Aggregated sampling output

November 20, 2020

Dataset: simulated_data_dataset1_no_error, model type: SDE

Trajectories without pathologies

e.g. no divergent transitions, no max_treedepth exceeded, no Rhat > 1.1, no n_eff < 100

```
number of trajectories without pathologies (out of 100):
[1] 34


indices of trajectories without pathologies:
 [1]  2  6  8  9 10 13 15 17 18 24 25 26 28 30 34 36 37 40 41 42 43 52 54 59 61
[26] 65 69 72 73 75 82 90 95 99
```

no pathologies for a subset of the parameters

```
parameters considered:
[1] "theta[1]"             "theta[3]"             "scale"
[4] "prod_theta2_m0"       "prod_theta2_m0_scale"
number of trajectories without pathologies (out of 100):
[1] 37


indices of trajectories without pathologies:
 [1]  2  6  8  9 10 13 15 17 18 24 25 26 27 28 30 34 36 37 40 41 42 43 52 54 59
[26] 61 65 69 72 73 75 82 85 87 90 95 99
```

Divergent transitions

num..of.div..transitions	Freq
0	37
1	3
2	1
3	2
4	1
5	1
7	1
8	1
13	1
14	2
16	1
17	1
18	1
20	2
25	1

num..of.div..transitions	Freq
26	1
30	1
36	1
43	2
50	1
54	1
57	1
62	1
65	1
77	1
78	1
79	1
83	1
91	1
92	1
103	1
115	1
127	1
128	1
144	1
147	1
156	1
167	1
174	1
178	1
194	1
221	1
227	1
253	1
254	1
279	1
287	1
327	1
330	1
414	1
455	1
473	1
516	1
597	1
619	1
754	1
1199	1
1644	1

```
total number of trajectories with div. transitions: 63
indices of trajectories with div. transitions:
1 3 4 5 7 11 12 14 16 19 20 21 22 23 29 31 32 33 35 38 39 44 45 46 47 48 49 50 51 53 55 56 57 58 60 62 6
```

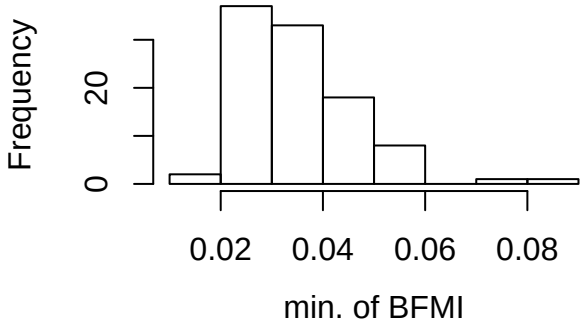
Maximum tree depth exceeded

num..of.max.t.d..exceeded	Freq
0	99
11	1

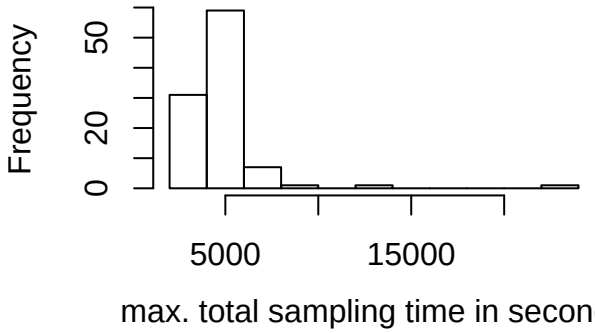
```
total number of trajectories were max. tree depth was exceeded: 1
indices of trajectories were max. tree depth was exceeded:
74
```

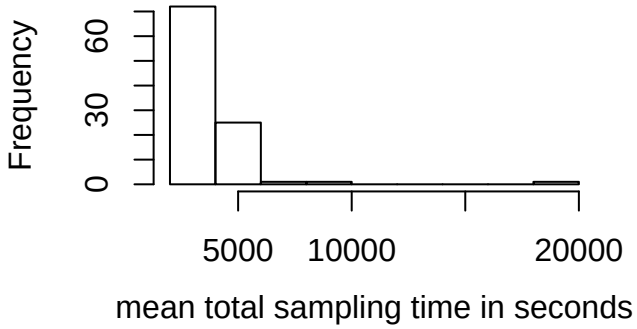
Bayesian fraction of missing information (BFMI)

num..of.low.BFMI	Freq
8	100



Total sampling time





R-hat

total number of trajectories with very high Rhat (> 1.1) (out of 100)

```
[1] 17
```

number of trajectories with high Rhat per parameter (out of 100)

	Rhat > 1.02	Rhat > 1.1
theta[1]	1	1
theta[2]	91	3
theta[3]	1	1
m0	98	15
scale	1	1
prod_theta2_m0	2	1
prod_theta2_scale	98	6
prod_m0_scale	93	9
prod_theta2_m0_scale	1	0
x[180,1]	70	2

number of parameters with high Rhat per trajectory (out of 10)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Rhat > 1.02	4	1	5	5	5	4	5	4	5	5	4	5	5	5	3	5	5	4	3	5
Rhat > 1.1	0	0	3	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	2

	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Rhat > 1.02	4	2	5	4	4	4	5	4	5	5	5	5	5	5	5	5	5	4	4	4
Rhat > 1.1	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0

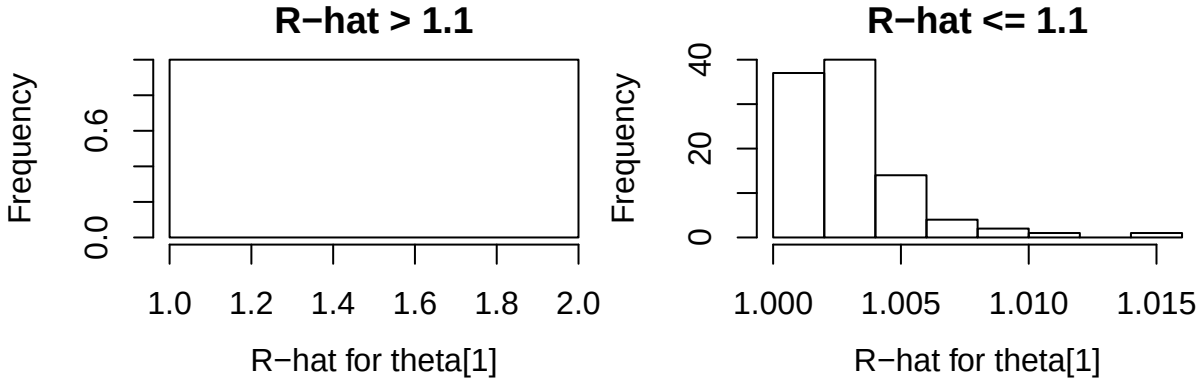
	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Rhat > 1.02	5	5	3	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	5	5
Rhat > 1.1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0

	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
Rhat > 1.02	5	5	5	5	3	7	5	5	4	5	5	5	1	3	4	2	8	5	4	5
Rhat > 1.1	0	2	0	0	0	1	0	0	0	2	3	0	0	0	0	0	8	2	0	1

	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Rhat > 1.02	5	5	5	5	5	5	5	5	5	5	4	5	4	5	4	1	5	4	5	5
Rhat > 1.1	2	0	0	0	0	0	1	0	1	0	0	1	0	2	0	0	0	0	0	0

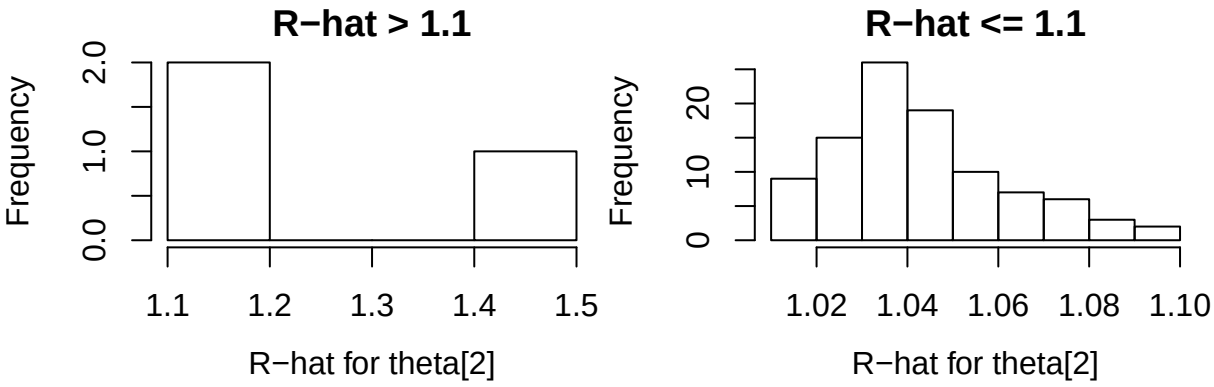
theta[1]

```
number of trajectories with Rhat > 1.02:    1

indizes of trajectories with Rhat > 1.02:
77

number of trajectories with Rhat > 1.1: 1

indices of trajectories with Rhat > 1.1:
77
```



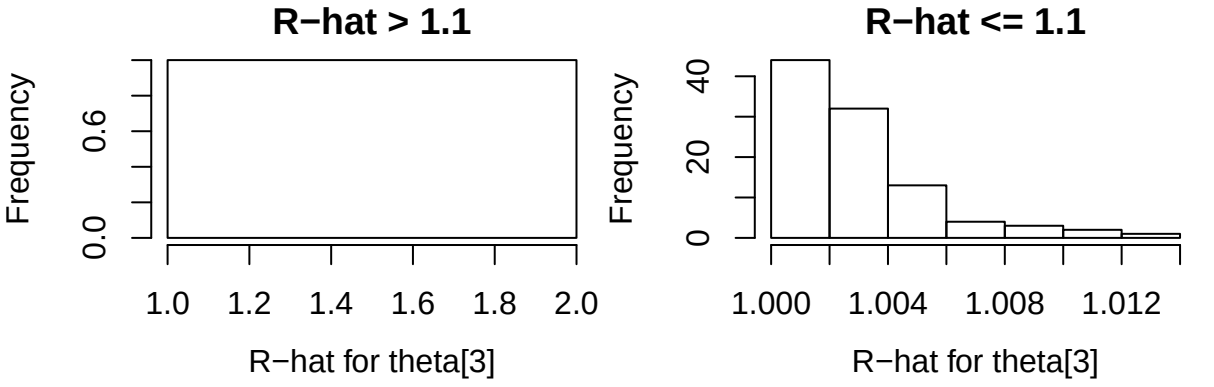
theta[2]

```
number of trajectories with Rhat > 1.02:    91

indizes of trajectories with Rhat > 1.02:
1 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 20 21 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 4

number of trajectories with Rhat > 1.1: 3

indices of trajectories with Rhat > 1.1:
14 70 77
```



theta[3]

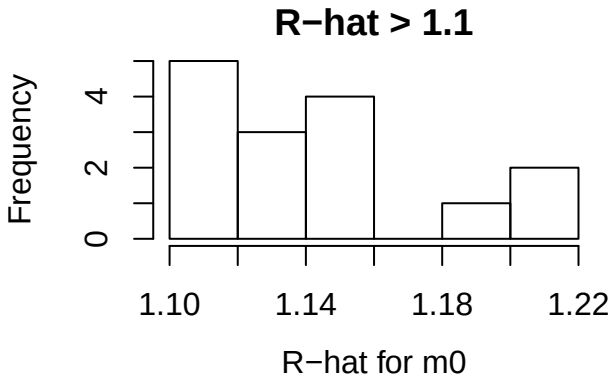
```
number of trajectories with Rhat > 1.02:    1

indizes of trajectories with Rhat > 1.02:
77

number of trajectories with Rhat > 1.1: 1

indices of trajectories with Rhat > 1.1:
77
```

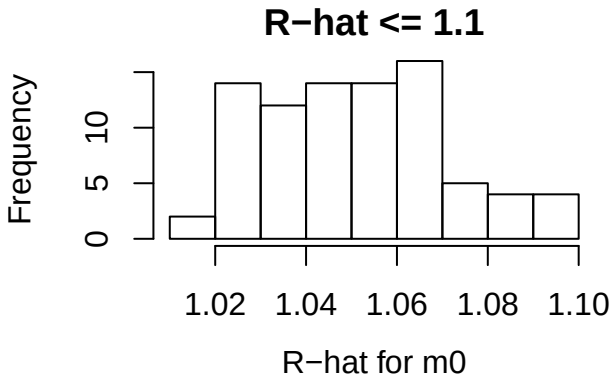


m0

```
number of trajectories with Rhat > 1.02:    98

indizes of trajectories with Rhat > 1.02:
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
```

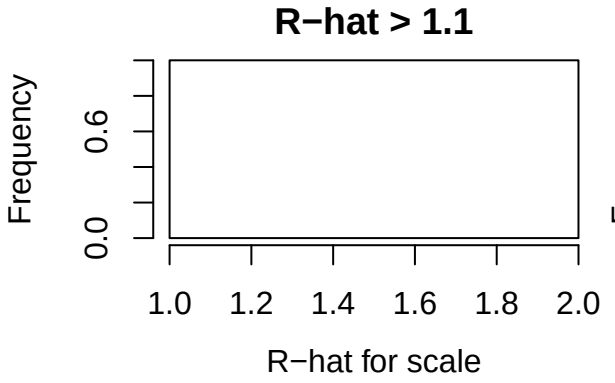
```
number of trajectories with Rhat > 1.1: 15

indices of trajectories with Rhat > 1.1:
3 14 20 27 48 62 66 71 77 78 80 81 87 92 94
```

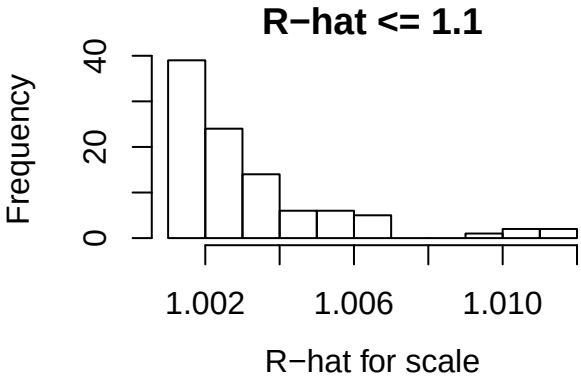




scale

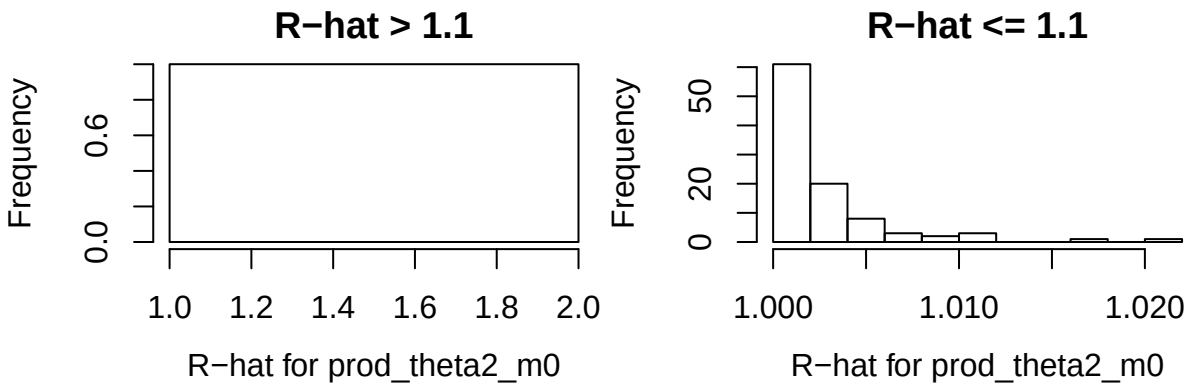
```
number of trajectories with Rhat > 1.02:    1

indizes of trajectories with Rhat > 1.02:
77

number of trajectories with Rhat > 1.1: 1

indices of trajectories with Rhat > 1.1:
77
```





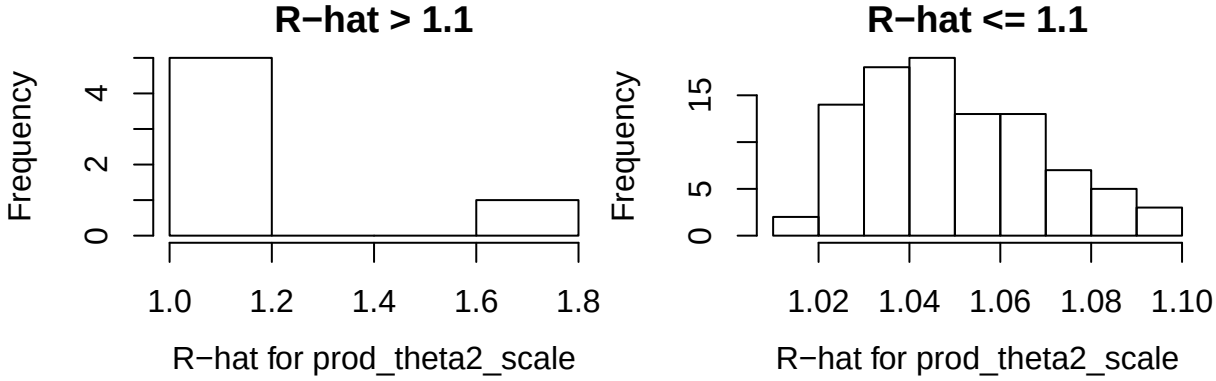
prod__theta2__m0

```
number of trajectories with Rhat > 1.02:    2

indizes of trajectories with Rhat > 1.02:
66 77

number of trajectories with Rhat > 1.1: 1

indices of trajectories with Rhat > 1.1:
77
```



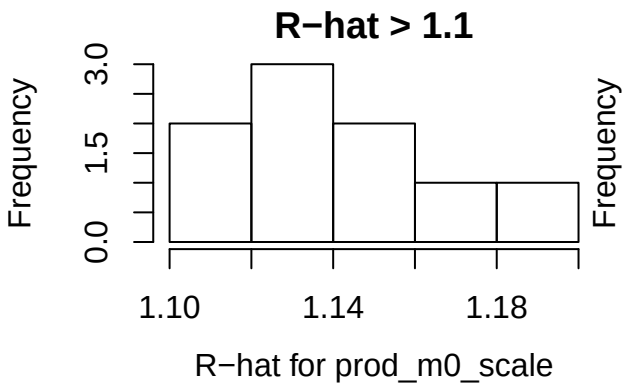
prod_theta2_scale

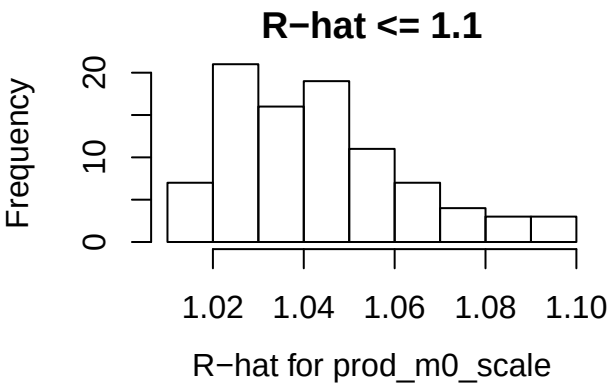
```
number of trajectories with Rhat > 1.02:    98

indizes of trajectories with Rhat > 1.02:
1 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 3

number of trajectories with Rhat > 1.1: 6

indices of trajectories with Rhat > 1.1:
14 27 70 71 77 89
```



prod_m0_scale

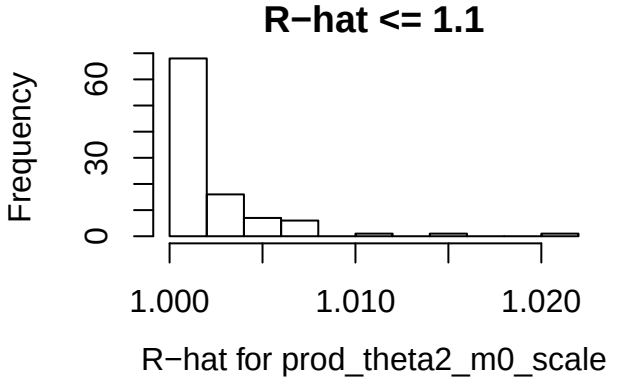
```
number of trajectories with Rhat > 1.02:    93

indizes of trajectories with Rhat > 1.02:
1 3 4 5 6 7 8 9 10 11 12 13 14 16 17 18 19 20 21 23 24 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 4

number of trajectories with Rhat > 1.1: 9

indices of trajectories with Rhat > 1.1:
3 14 20 62 71 77 78 81 94
```





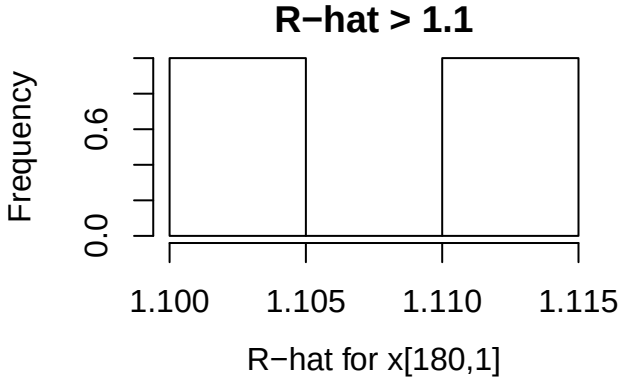
prod_theta2_m0_scale

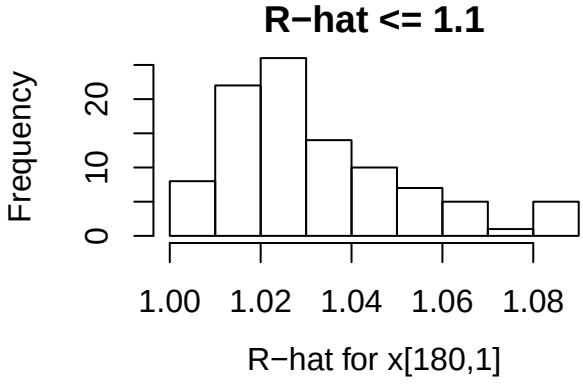
```
number of trajectories with Rhat > 1.02:    1

indizes of trajectories with Rhat > 1.02:
66
```



x[180,1]

```
number of trajectories with Rhat > 1.02:    70

indizes of trajectories with Rhat > 1.02:
3 4 5 7 9 10 12 13 14 16 17 20 23 25 27 29 30 31 32 33 34 35 36 37 41 42 44 45 46 47 48 49 50 51 52 53 5

number of trajectories with Rhat > 1.1: 2

indices of trajectories with Rhat > 1.1:
3 27
```





Effective sample size (ESS)

total number of trajectories with low ESS (< 100) (out of 100)

```
[1] 24
```

number of trajectories with low ESS (< 100) per parameter (out of 100)

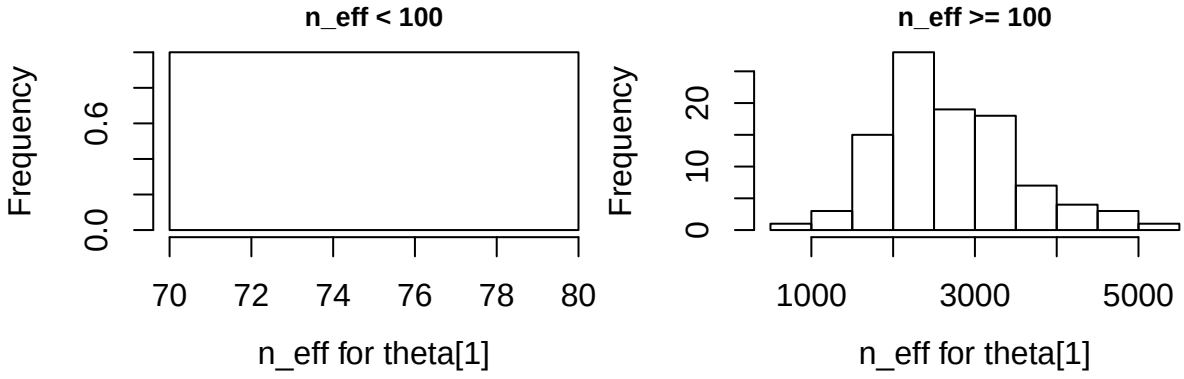
	n_eff < 100
theta[1]	1
theta[2]	5
theta[3]	1
m0	21
scale	1
prod_theta2_m0	1
prod_theta2_scale	14
prod_m0_scale	15
prod_theta2_m0_scale	0
x[180,1]	2

number of parameters with low ESS (< 300) per trajectory (out of 10)

	3	4	5	14	20	23	27	47	48	51	62	66	67	70	71	77	78	80	81	83
n_eff < 100	2	1	2	3	3	1	5	2	3	2	2	2	1	2	3	8	2	3	4	3

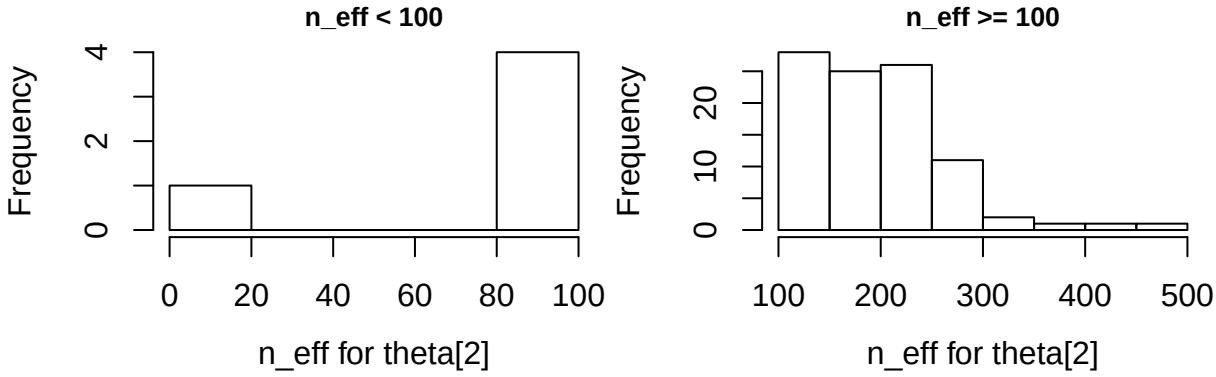
theta[1]

```
number of trajectories with n_eff < 100:    1

indices of trajectories with n_eff < 100:
77
```



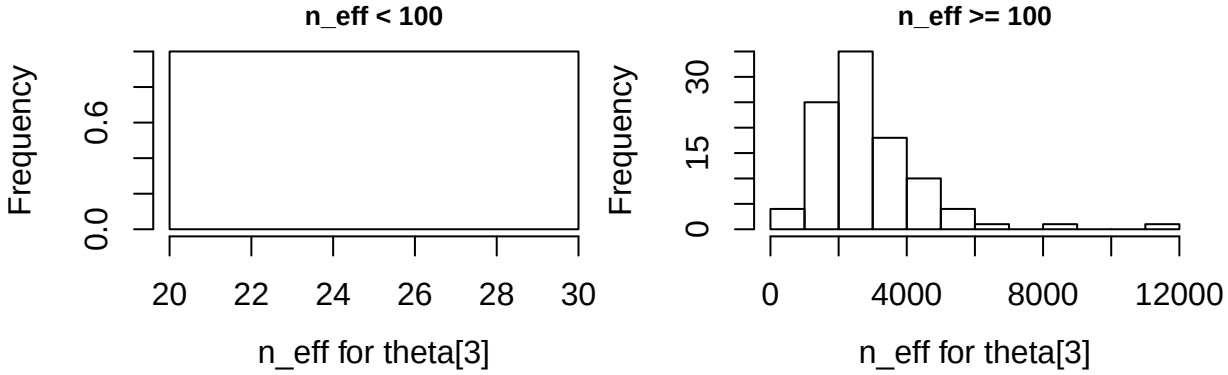
theta[2]

```
number of trajectories with n_eff < 100:    5

indices of trajectories with n_eff < 100:
27 48 70 77 81
```



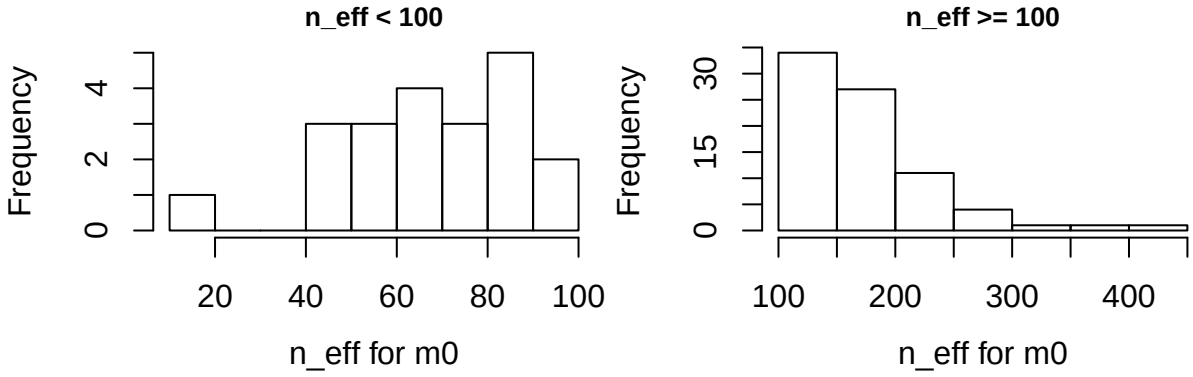
theta[3]

```
number of trajectories with n_eff < 100:    1

indices of trajectories with n_eff < 100:
77
```



m0

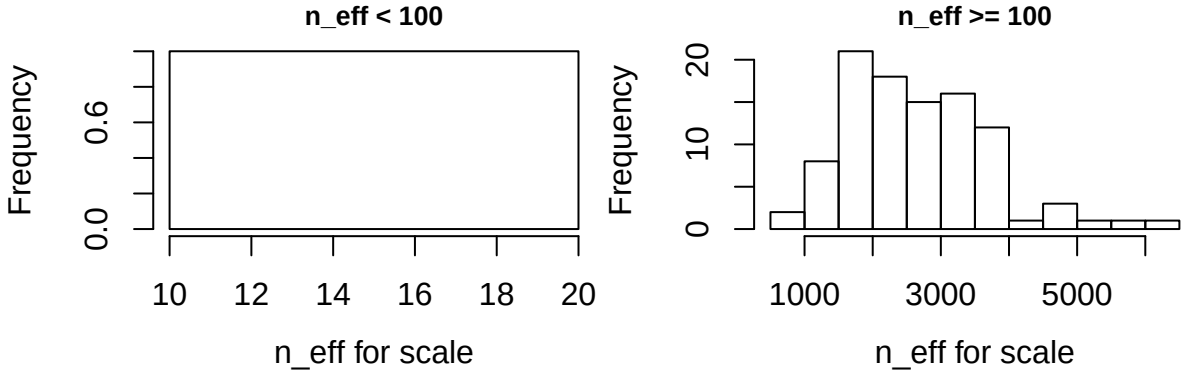
```
number of trajectories with n_eff < 100:    21

indices of trajectories with n_eff < 100:
3 4 5 14 20 23 27 47 48 51 62 66 71 77 78 80 81 83 85 87 94
```



scale

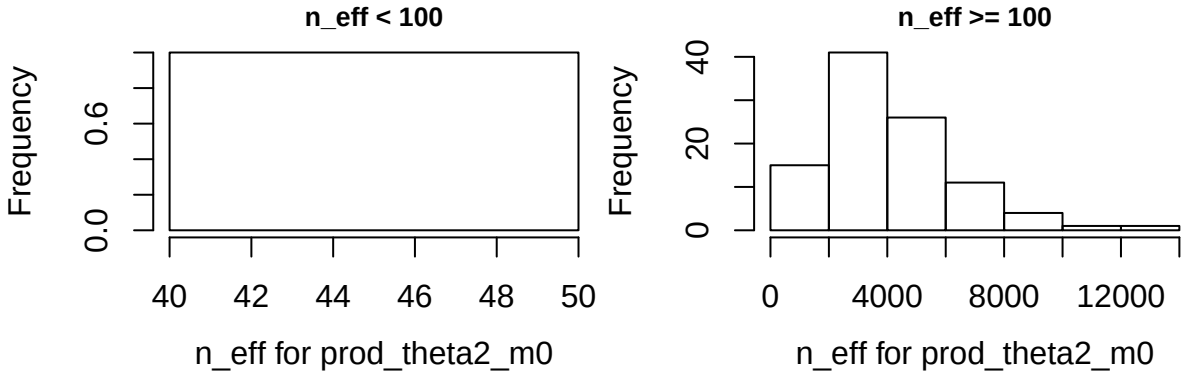
```
number of trajectories with n_eff < 100:    1
```

```
indices of trajectories with n_eff < 100:
77
```



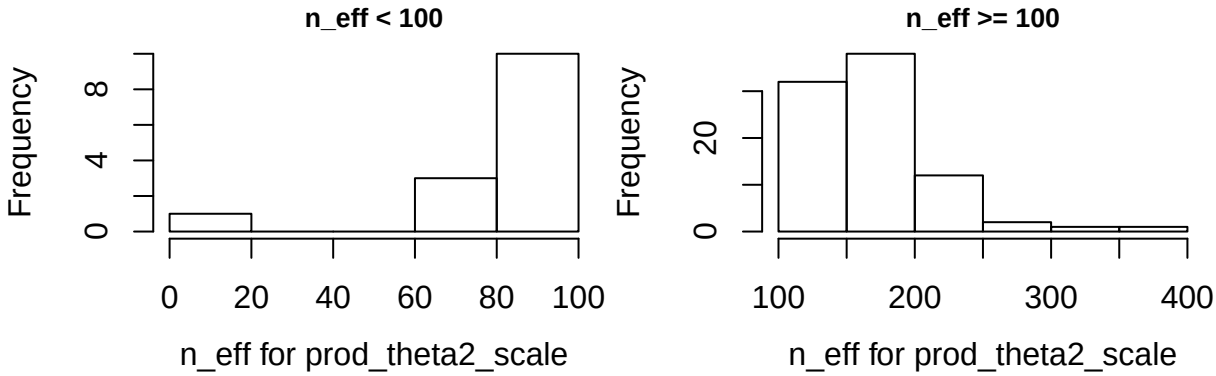
prod_theta2_m0

```
number of trajectories with n_eff < 100:    1

indices of trajectories with n_eff < 100:
77
```



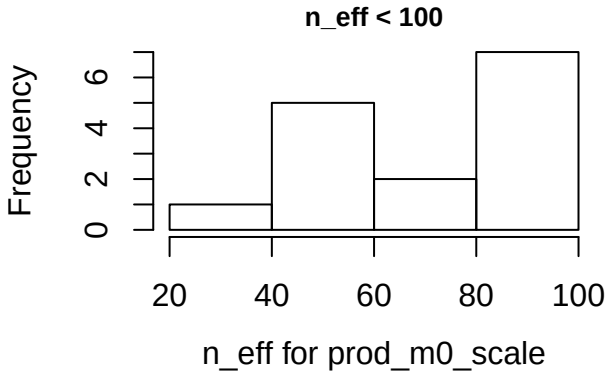
prod_theta2_scale

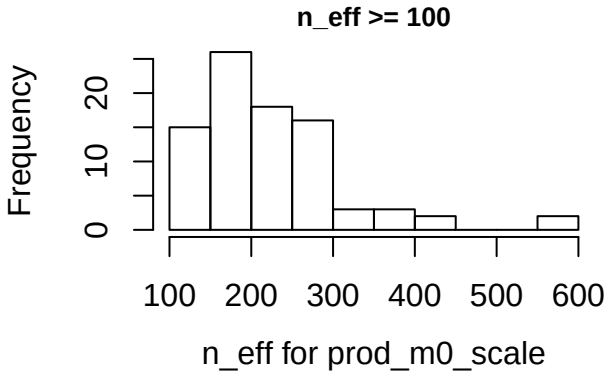
```
number of trajectories with n_eff < 100:    14

indices of trajectories with n_eff < 100:
14 20 27 47 48 51 67 70 71 77 80 81 89 94
```



prod_m0_scale

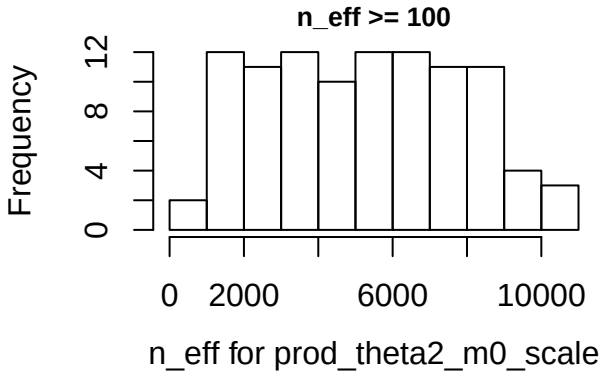
```
number of trajectories with n_eff < 100:    15

indices of trajectories with n_eff < 100:
3 5 14 20 27 62 66 71 77 78 80 81 83 87 94
```





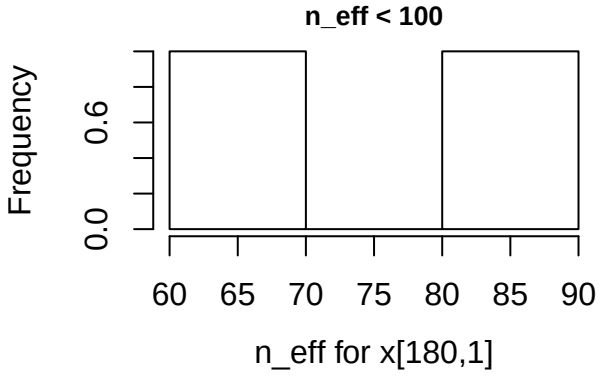
prod_theta2_m0_scale

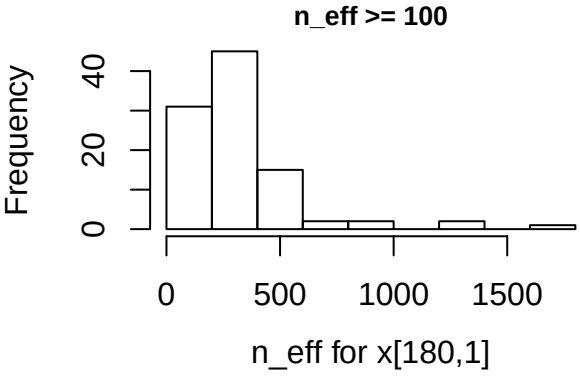
```
no n_eff < 100
```



x[180,1]

```
number of trajectories with n_eff < 100:    2

indices of trajectories with n_eff < 100:
27 83
```





Find problematic trajectories and parameters

Are there any trajectories and parameters for which n_eff is below the threshold, but Rhat does not exceed the threshold?

```
## [1] FALSE
```

parameters per trajectories with very high Rhat

```
3:   m0  prod_m0_scale  x[180,1]
14:   theta[2]  m0  prod_theta2_scale  prod_m0_scale
20:   m0  prod_m0_scale
27:   m0  prod_theta2_scale  x[180,1]
48:   m0
62:   m0  prod_m0_scale
66:   m0
70:   theta[2]  prod_theta2_scale
71:   m0  prod_theta2_scale  prod_m0_scale
77:   theta[1]  theta[2]  theta[3]  m0  scale  prod_theta2_m0  prod_theta2_scale  prod_m0_scale
78:   m0  prod_m0_scale
80:   m0
81:   m0  prod_m0_scale
87:   m0
89:   prod_theta2_scale
92:   m0
94:   m0  prod_m0_scale
```

unique combinations:

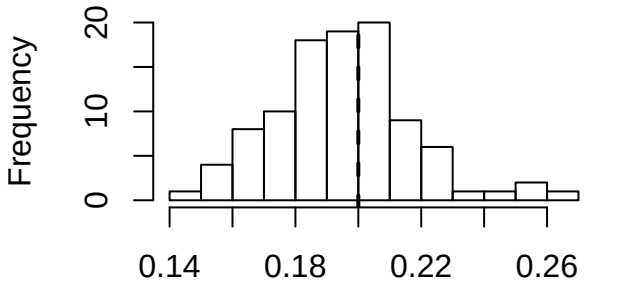
```
number of unique combinations:  9
```

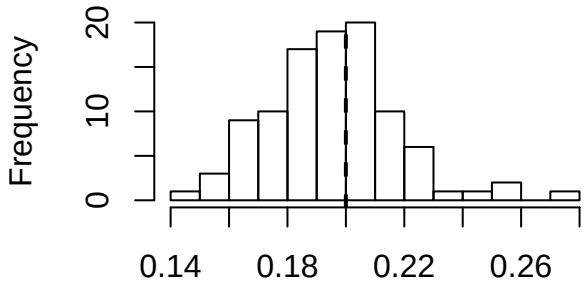
```
combinations and number of their occruence:
```

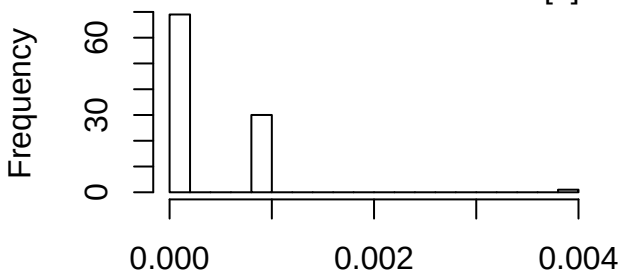
```
1  :  m0  prod_m0_scale  x[180,1]
1  :  theta[2]  m0  prod_theta2_scale  prod_m0_scale
5  :  m0  prod_m0_scale
1  :  m0  prod_theta2_scale  x[180,1]
5  :  m0
1  :  theta[2]  prod_theta2_scale
1  :  m0  prod_theta2_scale  prod_m0_scale
1  :  theta[1]  theta[2]  theta[3]  m0  scale  prod_theta2_m0  prod_theta2_scale  prod_m0_scale
1  :  prod_theta2_scale
```

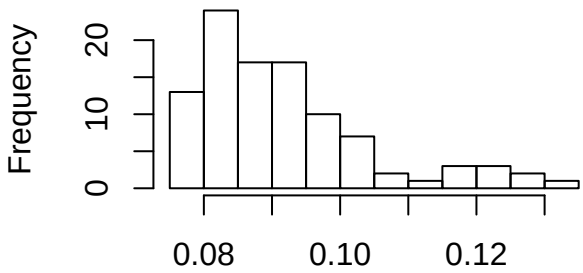
Overview of estimates

theta[1]

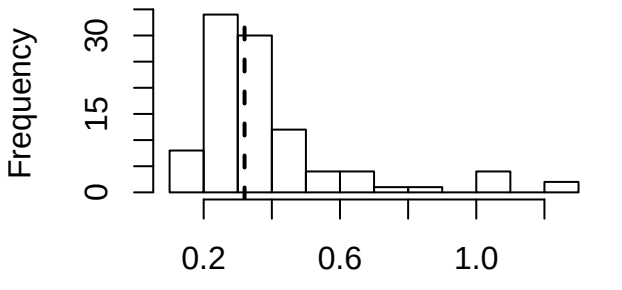


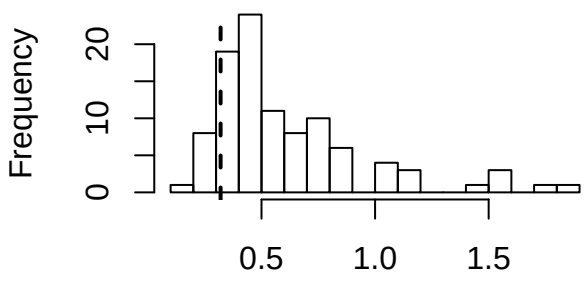


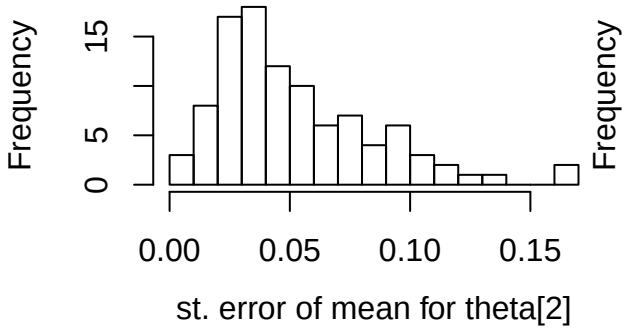


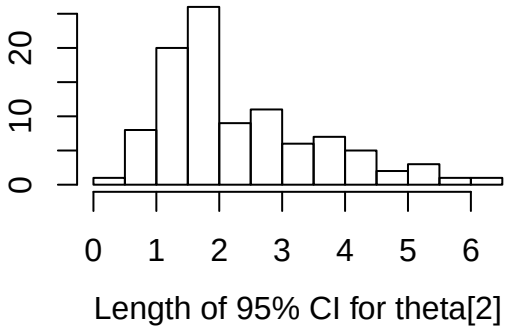


theta[2]

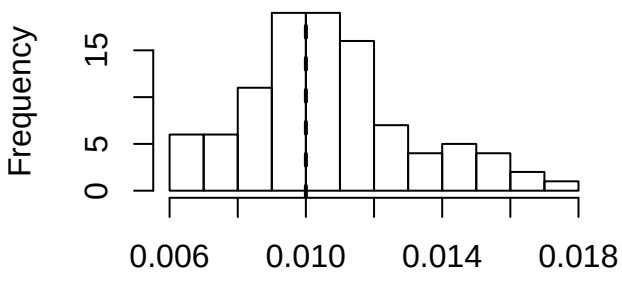


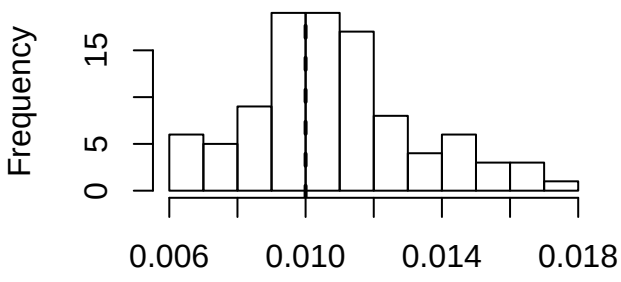


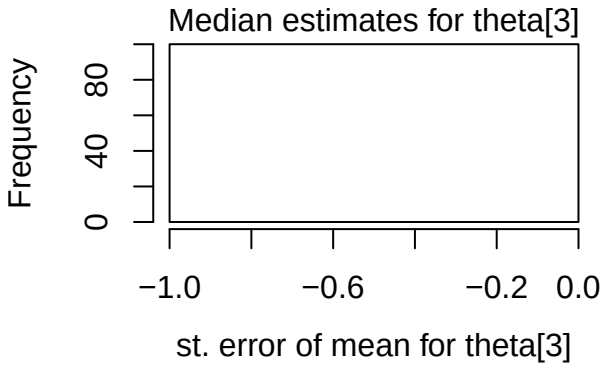


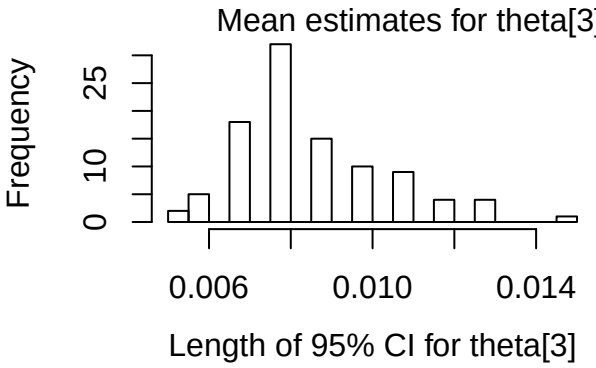


theta[3]

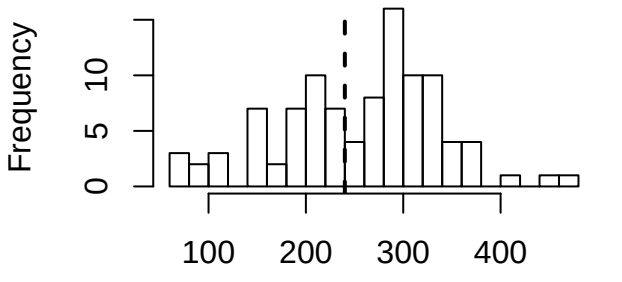

Frequency
0
5
15
0.006
0.010
0.014
0.018
Median estimates for theta[3]

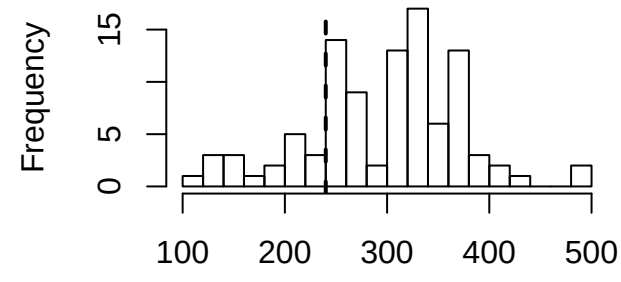

Frequency
0
5
15
0.006
0.010
0.014
0.018
Mean estimates for theta[3]

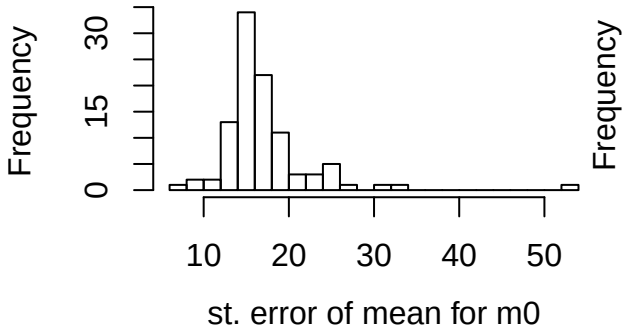

Frequency
0
40
80
−1.0
−0.6
−0.2
0.0
st. error of mean for theta[3]

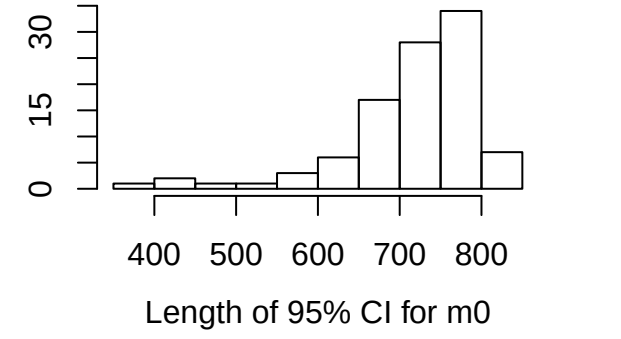

Frequency
0
10
25
0.006
0.010
0.014
Length of 95% CI for theta[3]

m0

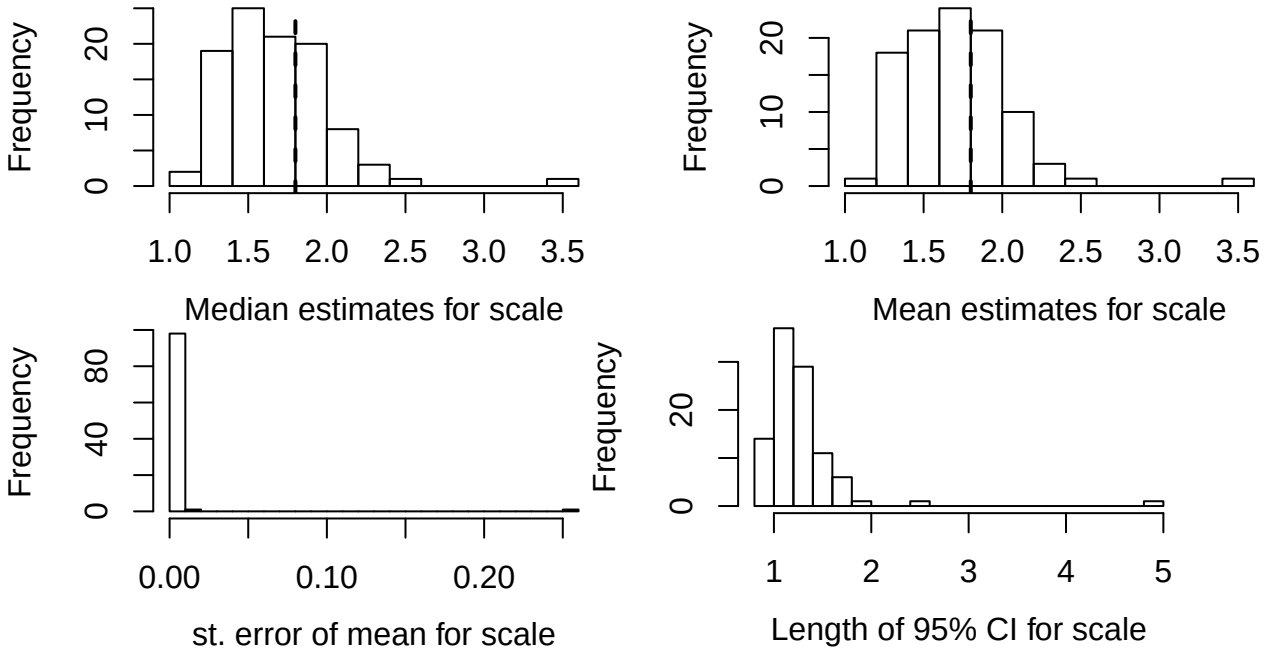

Frequency
0
5
10
100
200
300
400
Median estimates for m0


Frequency
0
5
15
100
200
300
400
500
Mean estimates for m0

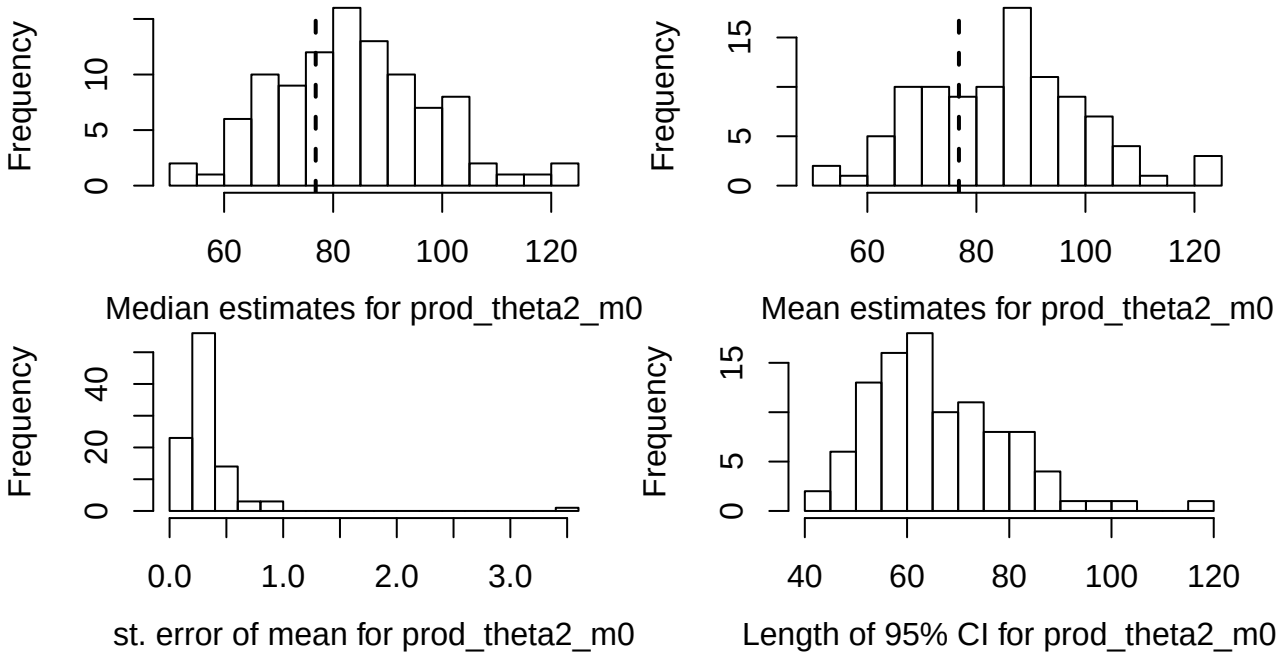

Frequency
0
15
30
10
20
30
40
50
st. error of mean for m0


Frequency
0
15
30
400
500
600
700
800
Length of 95% CI for m0

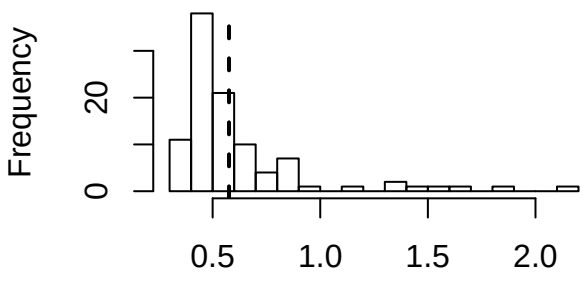
scale



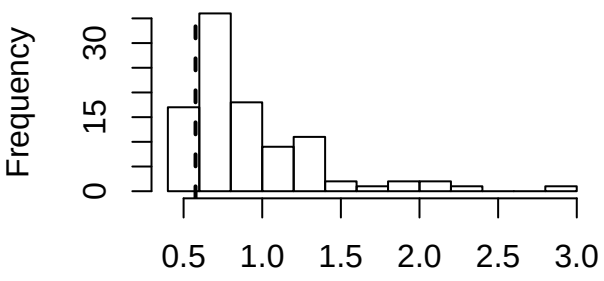
prod_theta2_m0



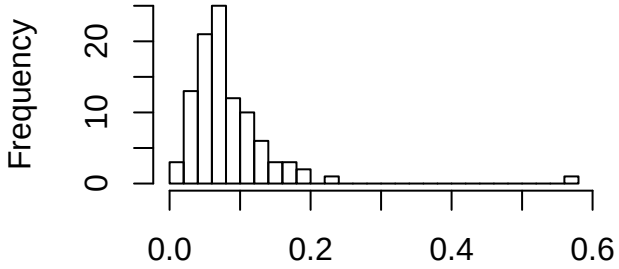
prod_theta2_scale



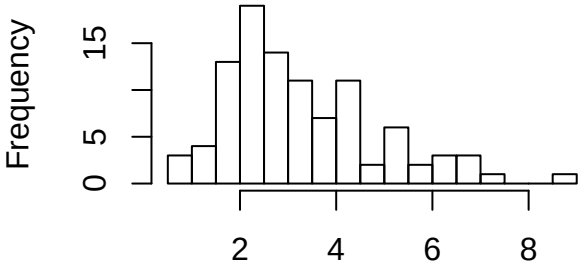
Median estimates for prod_theta2_scale



Mean estimates for prod_theta2_scale

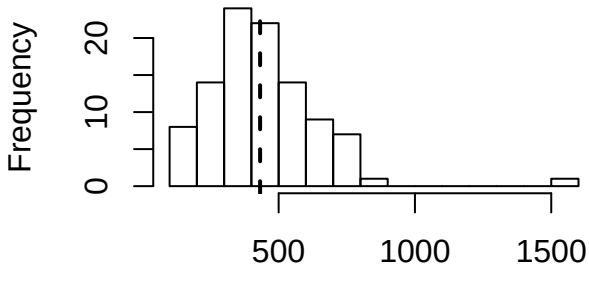


st. error of mean for prod_theta2_scale

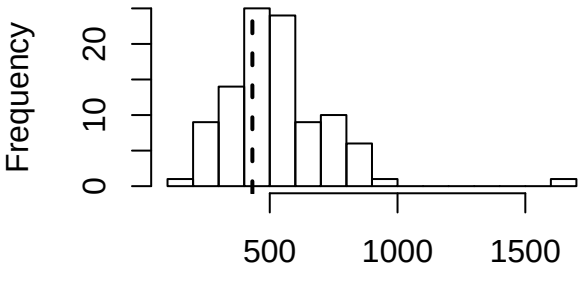


Length of 95% CI for prod_theta2_scale

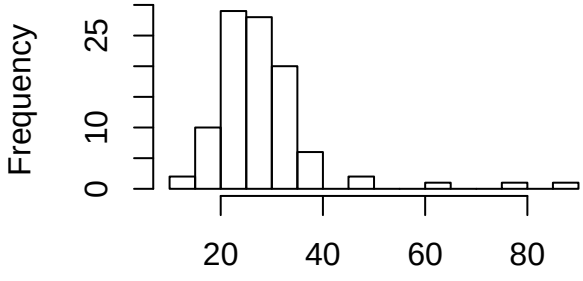
prod_m0_scale



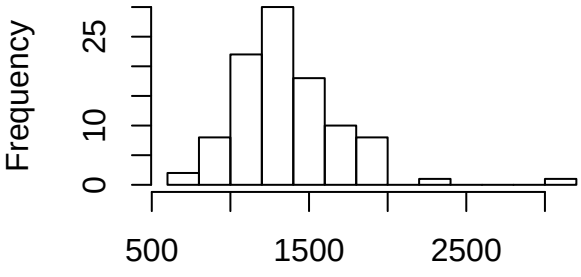
Median estimates for prod_m0_scale



Mean estimates for prod_m0_scale

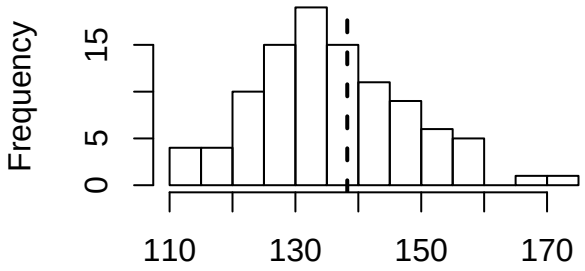


st. error of mean for prod_m0_scale

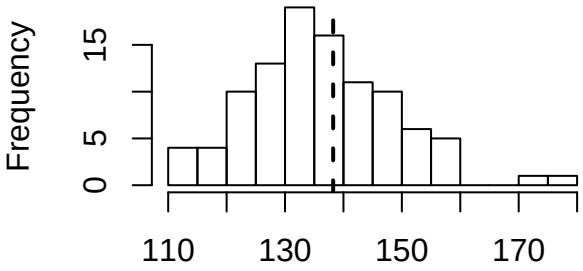


Length of 95% CI for prod_m0_scale

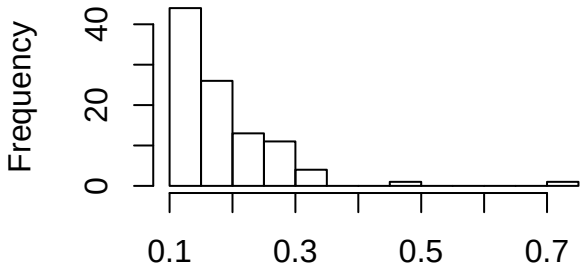
prod_theta2_m0_scale



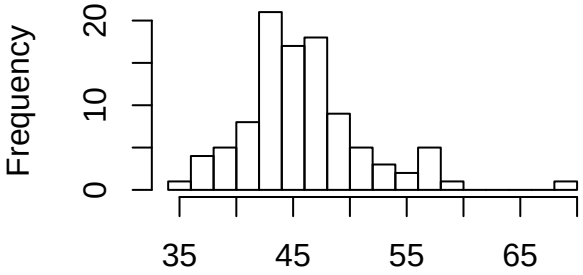
Median estimates for prod_theta2_m0_scal



Mean estimates for prod_theta2_m0_scale

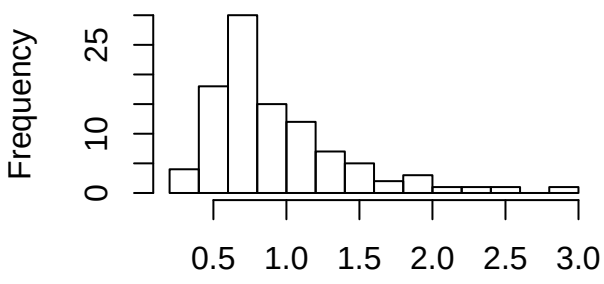


st. error of mean for prod_theta2_m0_scale

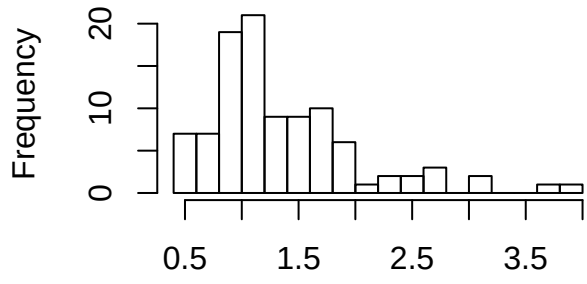


Length of 95% CI for prod_theta2_m0_scal

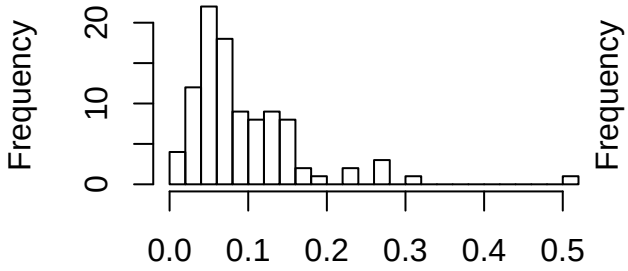
x[180,1]



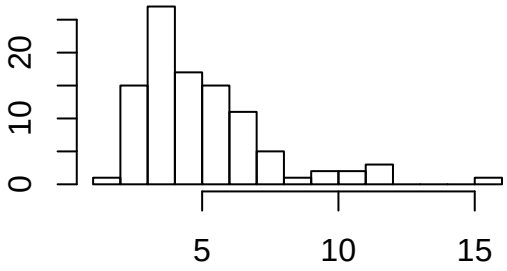
Median estimates for x[180,1]



Mean estimates for x[180,1]



st. error of mean for x[180,1]



Length of 95% CI for x[180,1]

Summary of length of 95% credible intervals (CIs)

Here we give the median, standard deviation (sd), and coefficient of variation (cv) of the length of the 95% CIs.

For simulated data (where the true parameter values are known), we also give the number of times that the CI covers the true value and median, sd, and cv of the length of those 95% CIs that cover the true value.

	median	sd	cv	num_cover	median_cover	sd_cover	cv_cover
theta[1]	0.090	0.013	0.140	93	0.090	0.013	0.138
theta[2]	1.880	1.292	0.551	100	1.880	1.292	0.551
theta[3]	0.008	0.002	0.217	91	0.008	0.002	0.206
m0	735.978	83.939	0.118	100	735.978	83.939	0.118
scale	1.200	0.449	0.351	95	1.201	0.434	0.338
prod_theta2_m0	63.597	13.555	0.204	96	63.597	13.064	0.197
prod_theta2_scale	2.888	1.583	0.482	100	2.888	1.583	0.482
prod_m0_scale	1315.626	344.132	0.252	99	1315.027	295.252	0.219
prod_theta2_m0_scale	45.280	5.359	0.116	93	45.464	4.477	0.097
x[180,1]	4.295	2.423	0.483	NA	NA	NA	NA

The following table shows the values of the median of *the length of the CIs divided by the median of each sample*

$$m_1 = \text{median}\left(\frac{q_i(0.975) - q_i(0.025)}{q_i(0.5)}\right),$$

the median of *the length of the CIs divided by the mean of each sample*

$$m_1 = \text{median}\left(\frac{q_i(0.975) - q_i(0.025)}{sample\_mean}\right),$$

as well as the median of the length of the CIs divided by *the median of the medians of the sample*

$$m_3 = \frac{\text{median}(q_i(0.975) - q_i(0.025))}{\text{median}(q_i(0.5))}.$$

and (if applicable) the median of *the length of the CIs divided by the true value*

$$m_4 = \frac{\text{median}(q_i(0.975) - q_i(0.025))}{\text{true value}}.$$

	m_1	m_2	m_3	m_4	num_cover	m_1_cover	m_3_cover
theta[1]	0.46	0.46	0.47	0.45	93	0.46	0.47
theta[2]	5.94	3.81	5.96	5.87	100	5.94	5.96
theta[3]	0.80	0.78	0.73	0.80	91	0.80	0.73
m0	2.75	2.41	2.68	3.07	100	2.75	2.68
scale	0.74	0.72	0.74	0.67	95	0.74	0.73
prod_theta2_m0	0.78	0.77	0.76	0.83	96	0.78	0.76
prod_theta2_scale	5.20	3.50	5.73	5.01	100	5.20	5.73
prod_m0_scale	3.12	2.62	3.07	3.05	99	3.13	3.09
prod_theta2_m0_scale	0.34	0.34	0.34	0.33	93	0.34	0.34
x[180,1]	5.42	3.72	5.49	NA	NA	NA	NA