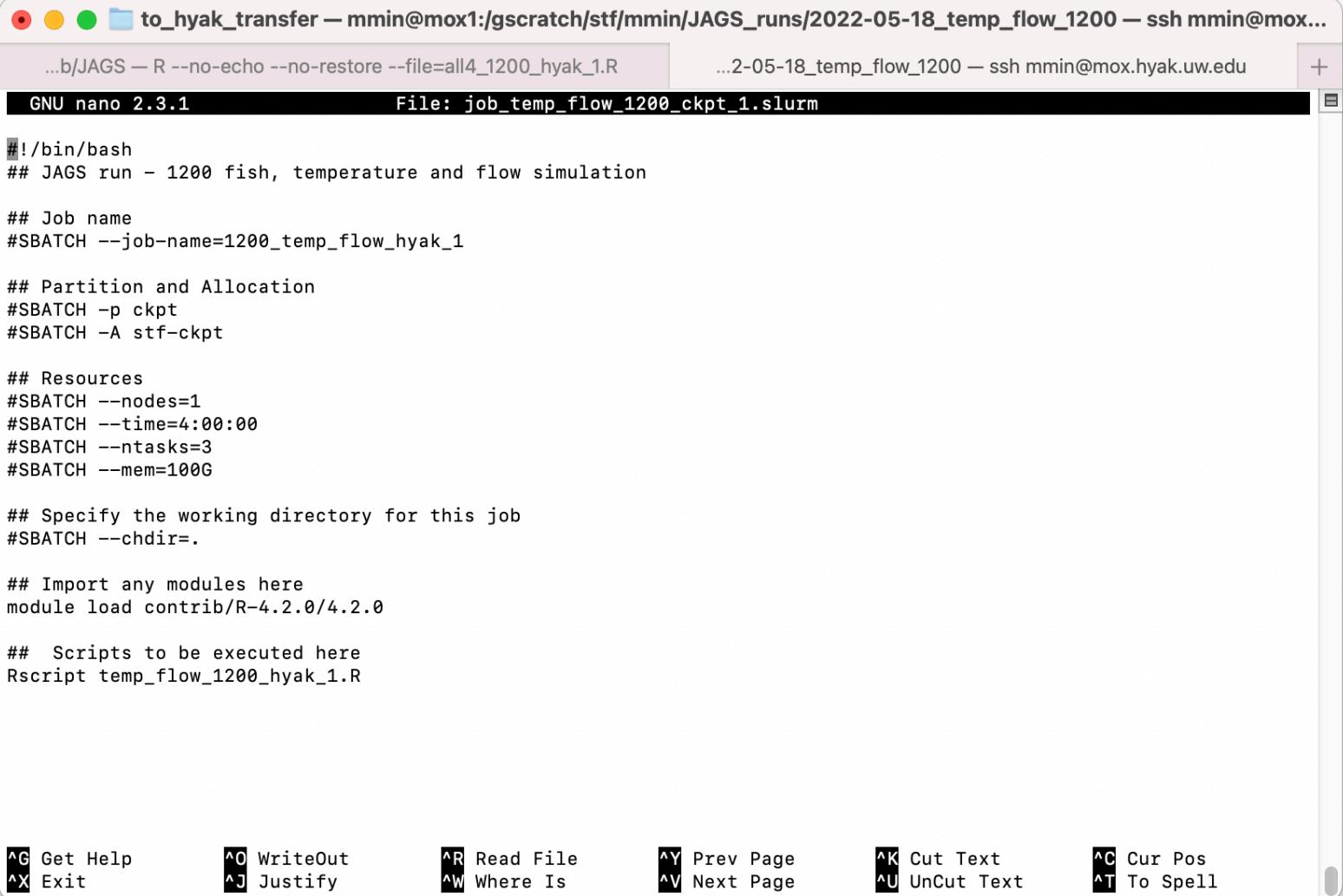


Steelhead Overshoot Update

Markus Min
5/19/2022

Mox/Hyak is up and running!



The screenshot shows a terminal window with a nano editor session. The title bar indicates the session is for 'to_hyak_transfer' on 'mmin@mox1:gscratch/stf/mmin/JAGS_runs/2022-05-18_temp_flow_1200' via SSH. The status bar shows the file name 'job_temp_flow_1200_ckpt_1.slurm'. The main area of the terminal displays a Slurm script:

```
#!/bin/bash
## JAGS run - 1200 fish, temperature and flow simulation

## Job name
#SBATCH --job-name=1200_temp_flow_hyak_1

## Partition and Allocation
#SBATCH -p ckpt
#SBATCH -A stf-ckpt

## Resources
#SBATCH --nodes=1
#SBATCH --time=4:00:00
#SBATCH --ntasks=3
#SBATCH --mem=100G

## Specify the working directory for this job
#SBATCH --chdir=.

## Import any modules here
module load contrib/R-4.2.0/4.2.0

## Scripts to be executed here
Rscript temp_flow_1200_hyak_1.R
```

At the bottom of the terminal window, there is a menu of keyboard shortcuts:

^G Get Help	^O WriteOut	^R Read File	^Y Prev Page	^K Cut Text	^C Cur Pos
^X Exit	^J Justify	^W Where Is	^V Next Page	^U UnCut Text	^T To Spell

Setup for categorical covariates (i.e., natal origin)

For our simulation, with three natal origins (JDR, YAK, and TUC)

Parameters:

1. Grand mean = β_0
2. Origin effect, JDR relative to TUC = $\beta_{origin,1}$
3. Origin effect, YAK relative to TUC = $\beta_{origin,2}$

Effect of origin:

$$JDR : \beta_0 + \beta_{origin,1}$$

$$YAK : \beta_0 + \beta_{origin,2}$$

$$TUC : \beta_0 - \beta_{origin,1} - \beta_{origin,2}$$

Interpretation is a bit funky

For example, in order for JDR origin fish to have a different movement probability than YAK and TUC origin fish, the following relationship must be followed:

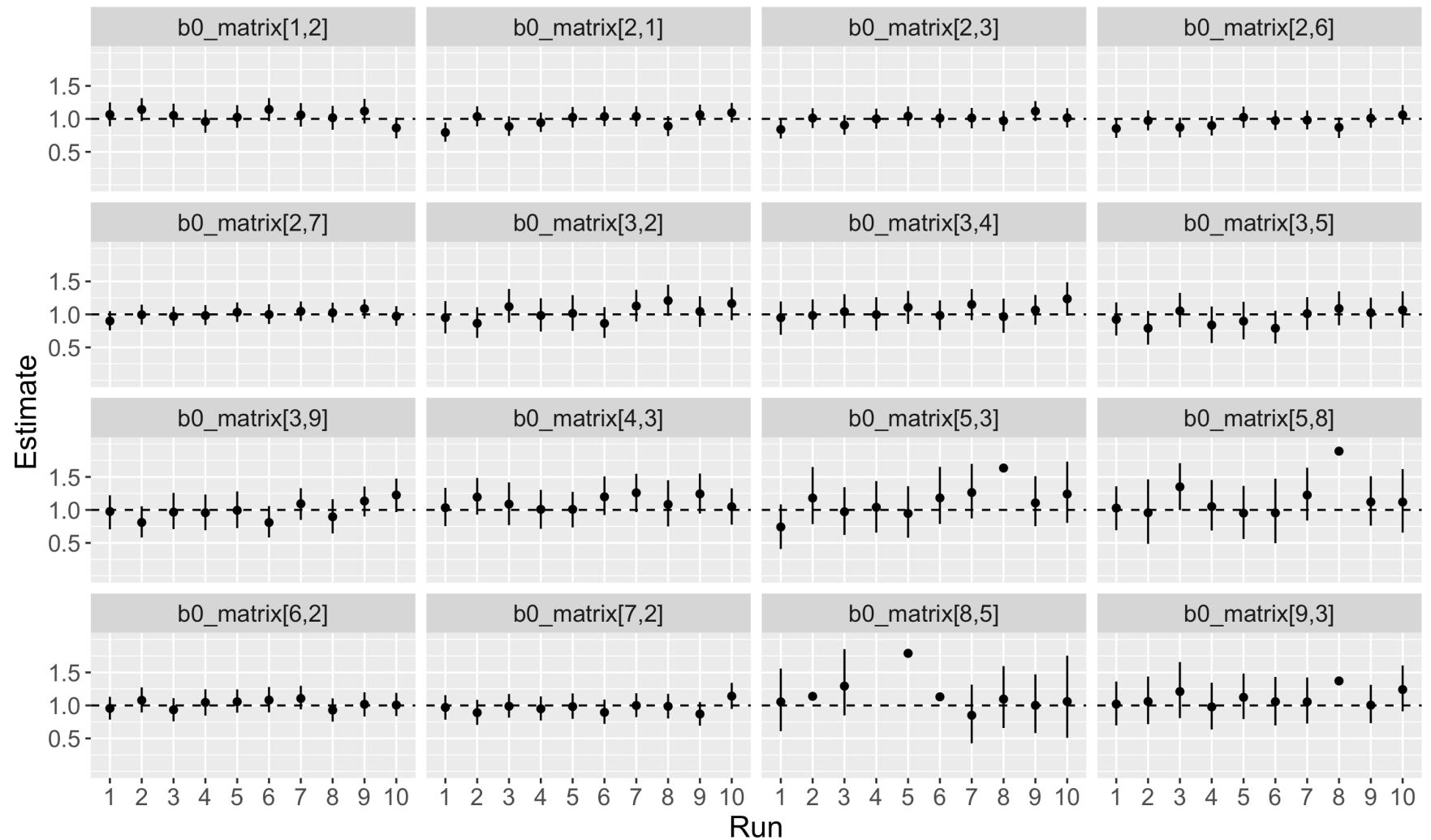
$$\begin{aligned}YAK &= TUC \\ \beta_0 + \beta_{origin,2} &= \beta_0 - \beta_{origin,1} - \beta_{origin,2} \\ 2 * \beta_{origin,2} &= -\beta_{origin,1}\end{aligned}$$

For example, $\beta_0 = 1$, $\beta_{origin,1} = -0.5$ and $\beta_{origin,2} = 0.25$ would lead to these observed effects:

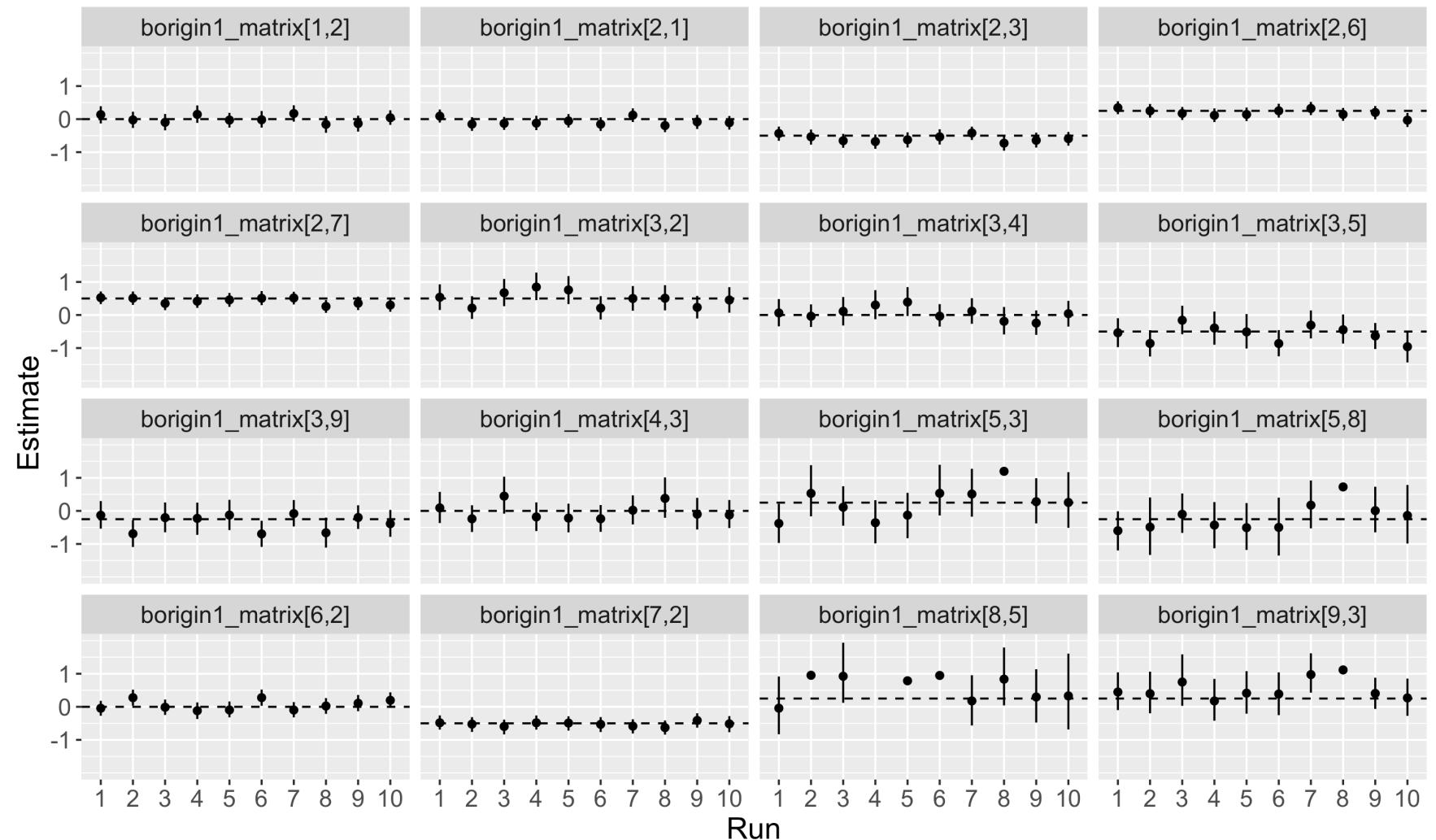
$$\begin{aligned}JDR &= 0.5 \\ YAK &= 1.25 \\ TUC &= 1.25\end{aligned}$$

Simulation model results

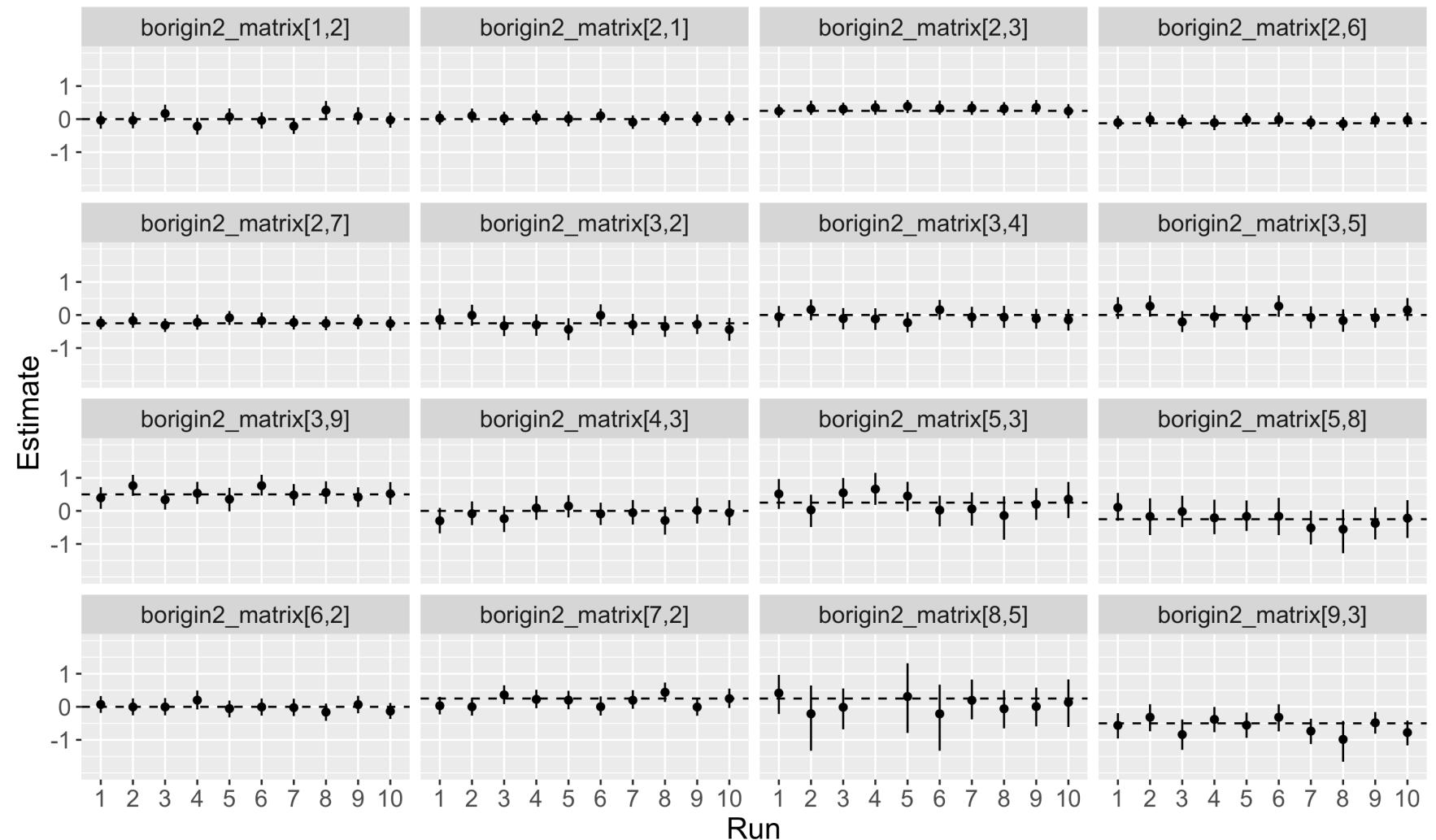
Origin only: b0



Origin only: borigin1



Origin only: borigin2

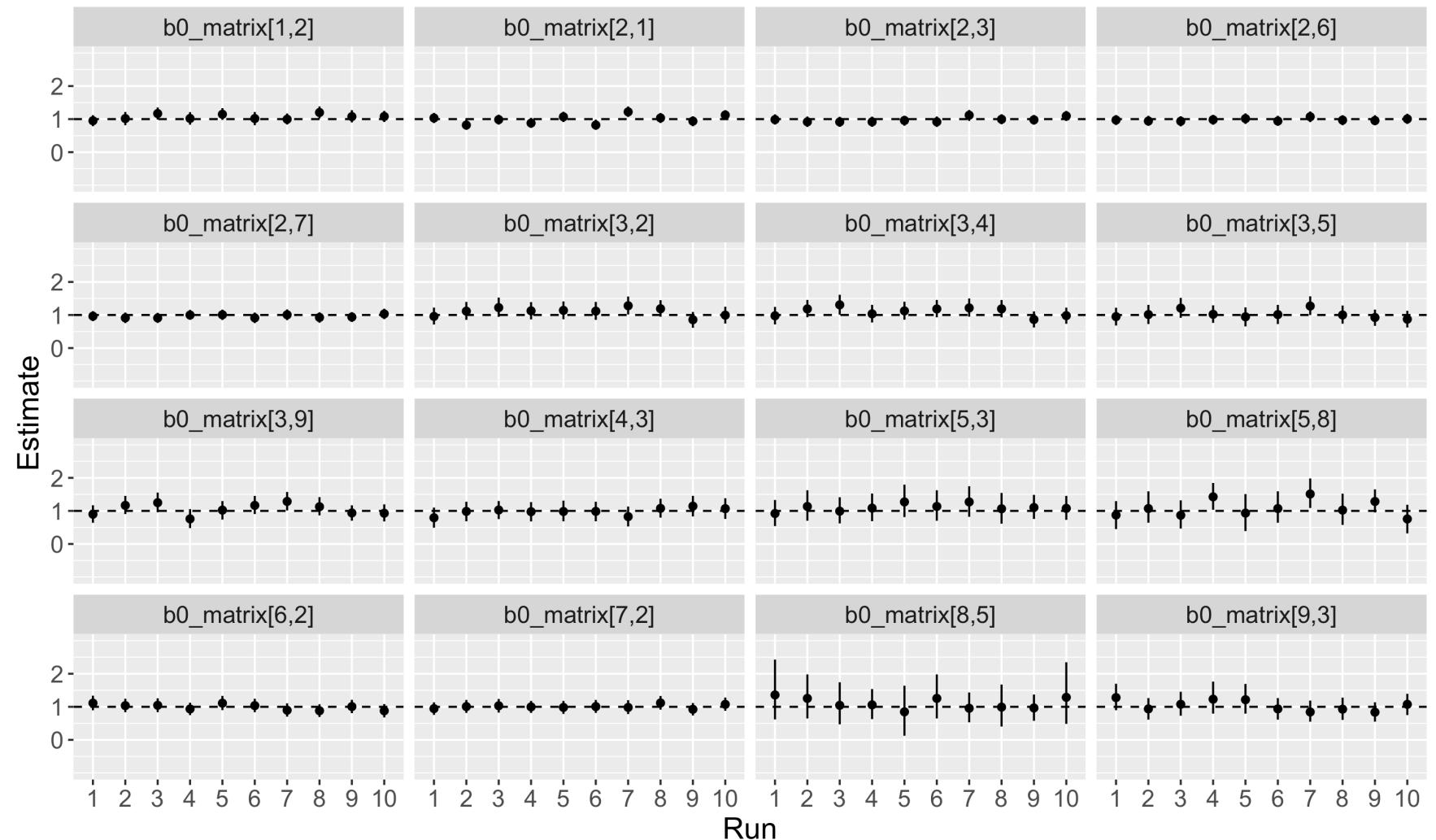


Run 4 - simulated dataset

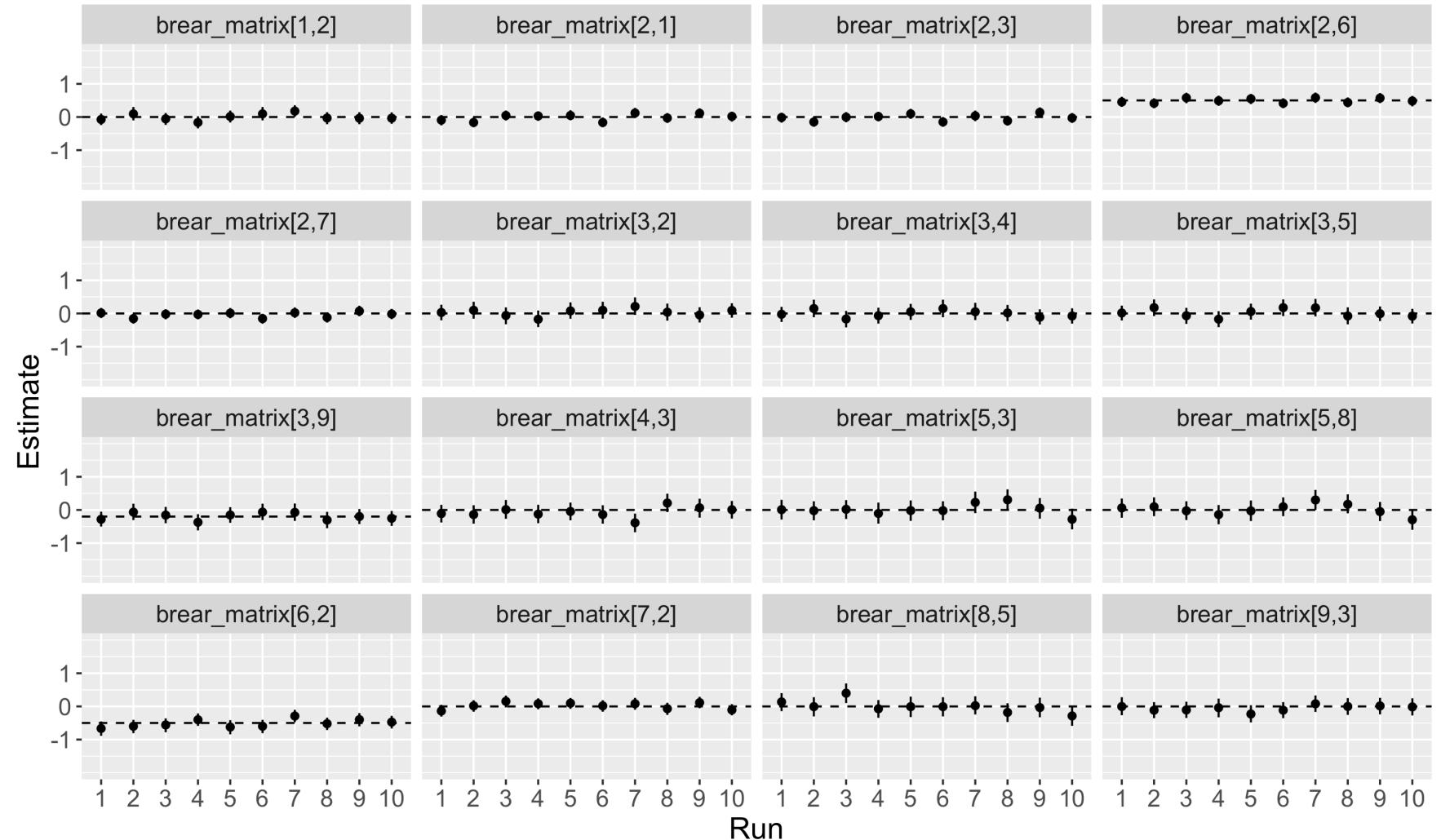
```
##      origin rear          state2 n indices
## 1       1    1           loss  5  [8,10]
## 2       1    2           loss  5  [8,10]
## 3       2    1           loss  3  [8,10]
## 4       2    2           loss  1  [8,10]
## 5       3    1           loss 34  [8,10]
## 6       3    2           loss 43  [8,10]
## 7       1    1 mainstem, ICH to LGR 15  [8,5]
## 8       1    2 mainstem, ICH to LGR 20  [8,5]
## 9       3    1 mainstem, ICH to LGR 45  [8,5]
## 10      3    2 mainstem, ICH to LGR 74  [8,5]
```

```
##      origin rear          state2 n indices
## 1       1    1           loss  3  [8,10]
## 2       1    2           loss  3  [8,10]
## 3       2    1           loss  2  [8,10]
## 4       2    2           loss  2  [8,10]
## 5       3    1           loss 24  [8,10]
## 6       3    2           loss 40  [8,10]
## 7       1    1 mainstem, ICH to LGR 16  [8,5]
## 8       1    2 mainstem, ICH to LGR 24  [8,5]
## 9       2    1 mainstem, ICH to LGR  3  [8,5]
## 10      2    2 mainstem, ICH to LGR  4  [8,5]
## 11      3    1 mainstem, ICH to LGR 46  [8,5]
## 12      3    2 mainstem, ICH to LGR 41  [8,5]
```

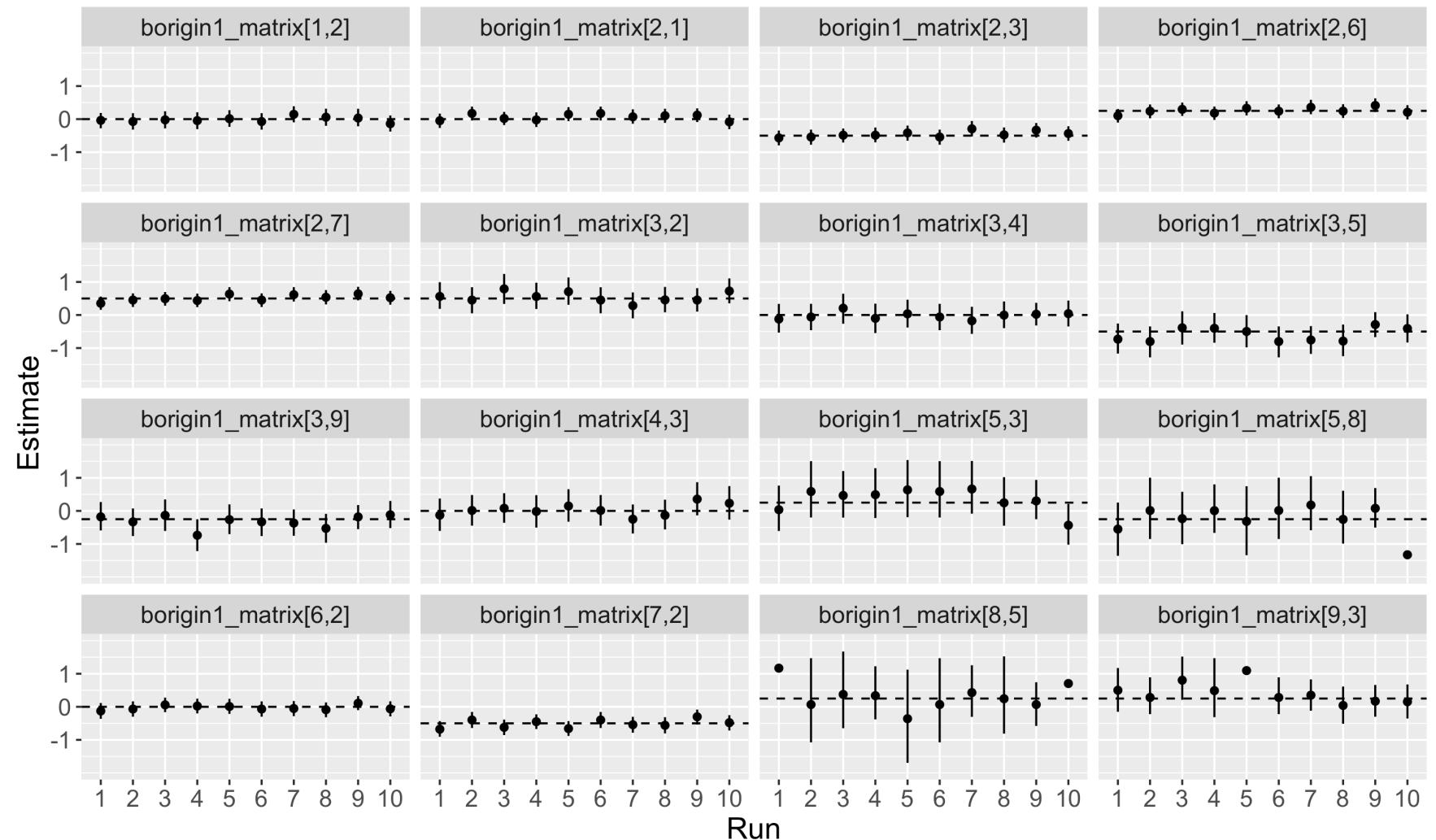
Origin + rear: beta_0



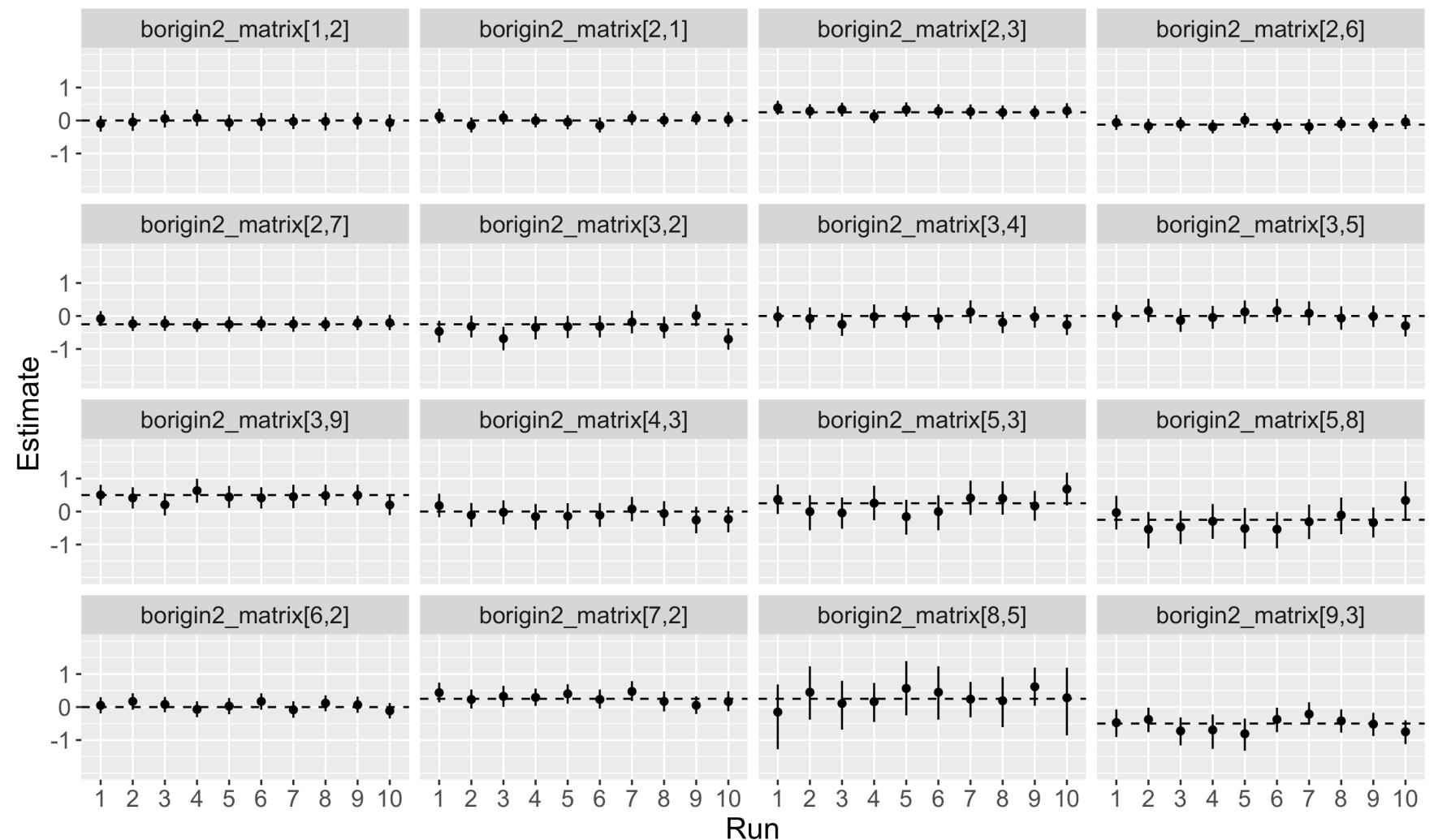
Origin + rear: rear



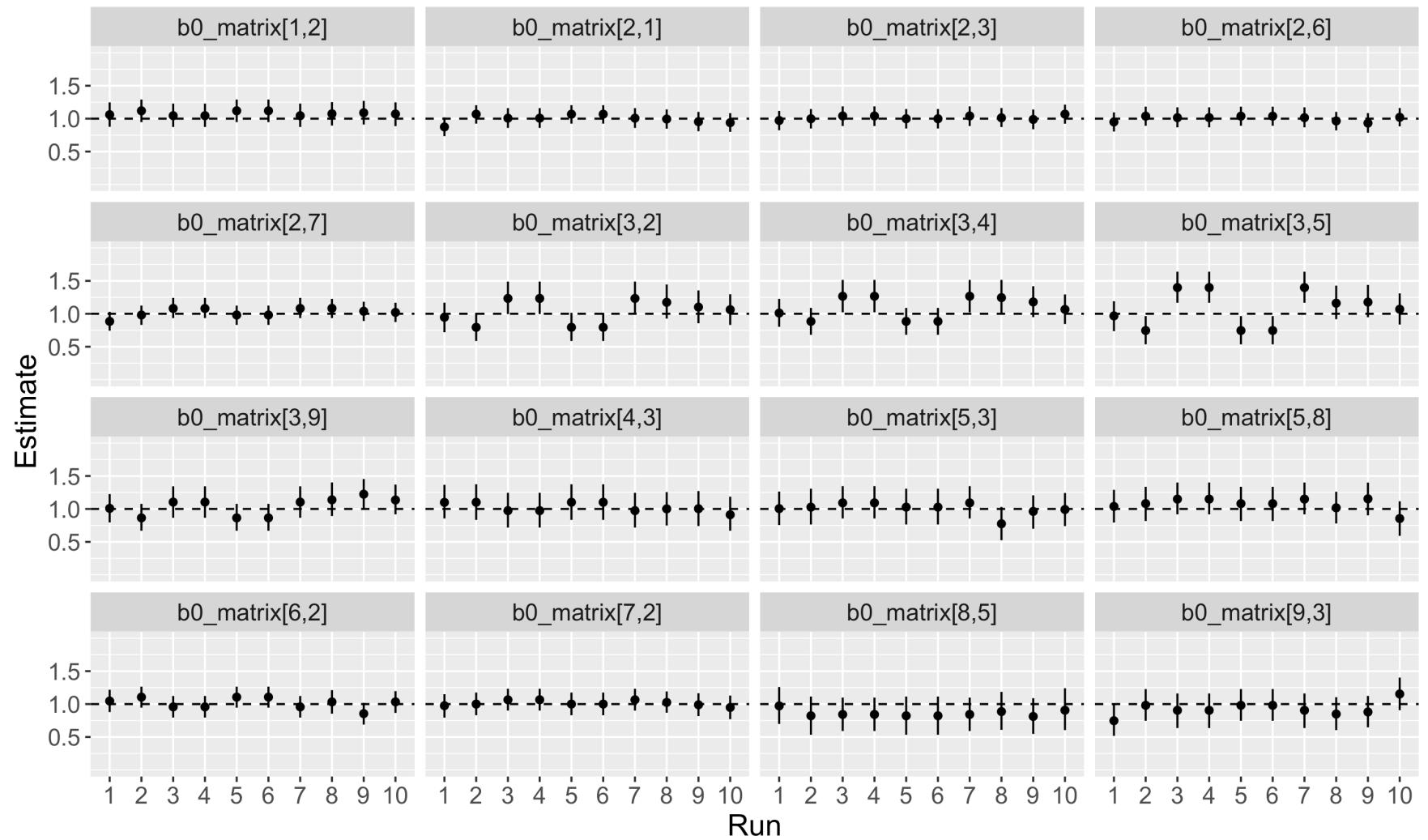
Origin + rear: beta_origin1



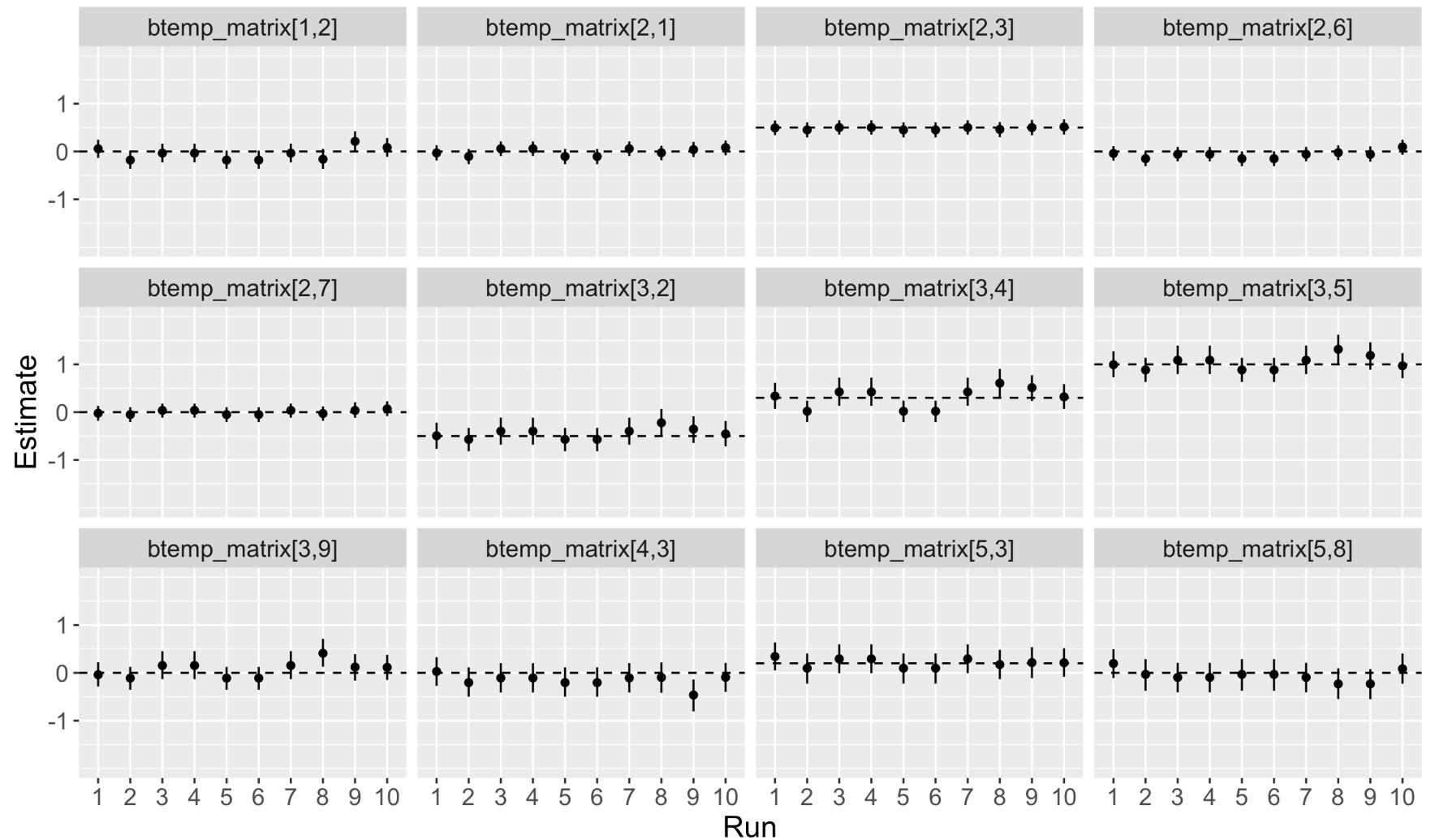
Origin + rear: beta_origin2



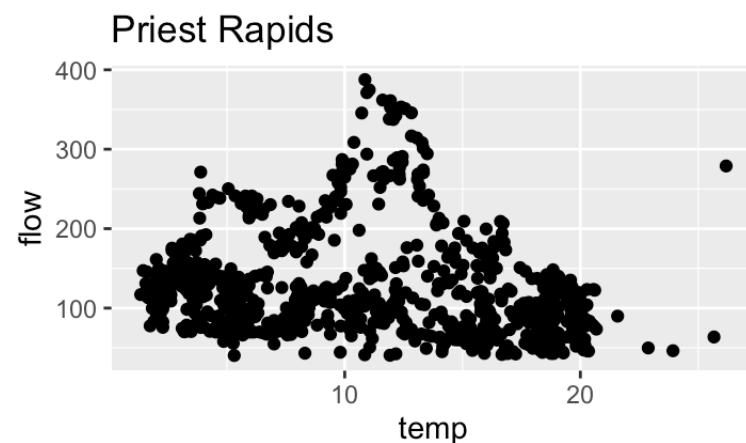
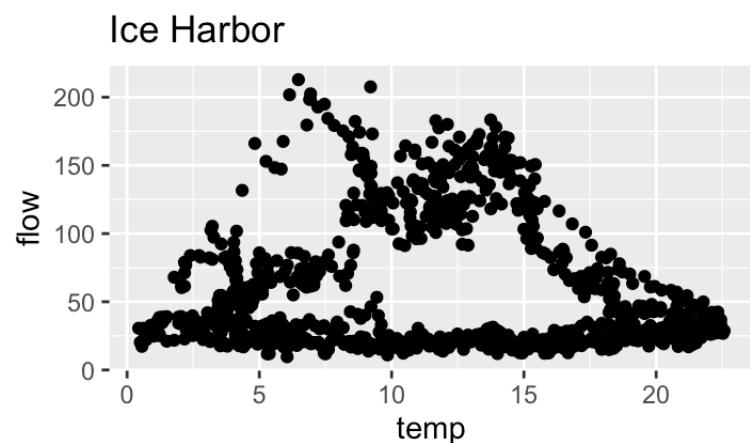
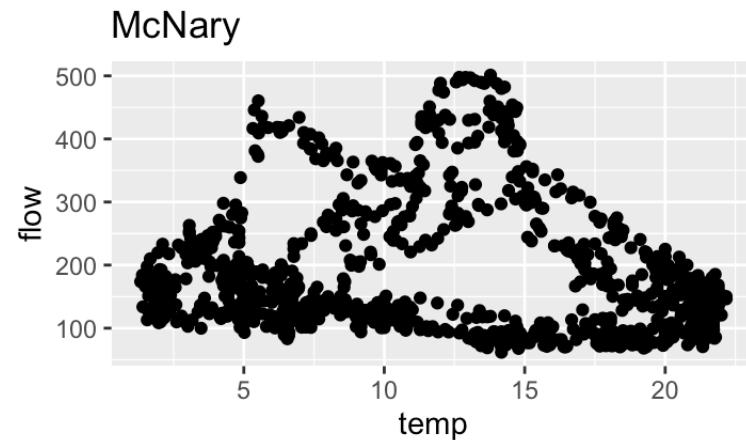
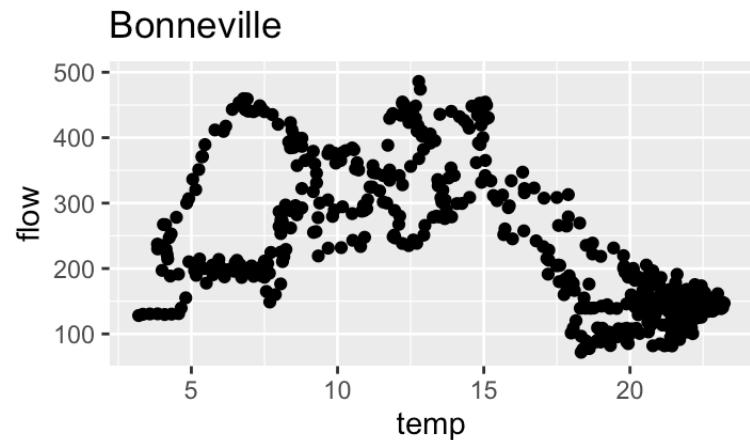
Temperature only: beta_0



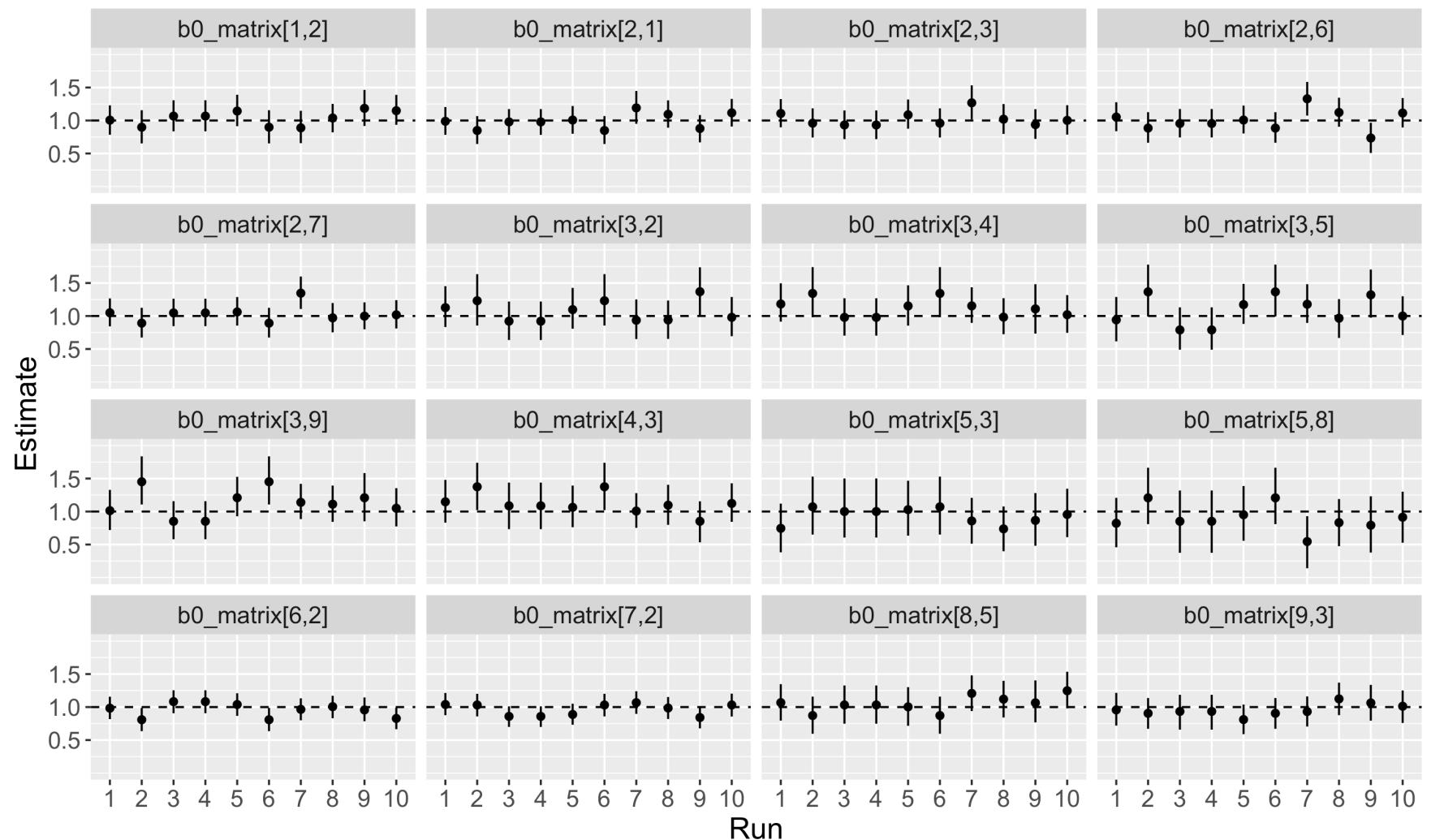
Temperature only: beta_temp



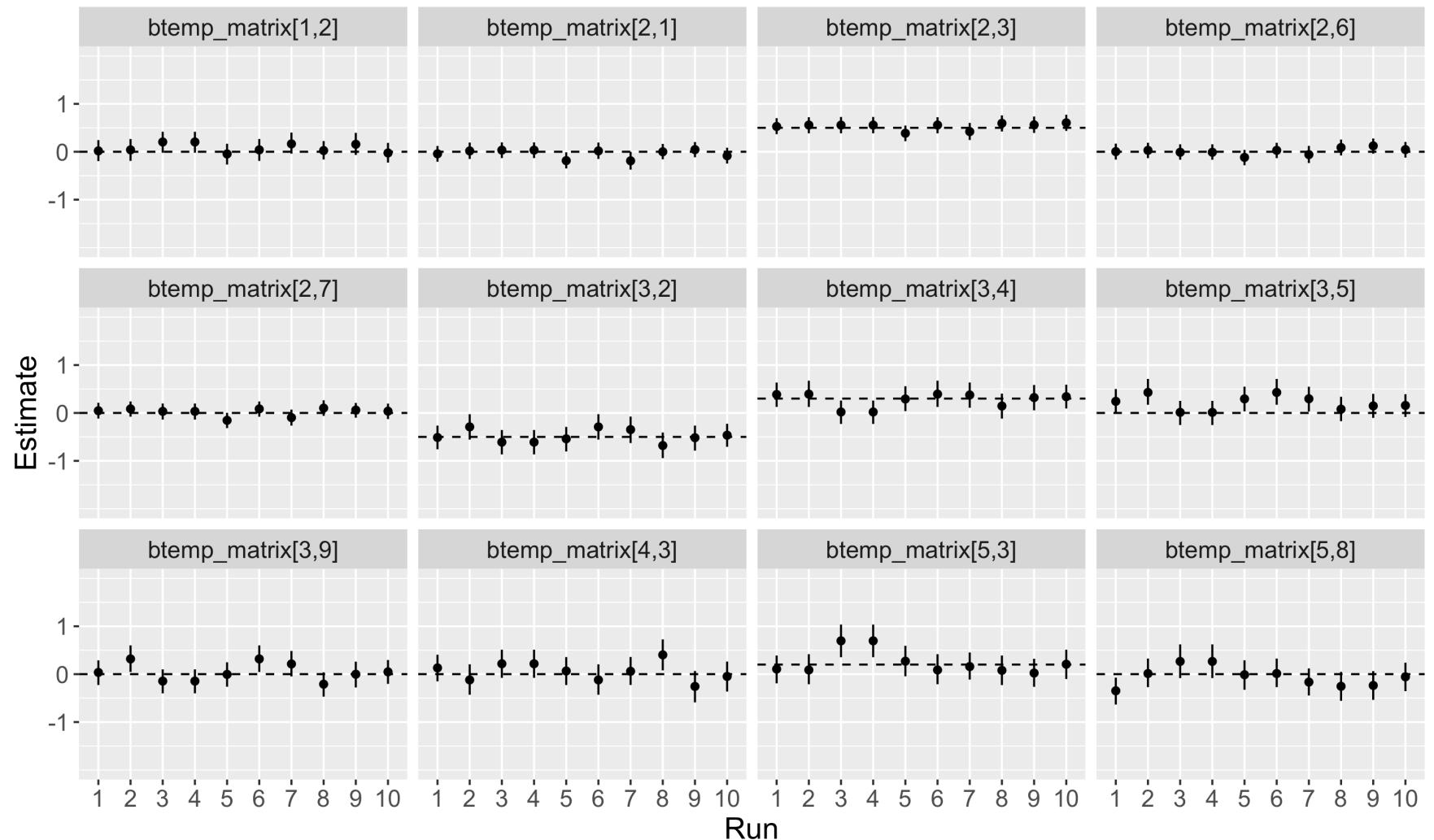
Temperature + flow - correlation issues?



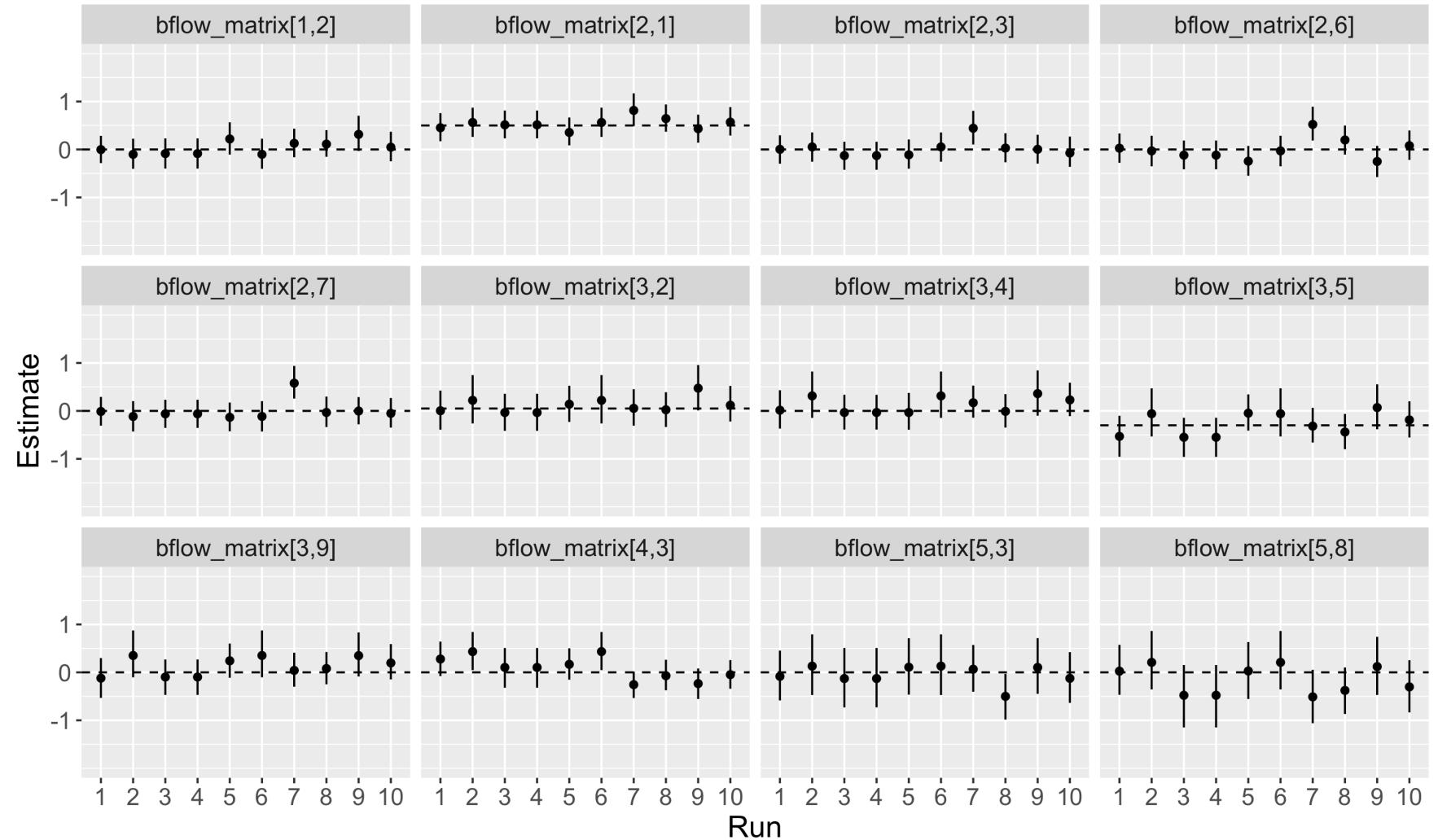
Temperature + flow: b0



Temperature + flow: btemp



Temperature + flow: bflow



Temperature, flow, origin, and rear

```
2022-05-19_all4_1200 — mmin@mox2:/sw/modules-1.775/modulefiles/contrib/JAGS — R --no-echo --no-restore...
...no-restore --file=all4_1200_hyak_1.R      .../steelhead/to_hyak_transfer -- zsh      ...0 — ssh mmin@mox.hyak.uw.edu +
The following objects are masked from 'package:base':
  date, intersect, setdiff, union

Attaching package: 'janitor'

The following objects are masked from 'package:stats':
  chisq.test, fisher.test

Loading required package: coda
Linked to JAGS 4.3.0
Loaded modules: basemod,bugs

Attaching package: 'jagsUI'

The following object is masked from 'package:coda':
  traceplot

Attaching package: 'R2jags'

The following objects are masked from 'package:jagsUI':
  autojags, jags, traceplot

The following object is masked from 'package:coda':
  traceplot

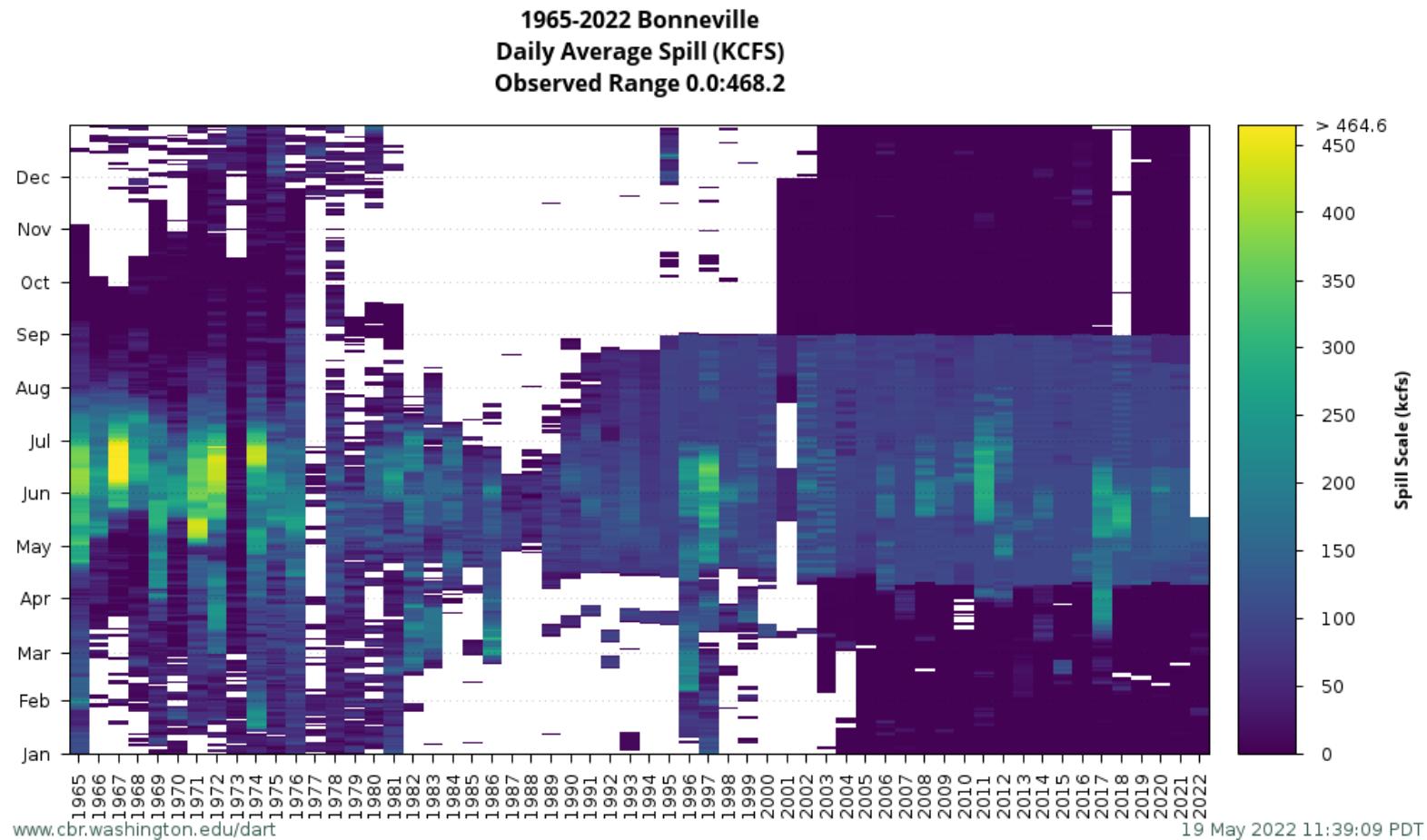
[1] "Run: 1"
[1] "2022-05-19 09:17:26 PDT"
```

Temperature, flow, origin, and rear - waiting in the queue...

```
to_hyak_transfer — mmin@mox1:gscratch/stf/mmin/JAGS_runs/2022-05-19_all4_1200 — ssh mmin@mox.hyak.uw.edu — 141x25
.../modules-1.775/modulefiles/contrib/JAGS — zsh ... ...nts/CBR/steelhead/from_hyak_transfer — zsh ...9_all4_1200 — ssh mmin@mox.hyak.uw.edu +
```

```
[mmin@mox1 2022-05-19_all4_1200]$ squeue -p stf
[   JOBID PARTITION      NAME      USER ST      TIME  NODES NODELIST(REASON)
2732117      stf    02bcpp  cliao25 PD      0:00      4 (Priority)
2732086      stf sulfprox  bermaj PD      0:00      4 (Resources)
1771614      stf      sort    asur PD      0:00      1 (Dependency)
1771610      stf      sort    asur PD      0:00      1 (Dependency)
1771600      stf      sort    asur PD      0:00      1 (Dependency)
1771596      stf      sort    asur PD      0:00      1 (Dependency)
2732162      stf 1200_all    mmin PD      0:00      1 (Priority)
2732161      stf 1200_all    mmin PD      0:00      1 (Priority)
2732160      stf 1200_all    mmin PD      0:00      1 (Priority)
2732159      stf 1200_all    mmin PD      0:00      1 (Priority)
2732158      stf 1200_all    mmin PD      0:00      1 (Priority)
2731504      stf mpi-j parkh27 R  4:15:14  15 n[2266-2267,2282-2283,2286-2289,2296,2302-2307]
2731521      stf sulfprox  bermaj R  38:29      4 n[2270,2277,2312-2313]
2731517      stf proxtmsa  bermaj R  2:14:14      4 n[2276,2280,2294,2300]
2731507      stf proxtmss  bermaj R  2:56:45      4 n[2285,2308-2310]
2730952      stf proxtmss  bermaj R  6:57:13      4 n[2272-2275]
2731477      stf ZnOInPS1 khoang89 R  6:57:13      4 n[2260-2261,2278-2279]
2730951      stf sulfprox  bermaj R  7:53:10      4 n[2262-2265]
2730931      stf tpp-hf  cliao25 R  17:41:01      4 n[2268,2281,2293,2295]
2732150      stf z_mrci shumilov R  38:25      1 n2298
2730418      stf Submit_T awrossi R  21:31:59      1 n2290
2730417      stf Submit_T awrossi R  21:33:47      1 n2284
[mmin@mox1 2022-05-19_all4_1200]$
```

Spill covariate



- Binary variable (was there any spill around a window of time of the estimated transition date), or count of days of spill within window?