.3
traceplot(x=as.mcmc(v_keep[-(1:burnin),2]), ylab="v_2")
```
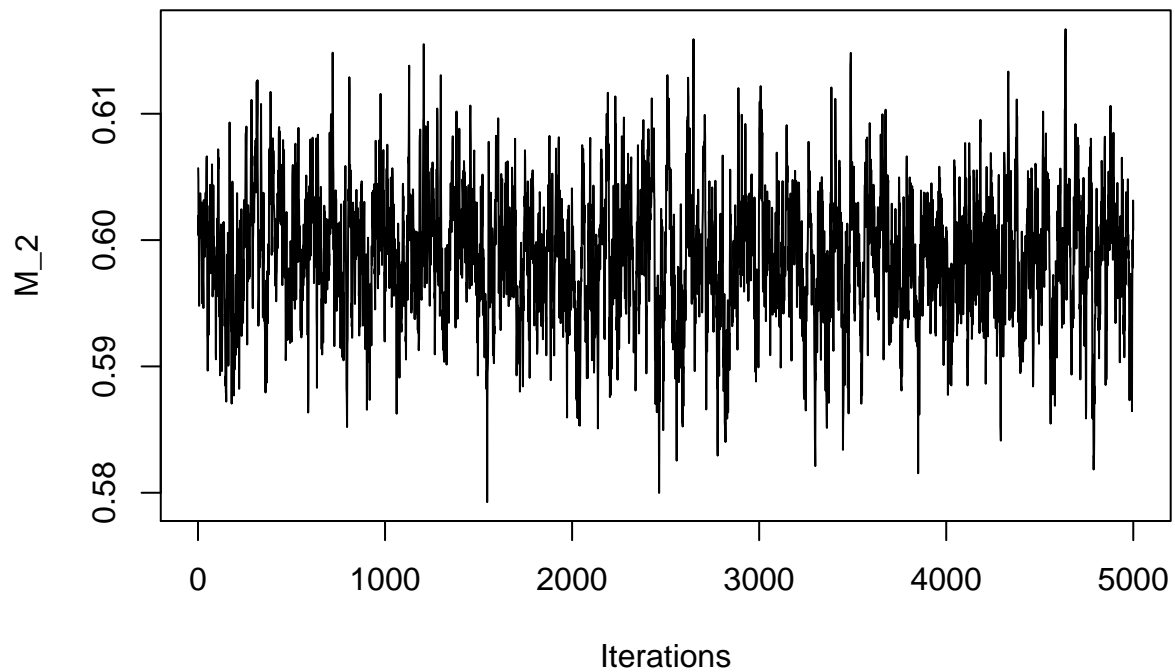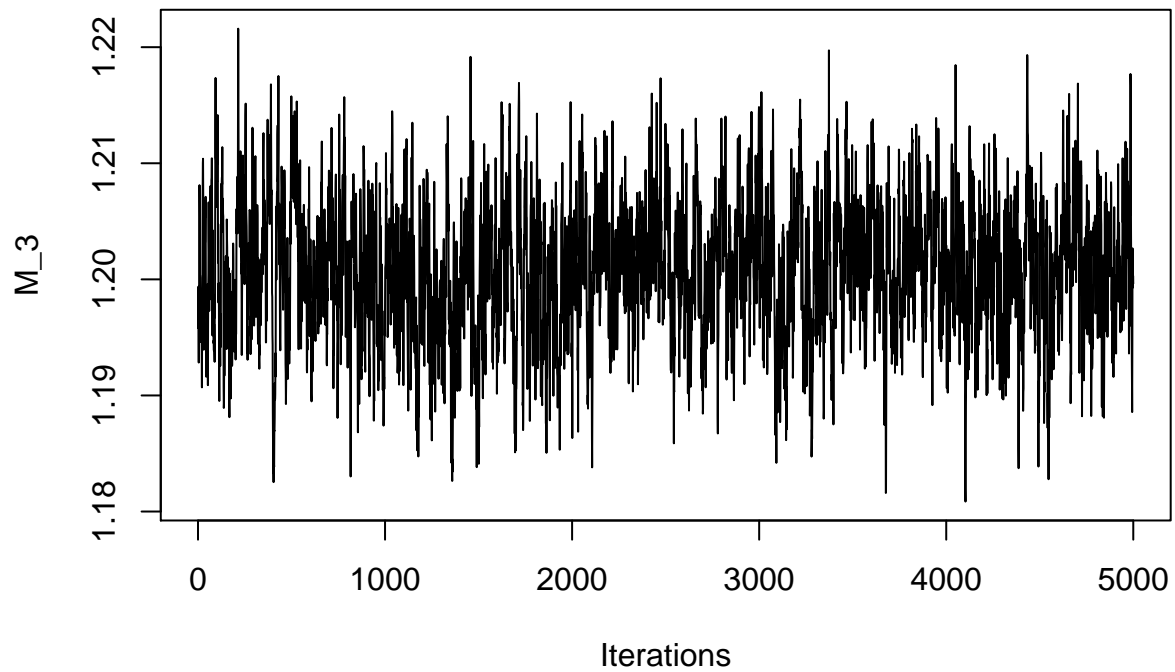
```
##true value of beta1 is -0.4
traceplot(x=as.mcmc(beta_keep[-(1:burnin),1]), ylab="beta_1")
```



```
##true value of beta2 is 0.5
traceplot(x=as.mcmc(beta_keep[-(1:burnin),2]), ylab="beta_2")
```
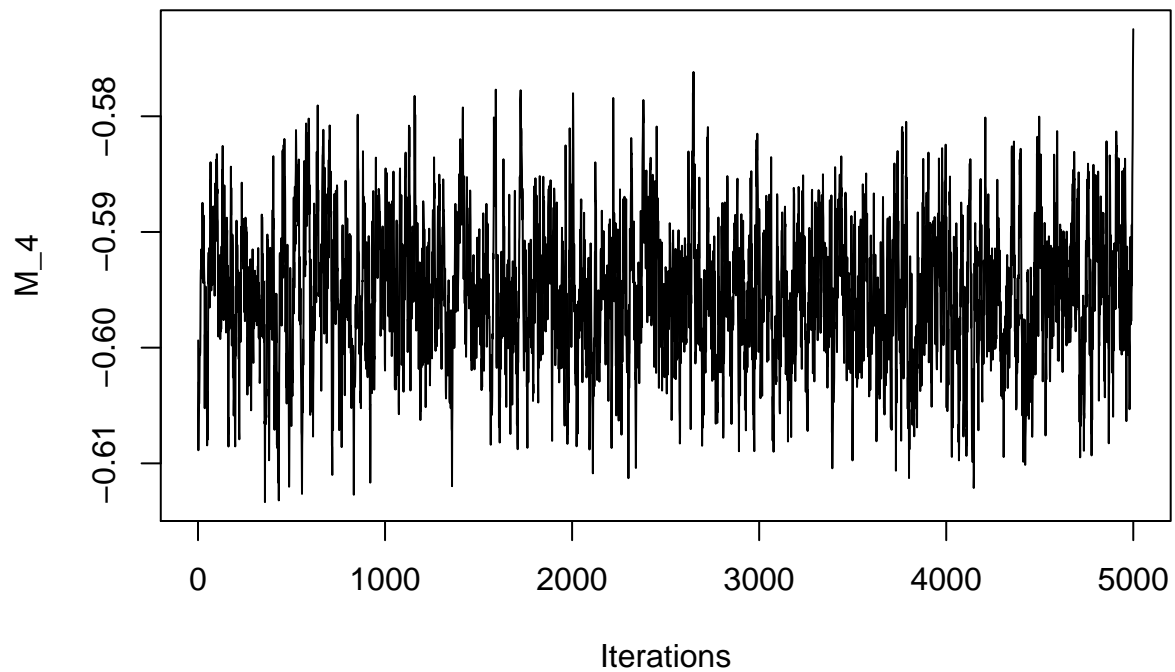
```
##true value of M2 is -0.6
traceplot(x=as.mcmc(M_keep[-(1:burnin),2]), ylab="M_2")
```
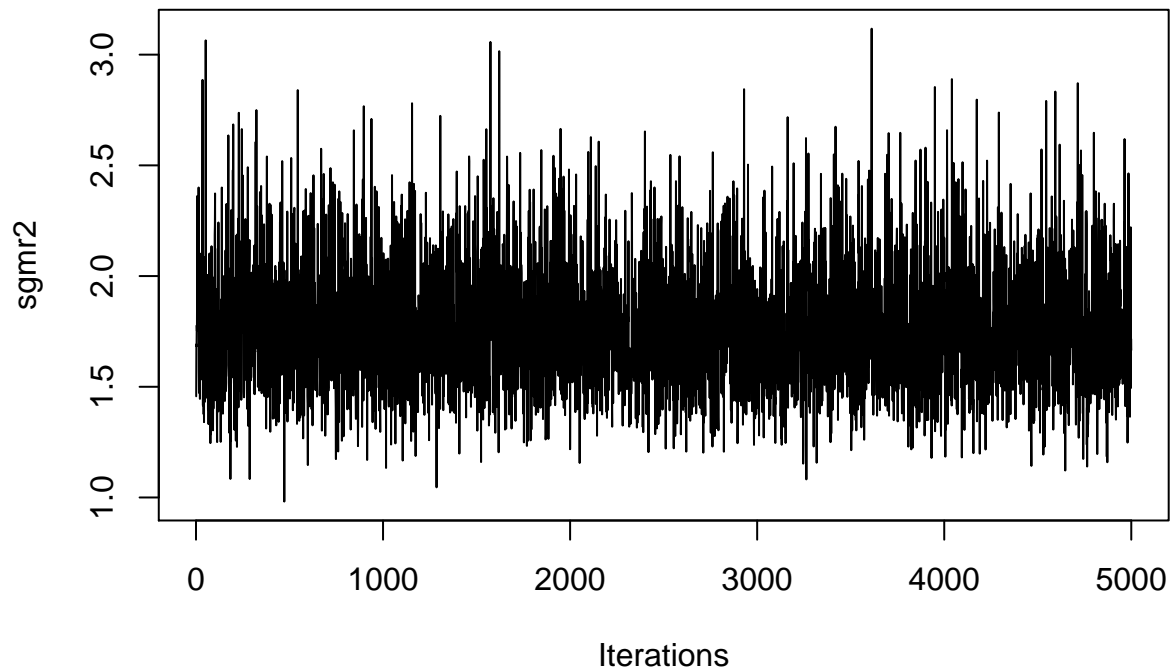


```
##true value of M3 is 0.6
traceplot(x=as.mcmc(M_keep[-(1:burnin),3]), ylab="M_3")
```
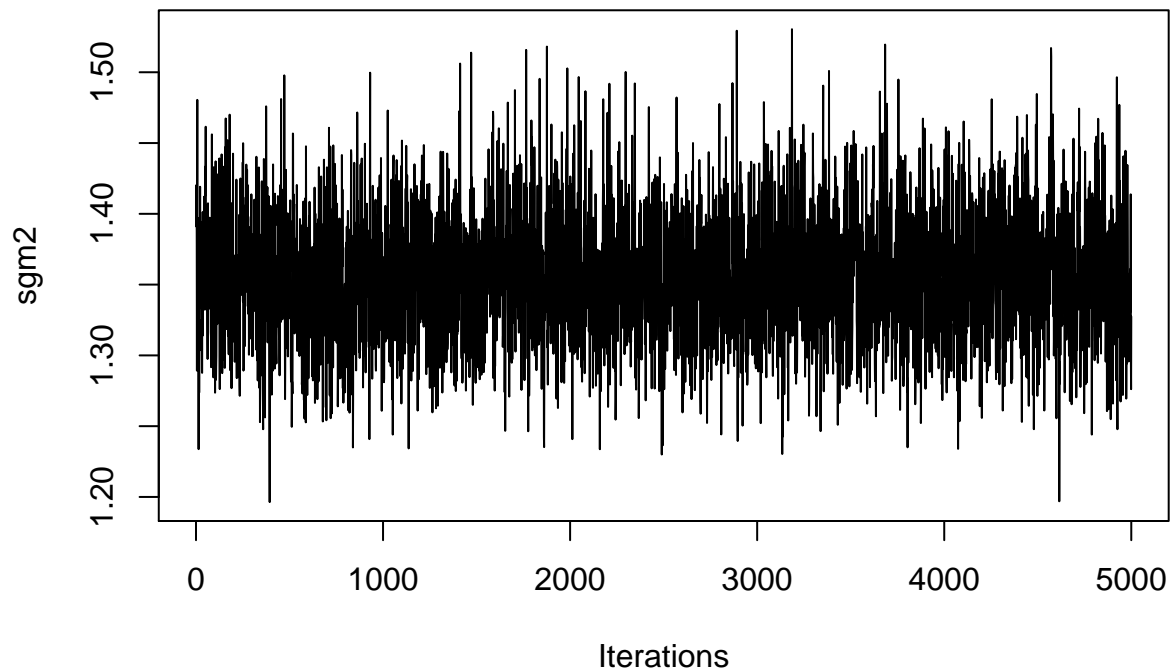
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```
##true value of M4 is 1.2
traceplot(x=as.mcmc(M_keep[-(1:burnin),4]), ylab="M_4")
```



```
##true value of sgmr2 is 1
traceplot(x=as.mcmc(sgmr2_keep[-(1:burnin)]), ylab="sgmr2")
```

```
##true value of sgm2 is 1
traceplot(x=as.mcmc(sgm2_keep[-(1:burnin)]), ylab="sgm2")
```



```
##true value of E is 1
traceplot(x=as.mcmc(E_keep[-(1:burnin)]), ylab="E")
```