

## Bayesian Analysis II, Fall 2020

### Lab Exercise 5:

1.

R-code in *H5T1.R*

a)

```
Iterations = 10:10000
Thinning interval = 10
Number of chains = 3
Sample size per chain = 1000
```

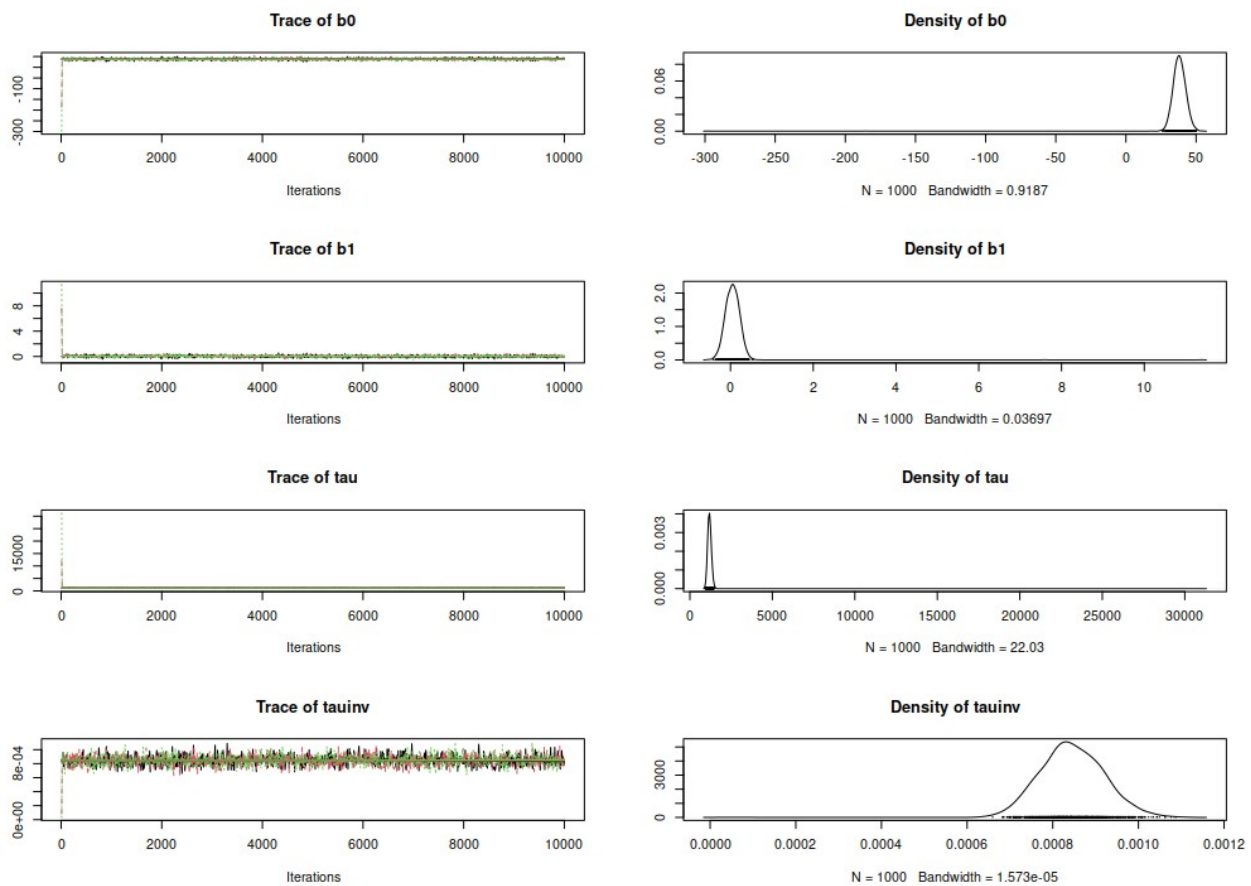
1. Empirical mean and standard deviation for each variable,  
plus standard error of the mean:

	Mean	SD	Naive SE	Time-series SE
b0	3.798e+01	8.546e+00	1.560e-01	1.651e-01
b1	5.403e-02	2.993e-01	5.465e-03	5.738e-03
tau	1.205e+03	5.924e+02	1.082e+01	1.082e+01
tauin	8.452e-04	7.613e-05	1.390e-06	1.389e-06

2. Quantiles for each variable:

	2.5%	25%	50%	75%	97.5%
b0	2.982e+01	3.527e+01	3.805e+01	4.103e+01	4.686e+01
b1	-2.819e-01	-6.811e-02	4.815e-02	1.637e-01	3.728e-01
tau	1.006e+03	1.116e+03	1.187e+03	1.255e+03	1.411e+03
tauin	7.088e-04	7.971e-04	8.428e-04	8.957e-04	9.936e-04

b)



2.

R-code in *H5T2.R*

a)

```
Iterations = 2010:12000
Thinning interval = 10
Number of chains = 3
Sample size per chain = 1000
```

1. Empirical mean and standard deviation for each variable, plus standard error of the mean:

	Mean	SD	Naive SE	Time-series SE
b1	10.999	4.69961	0.085803	0.408146
b2	-0.174	0.06906	0.001261	0.006008

2. Quantiles for each variable:

	2.5%	25%	50%	75%	97.5%
b1	2.1419	7.6017	10.9866	14.2437	20.34839
b2	-0.3109	-0.2206	-0.1726	-0.1249	-0.04585

b)

Iterations = 2010:12000

Thinning interval = 10

Number of chains = 3

Sample size per chain = 1000

1. Empirical mean and standard deviation for each variable,  
plus standard error of the mean:

	Mean	SD	Naive SE	Time-series SE
LD50	64.4492	8.4593	0.154445	0.154487
b1	-1.2487	0.6250	0.011411	0.011353
b2	-0.2873	0.1275	0.002328	0.002328

2. Quantiles for each variable:

	2.5%	25%	50%	75%	97.5%
LD50	56.4768	63.0996	65.060	66.6479	69.31317
b1	-2.5872	-1.6366	-1.230	-0.8264	-0.09144
b2	-0.5738	-0.3611	-0.272	-0.1948	-0.07796

c)

Iterations = 2010:12000

Thinning interval = 10

Number of chains = 3

Sample size per chain = 1000

1. Empirical mean and standard deviation for each variable,  
plus standard error of the mean:

	Mean	SD	Naive SE	Time-series SE
p.new[1]	0.98854	0.06045	0.001104	0.001103
p.new[2]	0.98723	0.06263	0.001144	0.001143
p.new[3]	0.98563	0.06510	0.001189	0.001188
p.new[4]	0.98366	0.06791	0.001240	0.001240
p.new[5]	0.98120	0.07112	0.001298	0.001298
p.new[6]	0.97811	0.07484	0.001366	0.001366
p.new[7]	0.97415	0.07919	0.001446	0.001446
p.new[8]	0.96904	0.08433	0.001540	0.001540
p.new[9]	0.96235	0.09045	0.001651	0.001651
p.new[10]	0.95347	0.09777	0.001785	0.001785
p.new[11]	0.94153	0.10653	0.001945	0.001945
p.new[12]	0.92527	0.11691	0.002134	0.002135
p.new[13]	0.90285	0.12896	0.002354	0.002355
p.new[14]	0.87163	0.14240	0.002600	0.002600
p.new[15]	0.82792	0.15625	0.002853	0.002853
p.new[16]	0.76698	0.16829	0.003073	0.003073
p.new[17]	0.68379	0.17431	0.003182	0.003183
p.new[18]	0.57587	0.16843	0.003075	0.003007
p.new[19]	0.44920	0.14773	0.002697	0.002630
p.new[20]	0.32288	0.12086	0.002207	0.002179
p.new[21]	0.21932	0.10051	0.001835	0.001755
p.new[22]	0.14626	0.08574	0.001565	0.001529
p.new[23]	0.09825	0.07316	0.001336	0.001311

## 2. Quantiles for each variable:

	2.5%	25%	50%	75%	97.5%
p.new[1]	0.89761	0.99875	0.99994	1.0000	1.0000
p.new[2]	0.88245	0.99815	0.99989	1.0000	1.0000
p.new[3]	0.86544	0.99728	0.99981	1.0000	1.0000
p.new[4]	0.84560	0.99592	0.99967	1.0000	1.0000
p.new[5]	0.82487	0.99398	0.99943	1.0000	1.0000
p.new[6]	0.79527	0.99103	0.99901	0.9999	1.0000
p.new[7]	0.75971	0.98651	0.99826	0.9998	1.0000
p.new[8]	0.73468	0.97988	0.99696	0.9997	1.0000
p.new[9]	0.70004	0.97045	0.99465	0.9993	1.0000
p.new[10]	0.66191	0.95665	0.99086	0.9986	1.0000
p.new[11]	0.61985	0.93616	0.98434	0.9969	1.0000
p.new[12]	0.56559	0.90801	0.97319	0.9937	0.9999
p.new[13]	0.50577	0.86918	0.95423	0.9874	0.9995
p.new[14]	0.46797	0.81441	0.92329	0.9739	0.9985
p.new[15]	0.42097	0.74518	0.87555	0.9487	0.9954
p.new[16]	0.37380	0.66093	0.80197	0.9027	0.9864
p.new[17]	0.31739	0.55921	0.70122	0.8237	0.9592
p.new[18]	0.25913	0.45053	0.57443	0.7035	0.8913
p.new[19]	0.18622	0.34038	0.44032	0.5531	0.7477
p.new[20]	0.11751	0.23528	0.31229	0.4019	0.5826
p.new[21]	0.05589	0.14340	0.20837	0.2834	0.4393
p.new[22]	0.02297	0.08083	0.13226	0.1986	0.3535
p.new[23]	0.00873	0.04244	0.08078	0.1386	0.2783

3.

R-code in *H5T3.R*

a)

```
Iterations = 10:10000
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```
Thinning interval = 10
```

```
Number of chains = 3
```

```
Sample size per chain = 1000
```

1. Empirical mean and standard deviation for each variable,  
plus standard error of the mean:

	Mean	SD	Naive SE	Time-series SE
gam	4.025	1.9944	0.036412	0.036414
tau	2.832	0.2912	0.005317	0.005307

2. Quantiles for each variable:

	2.5%	25%	50%	75%	97.5%
gam	1.682	2.723	3.553	4.742	9.223
tau	2.317	2.626	2.812	3.014	3.456

b)

Iterations = 10:10000  
Thinning interval = 10  
Number of chains = 3  
Sample size per chain = 1000

1. Empirical mean and standard deviation for each variable,  
plus standard error of the mean:

	Mean	SD	Naive SE	Time-series SE
gam[1]	6.286e+02	2.167e+04	3.956e+02	4.712e+02
gam[2]	3.573e+04	1.387e+06	2.532e+04	2.532e+04
gam[3]	1.570e+05	5.809e+06	1.061e+05	1.061e+05
gam[4]	2.056e+02	5.884e+03	1.074e+02	1.079e+02
tau	8.818e+00	3.057e+00	5.582e-02	5.505e-02

2. Quantiles for each variable:

	2.5%	25%	50%	75%	97.5%
gam[1]	0.007815	0.07055	0.4174	3.40	326.63
gam[2]	5.068172	21.46989	64.2235	304.62	23249.85
gam[3]	9.961604	40.31632	123.2771	544.59	49780.33
gam[4]	0.008400	0.06104	0.2842	1.90	176.58
tau	4.626265	6.70667	8.1981	10.28	16.46