

# Kalman Filter Analysis for Experiment 06 and Condition Visual

Joaquin Rapela

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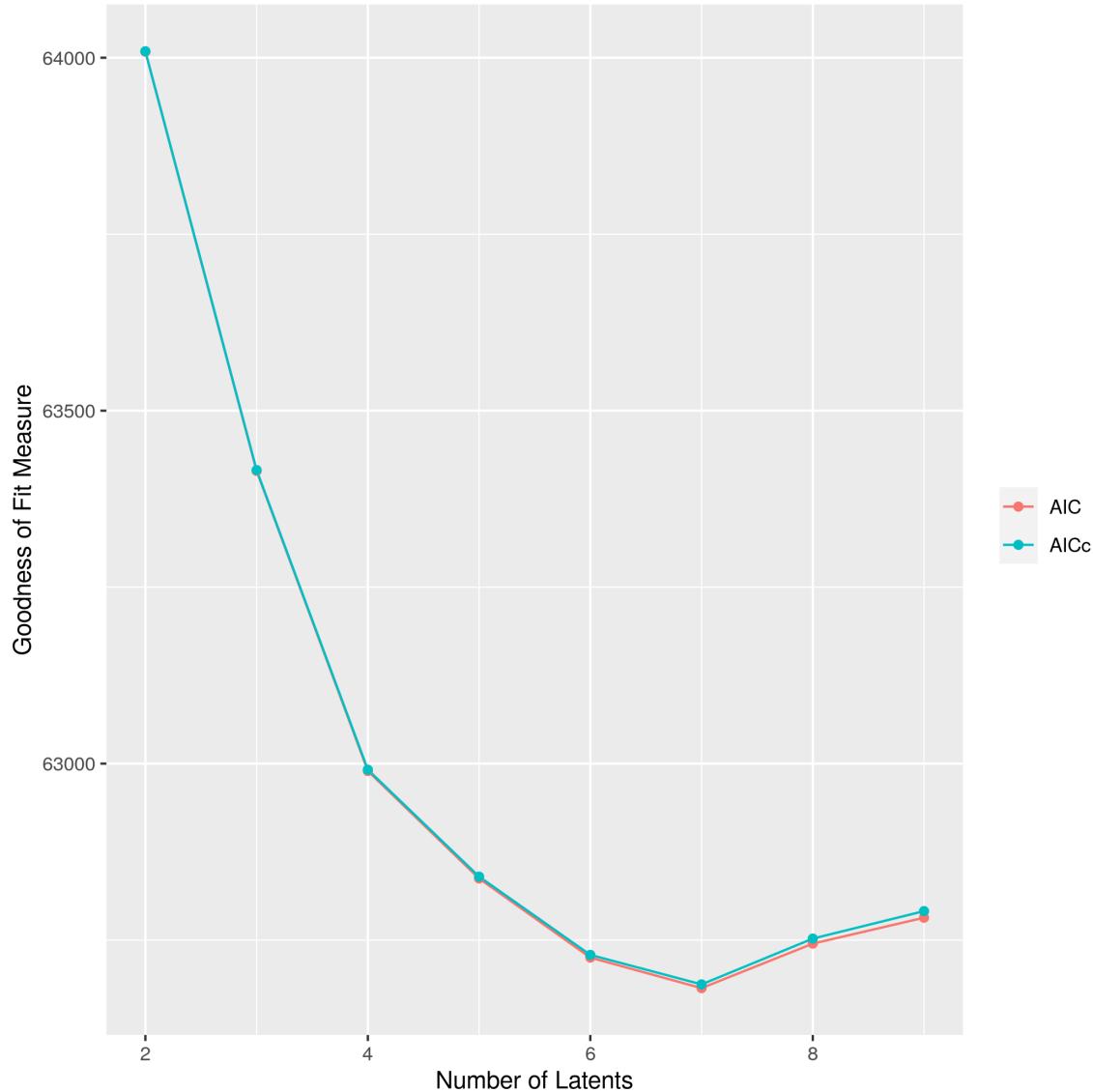


Figure 1: AIC curves used to select the number of latents. Click on the figure to open the interactive version.

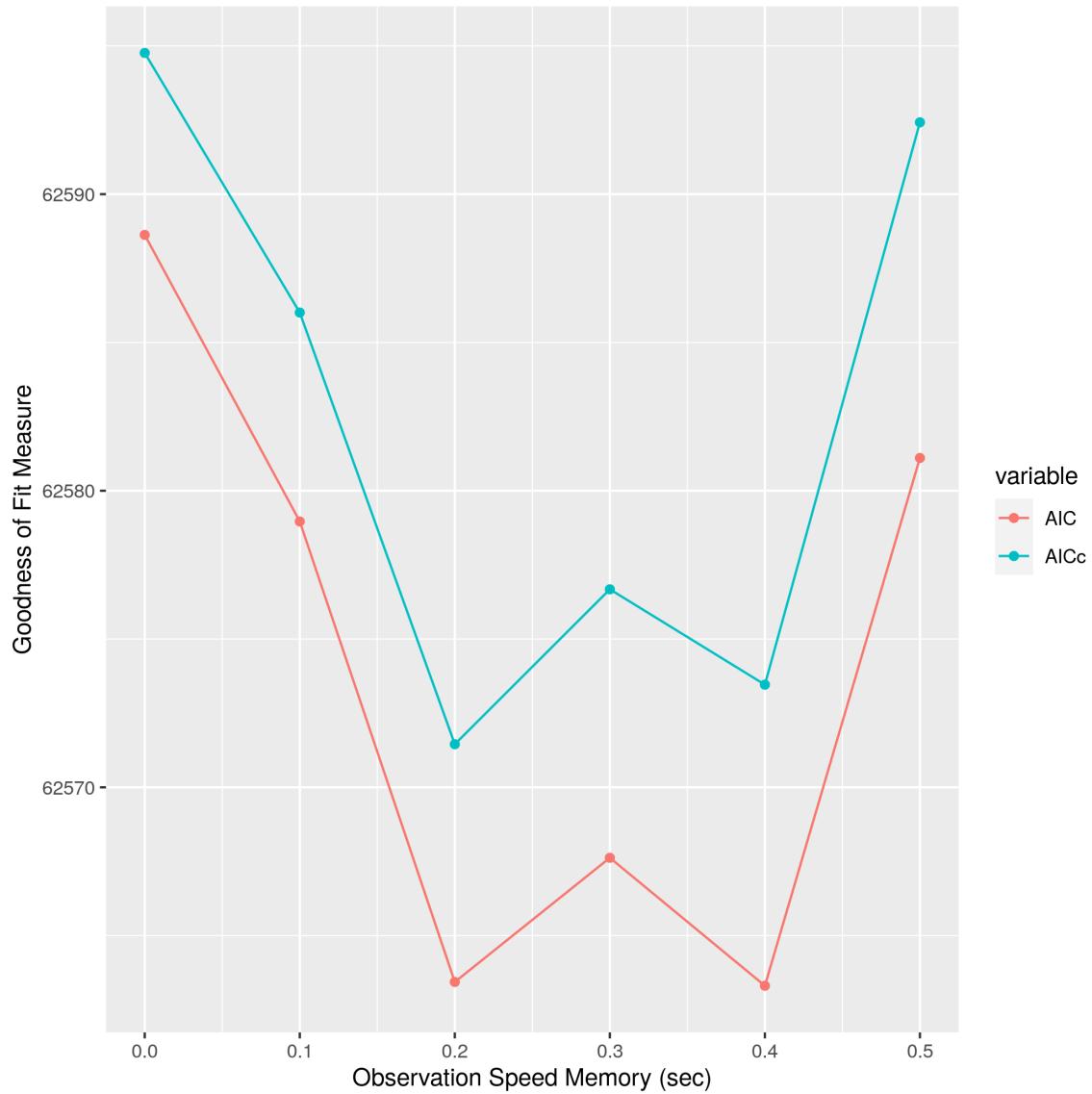


Figure 2: AIC curves used to select the length of the observations speed memory. Click on the figure to open the interactive version.

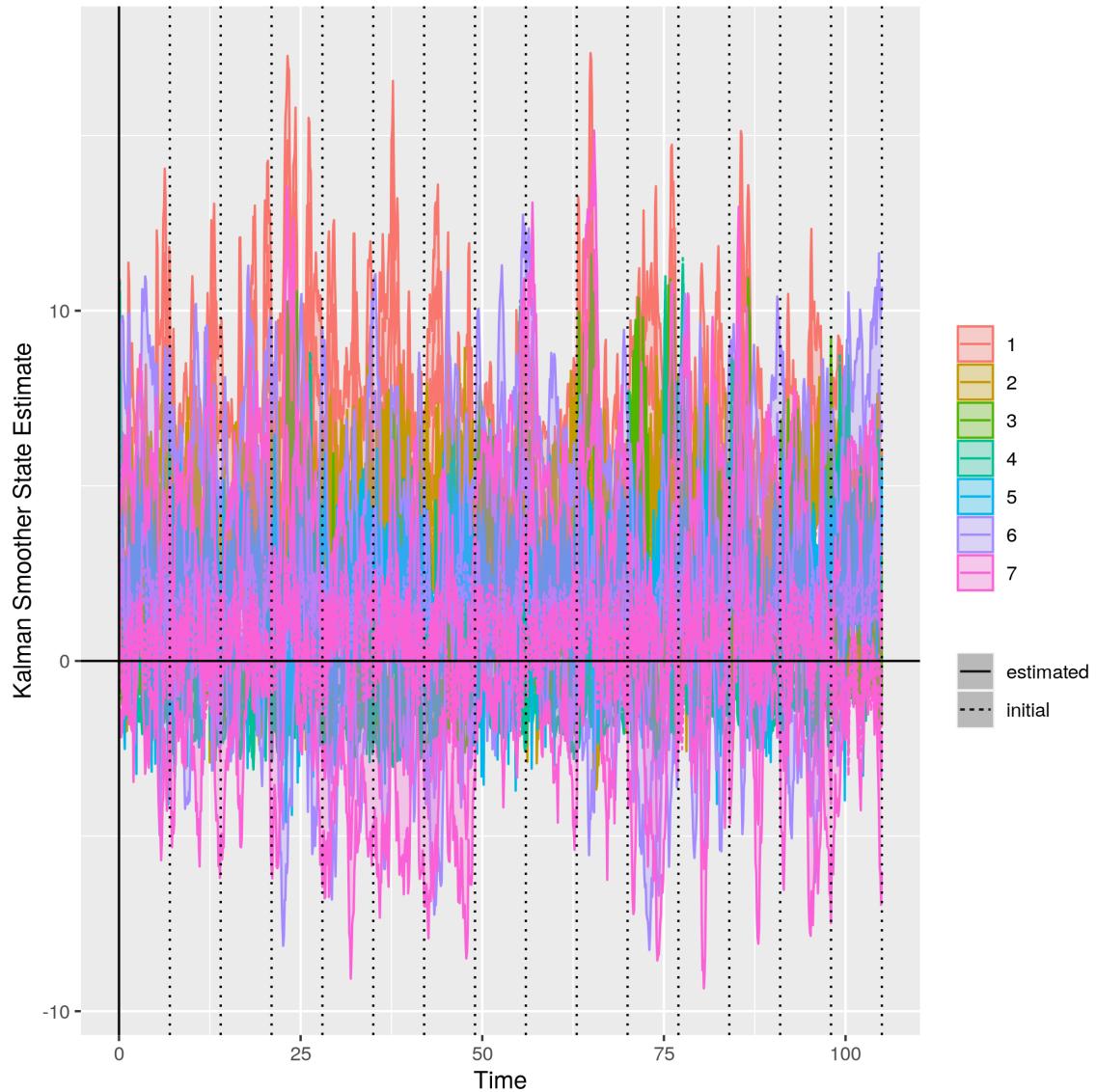
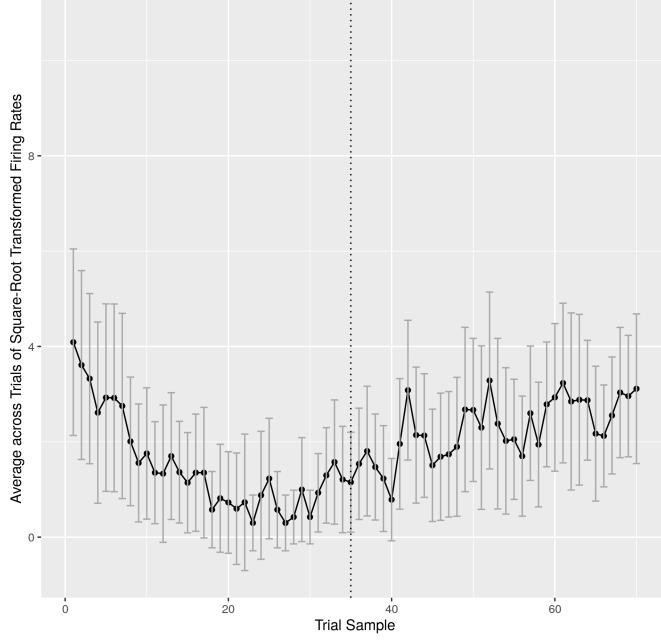


Figure 3: Estimated latents using the Kalman smoother (i.e.,  $P(x_n|y_1, \dots, y_N)$ ). Click on the figure to open the interactive version.

Expt 06, Visual, Cell 01, Mean Firing Rate 1.89 (spikes/sec)



Expt06Cell01

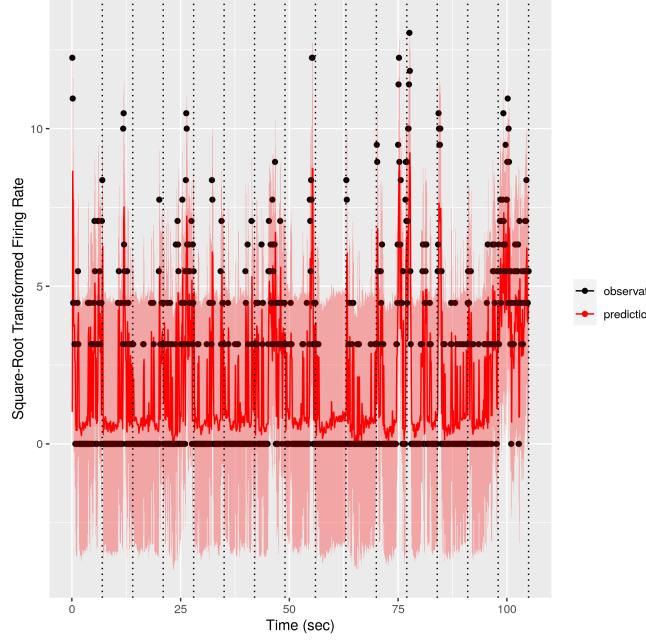
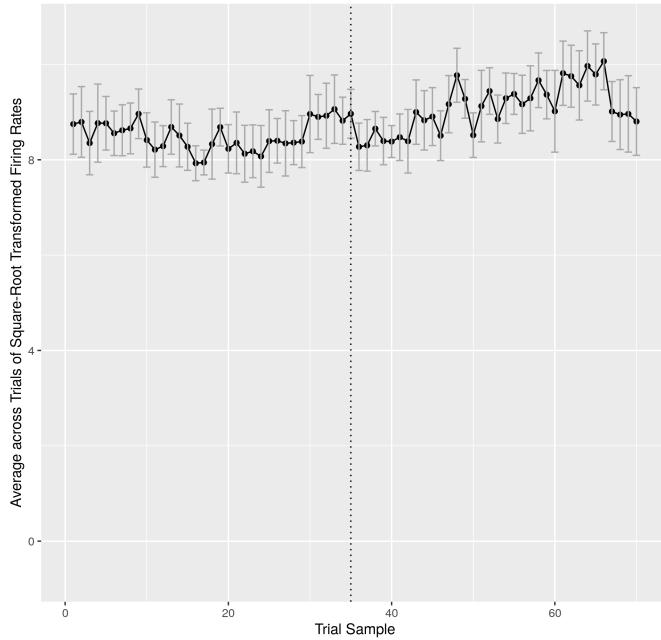


Figure 4: Left: trial-averaged squared-root transformed firing rates. Right: one-step-ahead prediction of cell 01 response (i.e.,  $P(y_n|y_1, \dots, y_{n-1}, s_n, \dots, s_{n-L})$ ). Click on the figures to open the interactive version.

Expt 06, Visual, Cell 02, Mean Firing Rate 8.80 (spikes/sec)



Expt06Cell02

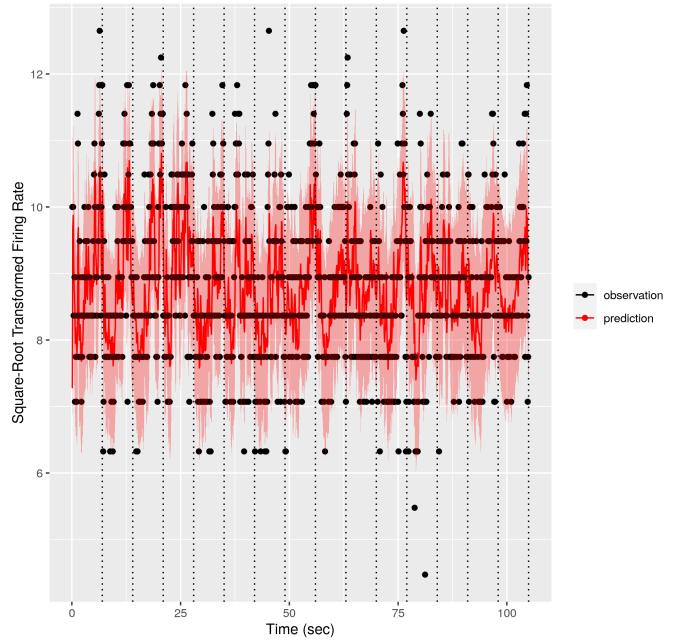


Figure 5: Left: trial-averaged squared-root transformed firing rates. Right: one-step-ahead prediction of cell 02 response (i.e.,  $P(y_n|y_1, \dots, y_{n-1}, s_n, \dots, s_{n-L})$ ). Click on the figures to open the interactive version.

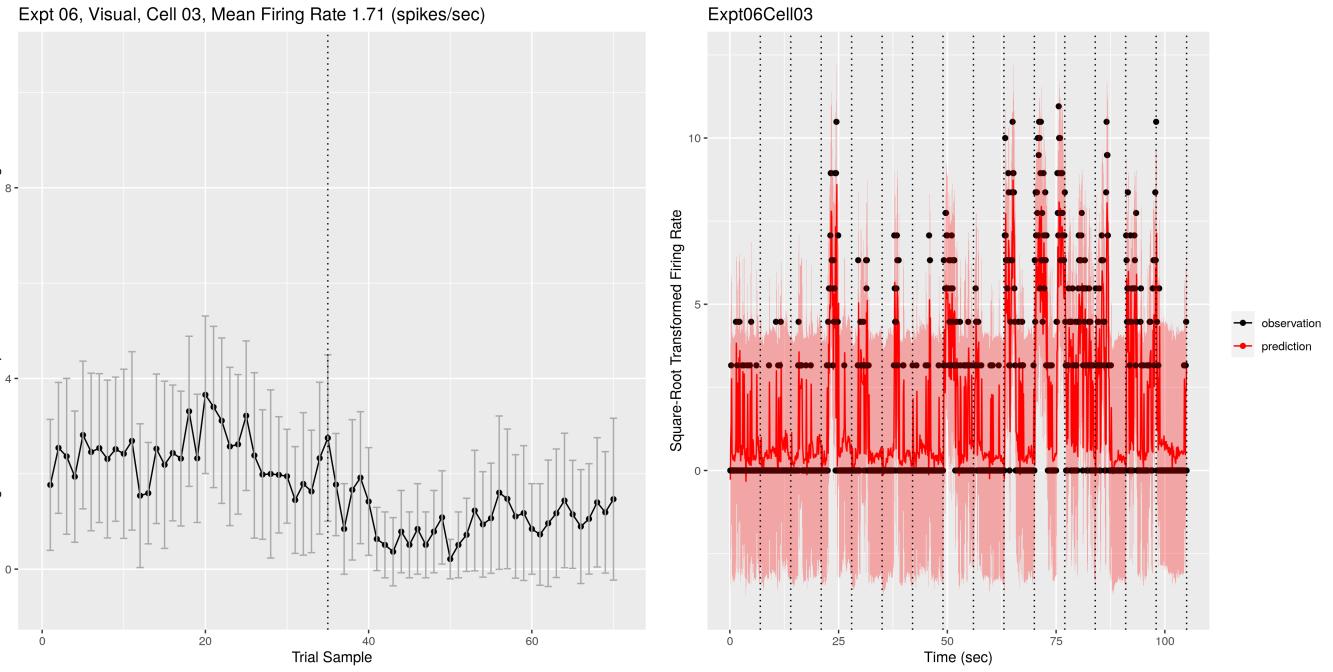


Figure 6: Left: trial-averaged squared-root transformed firing rates. Right: one-step-ahead prediction of cell 03 response (i.e.,  $P(y_n|y_1, \dots, y_{n-1}, s_n, \dots, s_{n-L})$ ). Click on the figures to open the interactive version.

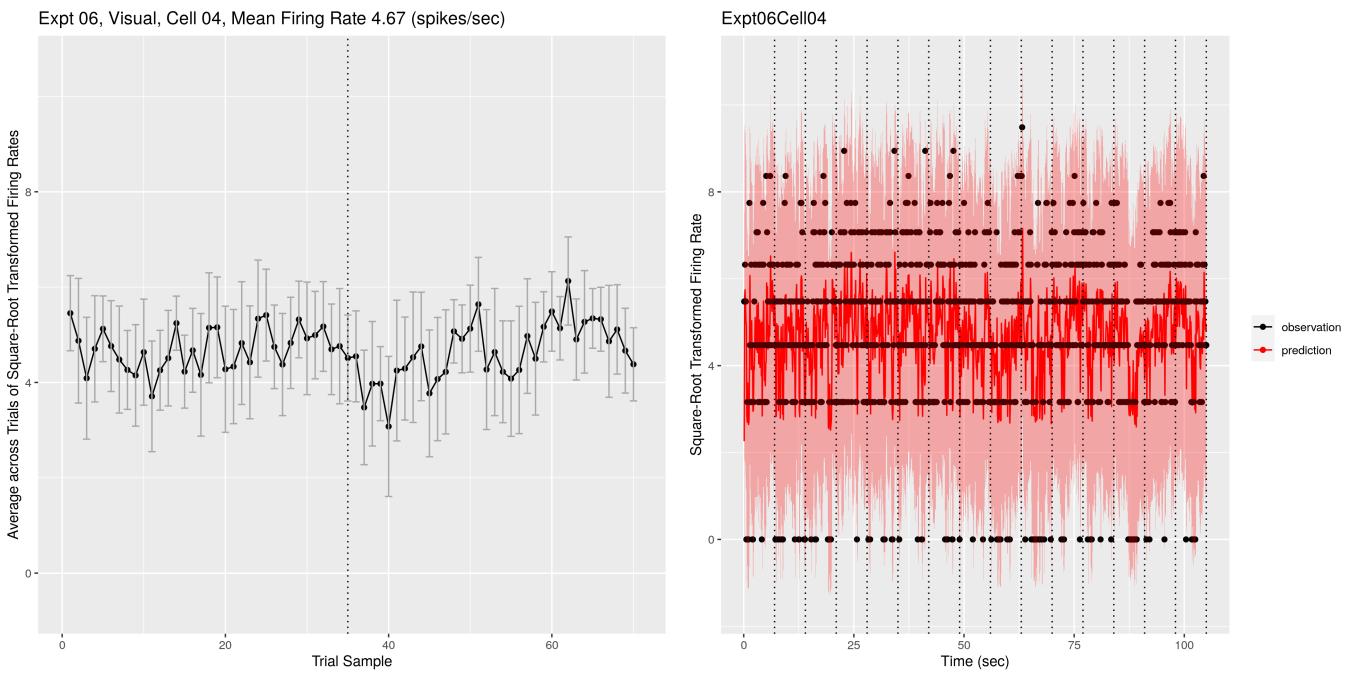


Figure 7: Left: trial-averaged squared-root transformed firing rates. Right: one-step-ahead prediction of cell 04 response (i.e.,  $P(y_n|y_1, \dots, y_{n-1}, s_n, \dots, s_{n-L})$ ). Click on the figures to open the interactive version.

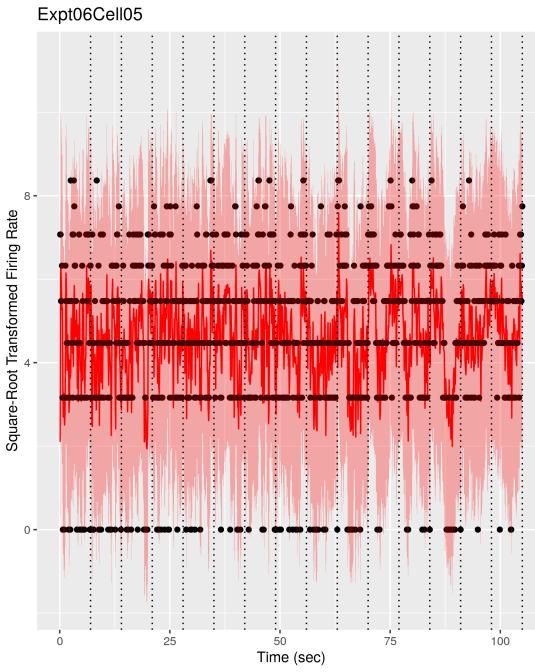
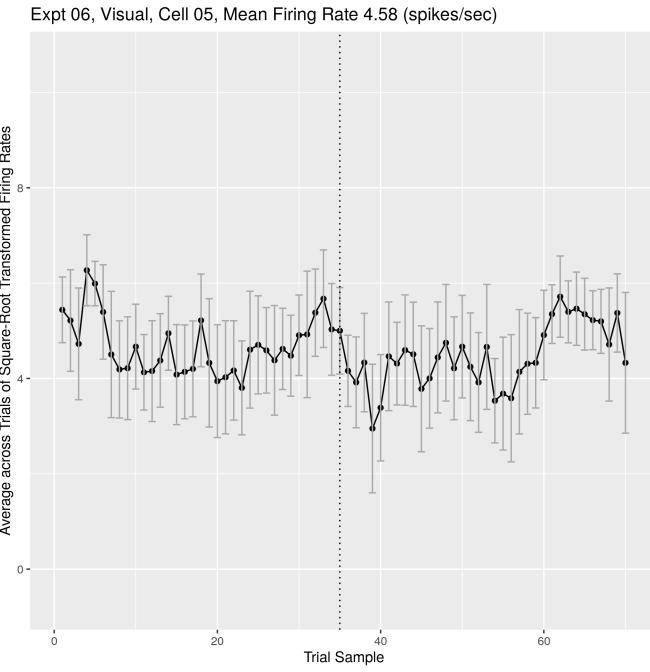


Figure 8: Left: trial-averaged squared-root transformed firing rates. Right: one-step-ahead prediction of cell 05 response (i.e.,  $P(y_n|y_1, \dots, y_{n-1}, s_n, \dots, s_{n-L})$ ). Click on the figures to open the interactive version.

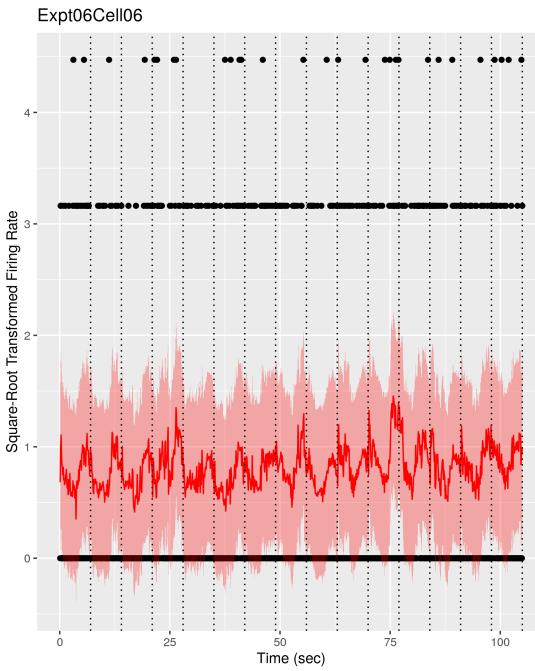
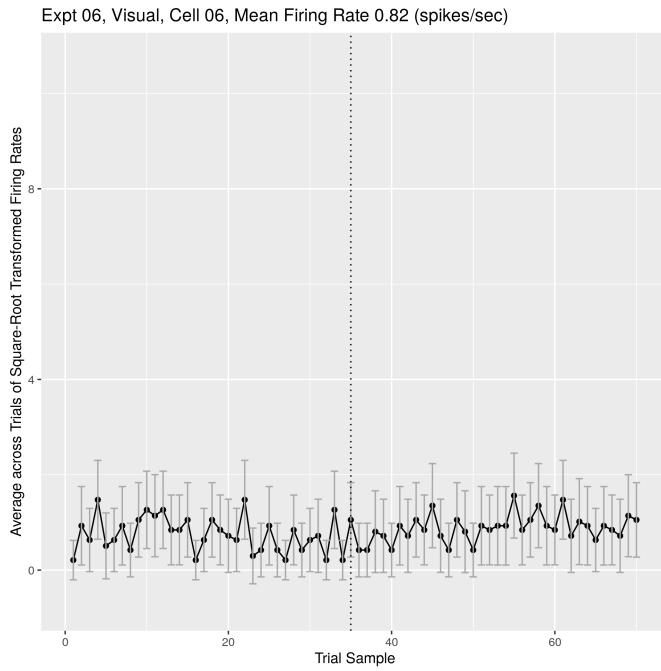
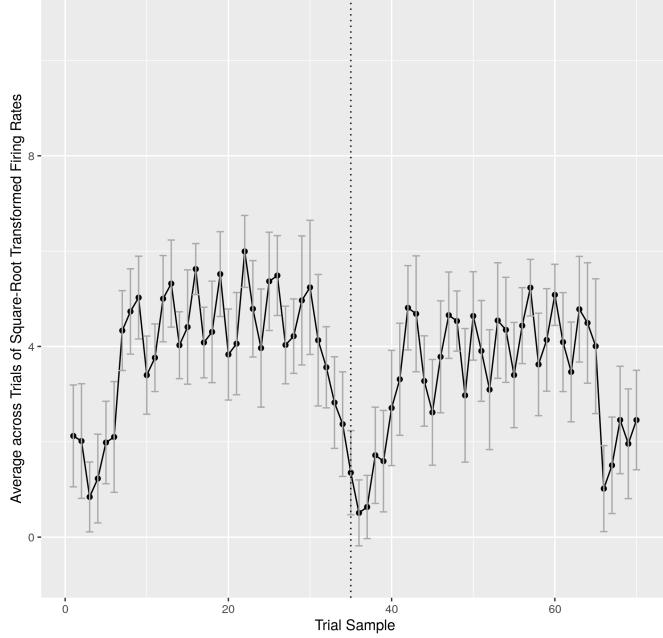


Figure 9: Left: trial-averaged squared-root transformed firing rates. Right: one-step-ahead prediction of cell 06 response (i.e.,  $P(y_n|y_1, \dots, y_{n-1}, s_n, \dots, s_{n-L})$ ). Click on the figures to open the interactive version.

Expt 06, Visual, Cell 07, Mean Firing Rate 3.64 (spikes/sec)



Expt06Cell07

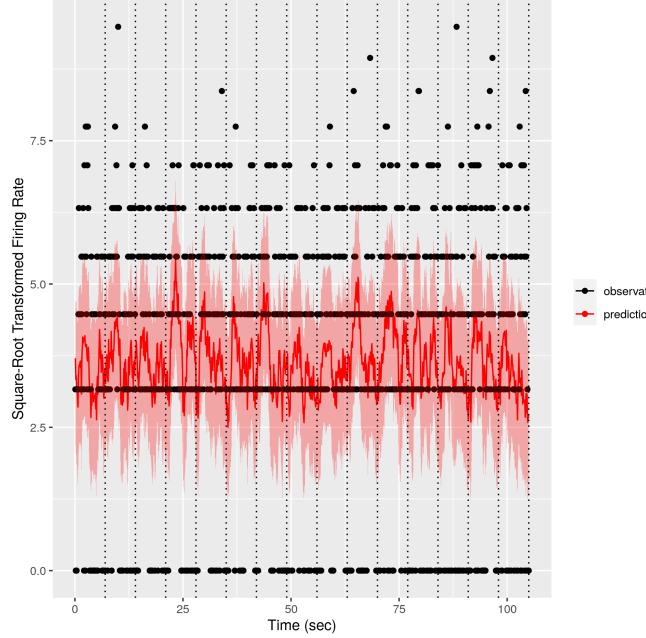
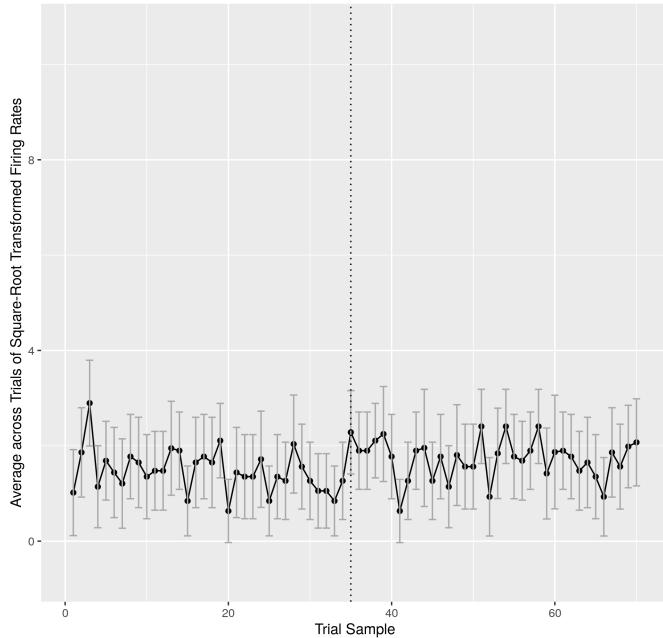


Figure 10: Left: trial-averaged squared-root transformed firing rates. Right: one-step-ahead prediction of cell 07 response (i.e.,  $P(y_n|y_1, \dots, y_{n-1}, s_n, \dots, s_{n-L})$ ). Click on the figures to open the interactive version.

Expt 06, Visual, Cell 08, Mean Firing Rate 1.60 (spikes/sec)



Expt06Cell08

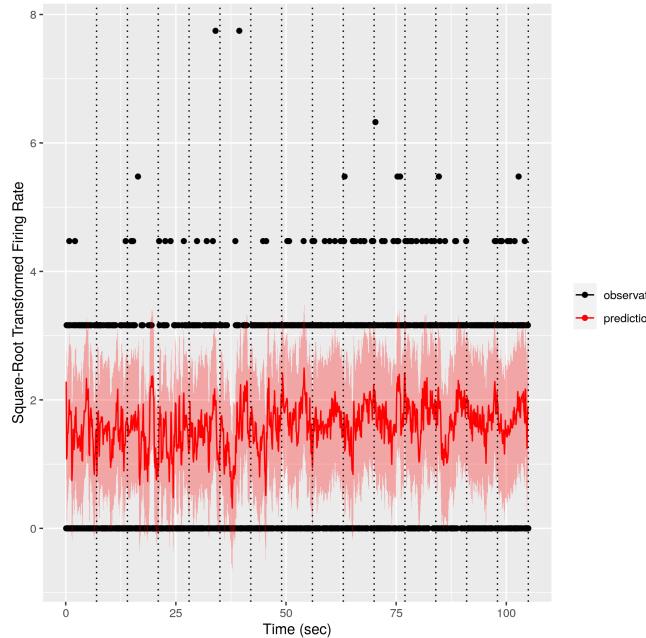
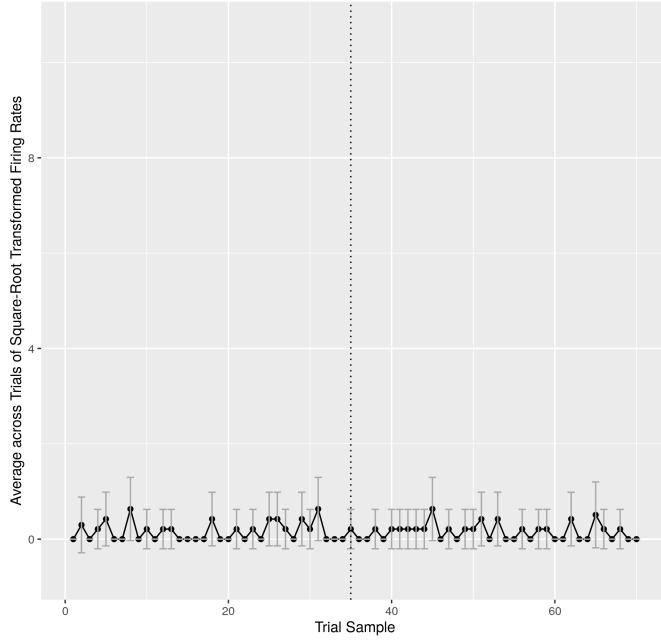


Figure 11: Left: trial-averaged squared-root transformed firing rates. Right: one-step-ahead prediction of cell 08 response (i.e.,  $P(y_n|y_1, \dots, y_{n-1}, s_n, \dots, s_{n-L})$ ). Click on the figures to open the interactive version.

Expt 06, Visual, Cell 09, Mean Firing Rate 0.16 (spikes/sec)



Expt06Cell09

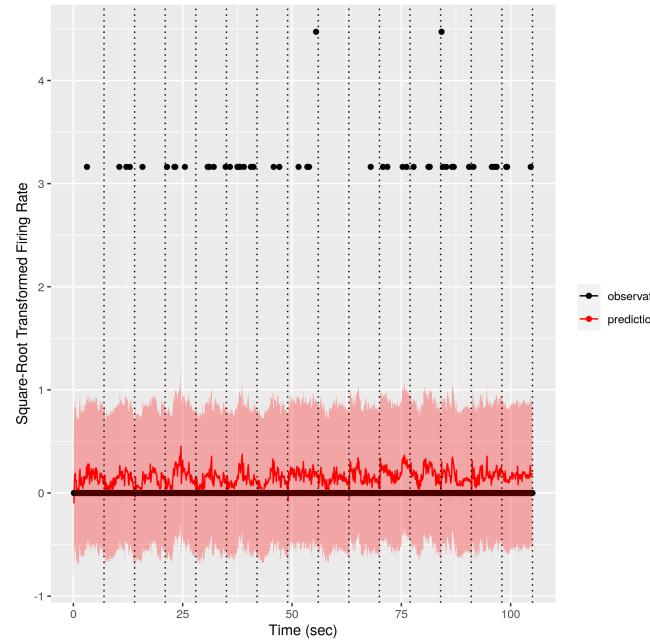
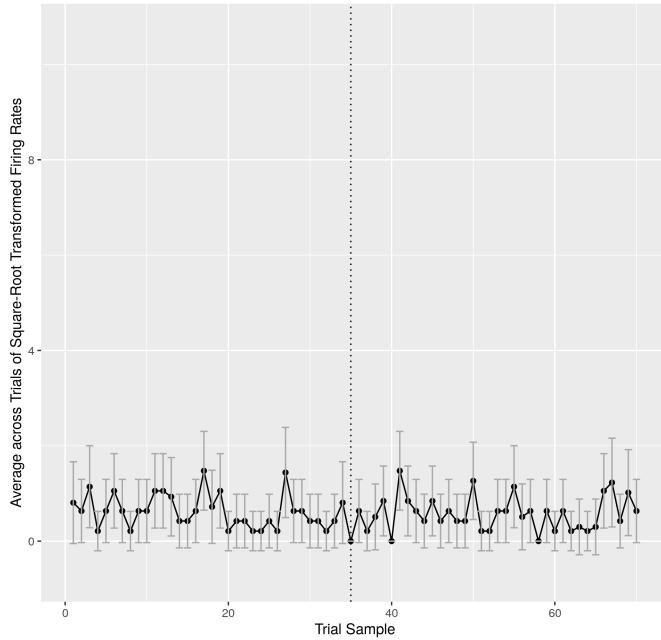


Figure 12: Left: trial-averaged squared-root transformed firing rates. Right: one-step-ahead prediction of cell 09 response (i.e.,  $P(y_n|y_1, \dots, y_{n-1}, s_n, \dots, s_{n-L})$ ). Click on the figures to open the interactive version.

Expt 06, Visual, Cell 10, Mean Firing Rate 0.60 (spikes/sec)



Expt06Cell10

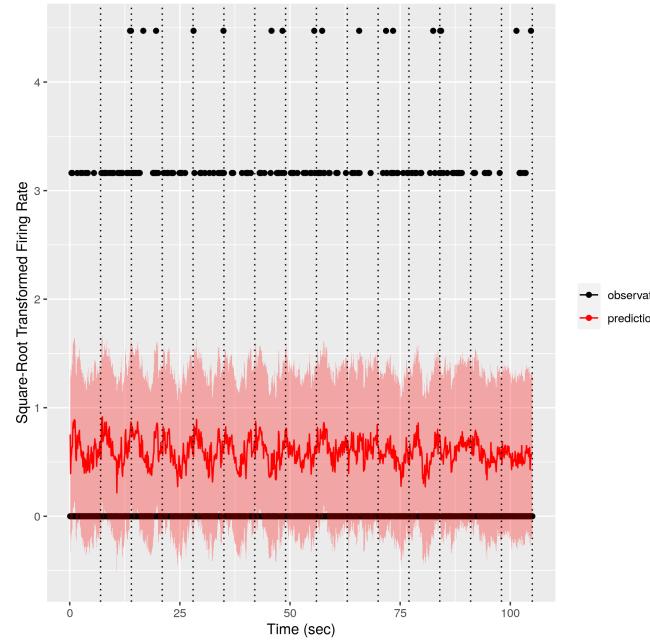
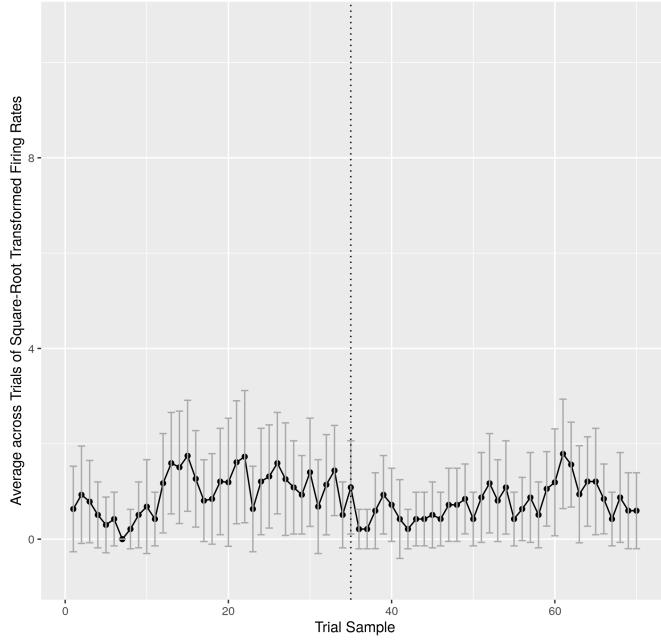


Figure 13: Left: trial-averaged squared-root transformed firing rates. Right: one-step-ahead prediction of cell 10 response (i.e.,  $P(y_n|y_1, \dots, y_{n-1}, s_n, \dots, s_{n-L})$ ). Click on the figures to open the interactive version.

Expt 06, Visual, Cell 11, Mean Firing Rate 0.87 (spikes/sec)



Expt06Cell11

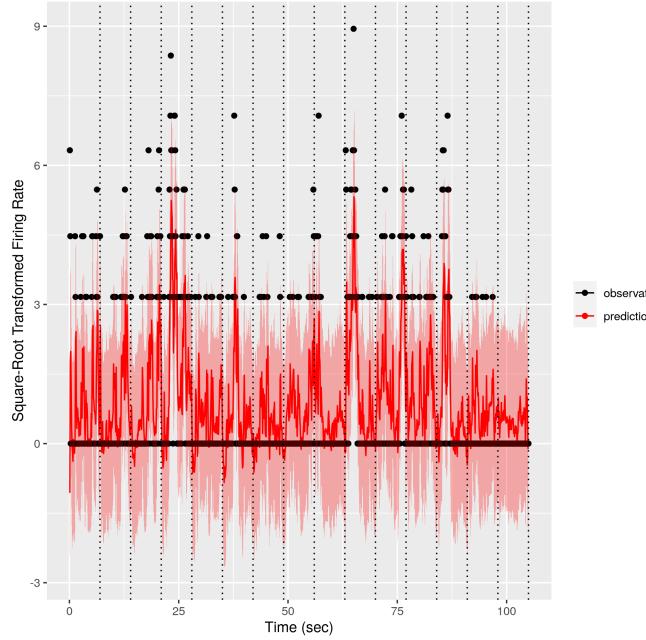
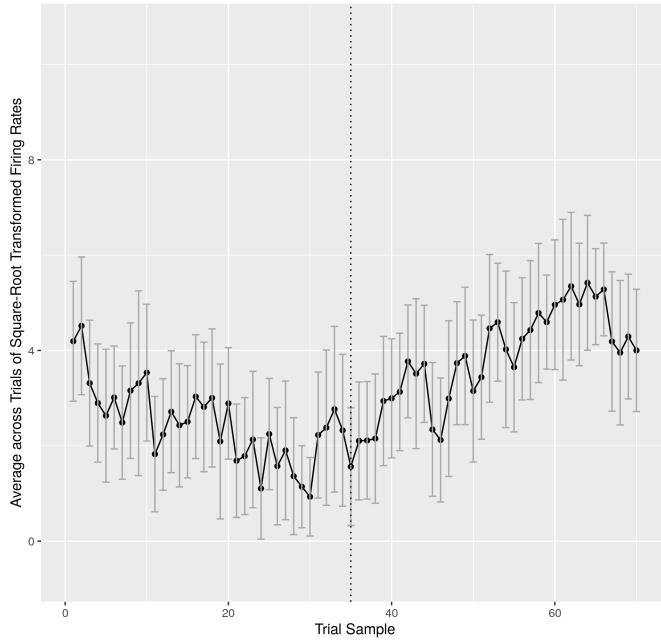


Figure 14: Left: trial-averaged squared-root transformed firing rates. Right: one-step-ahead prediction of cell 11 response (i.e.,  $P(y_n|y_1, \dots, y_{n-1}, s_n, \dots, s_{n-L})$ ). Click on the figures to open the interactive version.

Expt 06, Visual, Cell 12, Mean Firing Rate 3.16 (spikes/sec)



Expt06Cell12

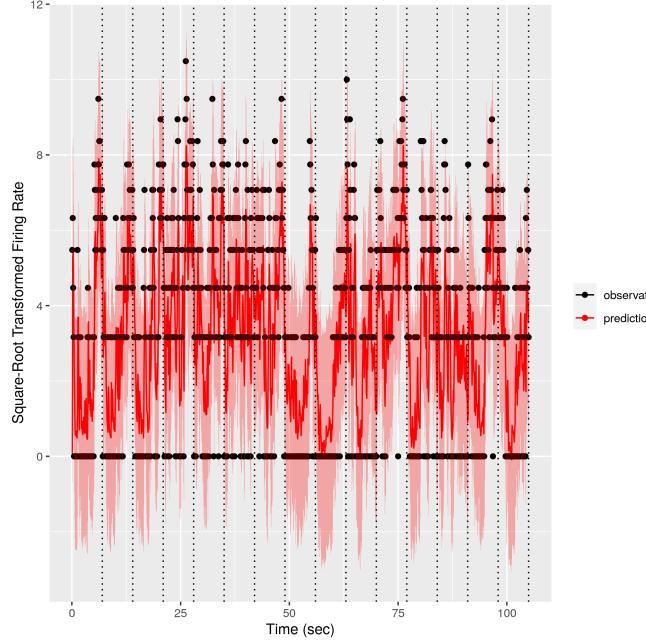
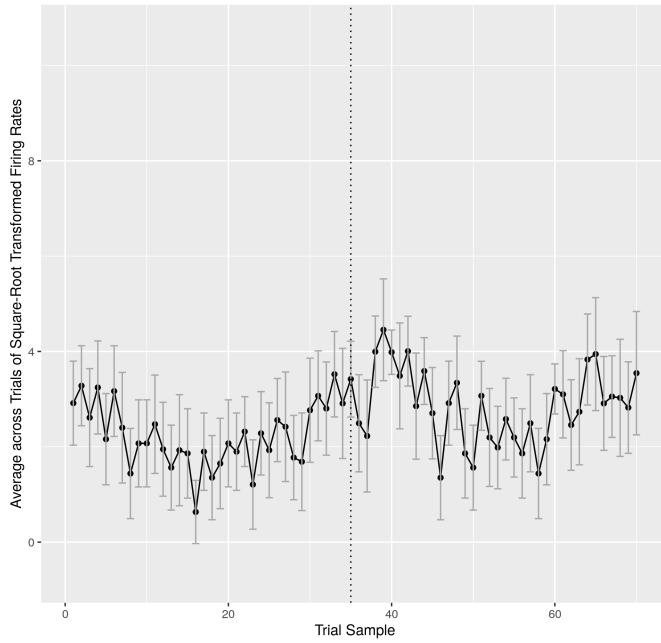


Figure 15: Left: trial-averaged squared-root transformed firing rates. Right: one-step-ahead prediction of cell 12 response (i.e.,  $P(y_n|y_1, \dots, y_{n-1}, s_n, \dots, s_{n-L})$ ). Click on the figures to open the interactive version.

Expt 06, Visual, Cell 13, Mean Firing Rate 2.55 (spikes/sec)



Expt06Cell13

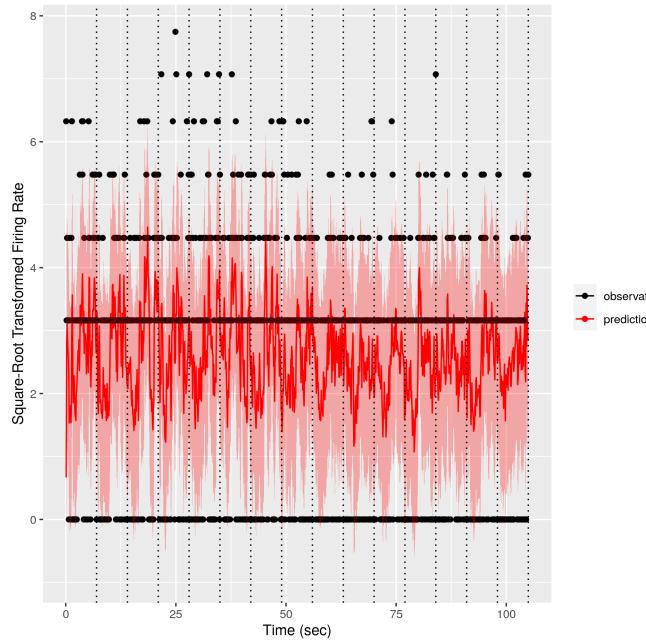
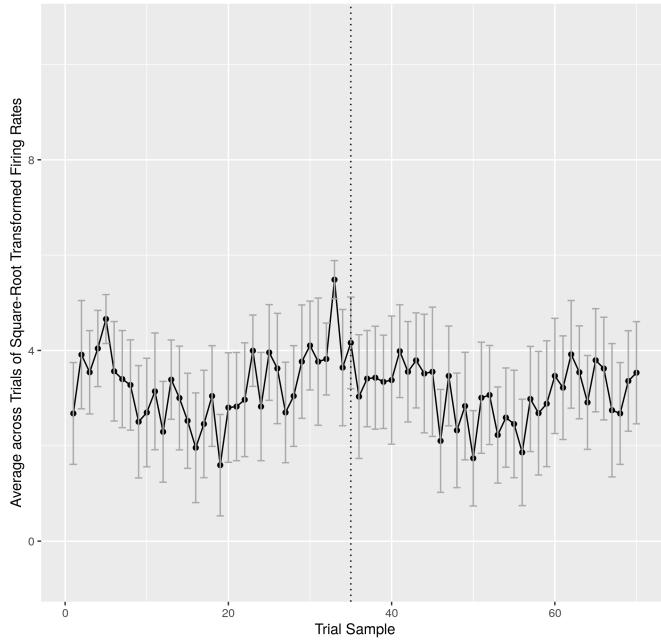


Figure 16: Left: trial-averaged squared-root transformed firing rates. Right: one-step-ahead prediction of cell 13 response (i.e.,  $P(y_n|y_1, \dots, y_{n-1}, s_n, \dots, s_{n-L})$ ). Click on the figures to open the interactive version.

Expt 06, Visual, Cell 14, Mean Firing Rate 3.19 (spikes/sec)



Expt06Cell14

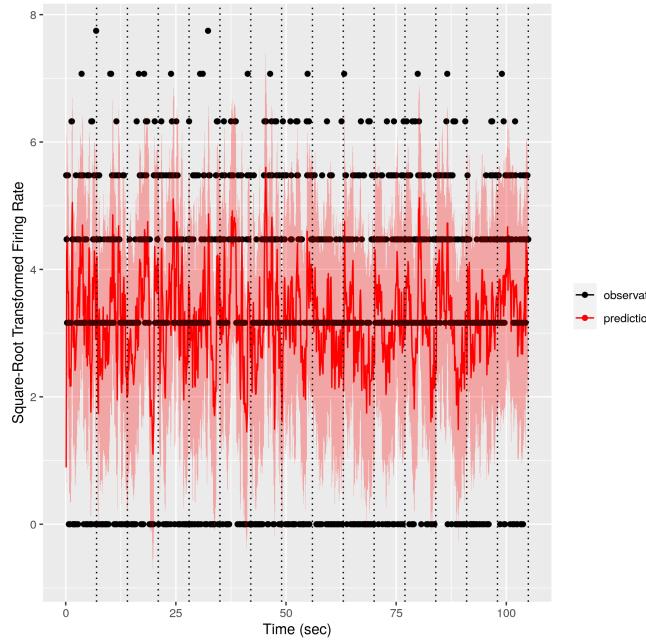
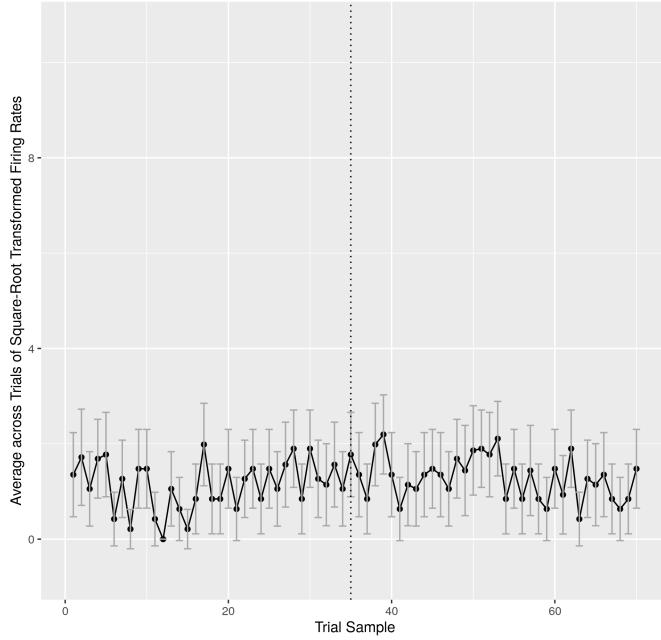


Figure 17: Left: trial-averaged squared-root transformed firing rates. Right: one-step-ahead prediction of cell 14 response (i.e.,  $P(y_n|y_1, \dots, y_{n-1}, s_n, \dots, s_{n-L})$ ). Click on the figures to open the interactive version.

Expt 06, Visual, Cell 15, Mean Firing Rate 1.22 (spikes/sec)



Expt06Cell15

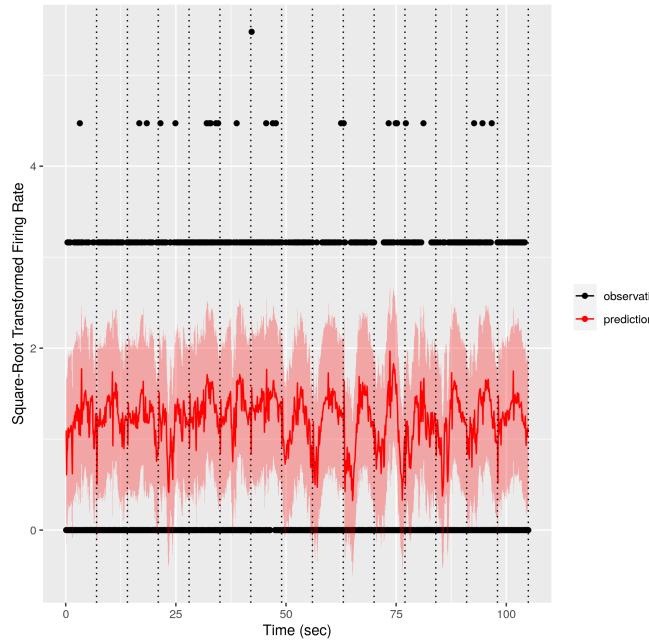
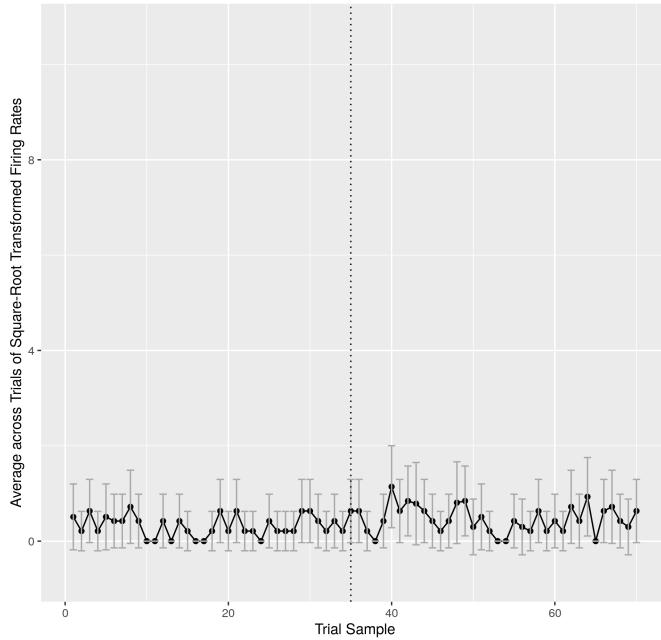


Figure 18: Left: trial-averaged squared-root transformed firing rates. Right: one-step-ahead prediction of cell 15 response (i.e.,  $P(y_n|y_1, \dots, y_{n-1}, s_n, \dots, s_{n-L})$ ). Click on the figures to open the interactive version.

Expt 06, Visual, Cell 16, Mean Firing Rate 0.39 (spikes/sec)



Expt06Cell16

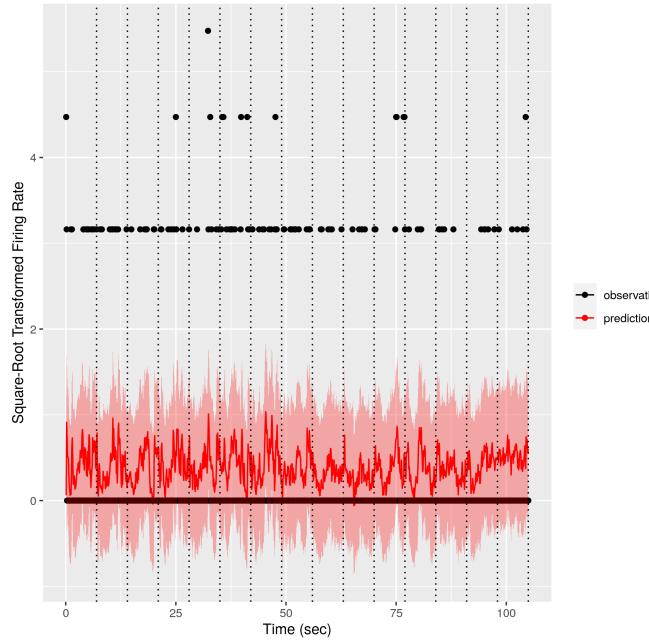


Figure 19: Left: trial-averaged squared-root transformed firing rates. Right: one-step-ahead prediction of cell 16 response (i.e.,  $P(y_n|y_1, \dots, y_{n-1}, s_n, \dots, s_{n-L})$ ). Click on the figures to open the interactive version.

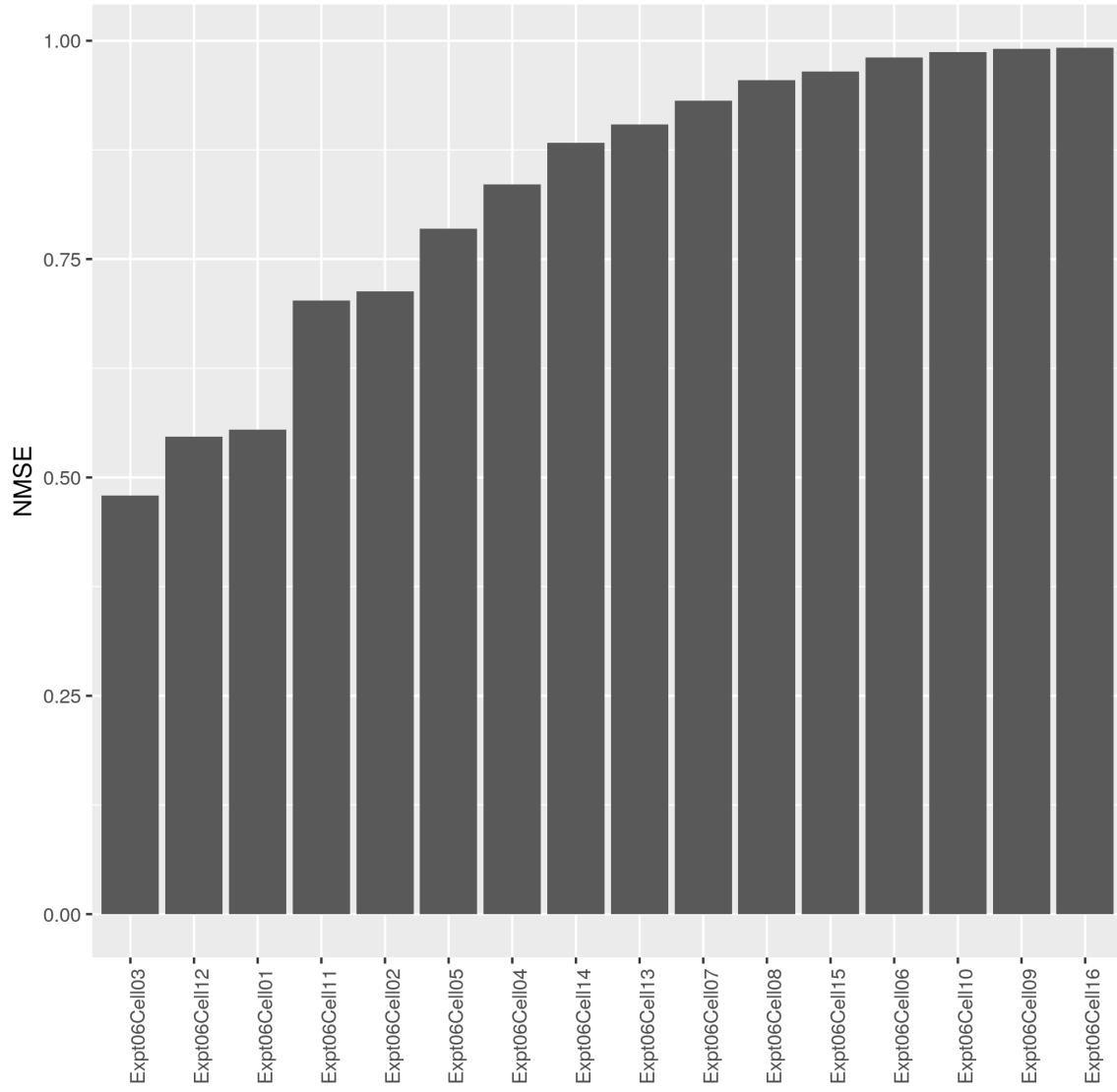


Figure 20: Normalized MSE of predictions. Click on the figure to open the interactive version.

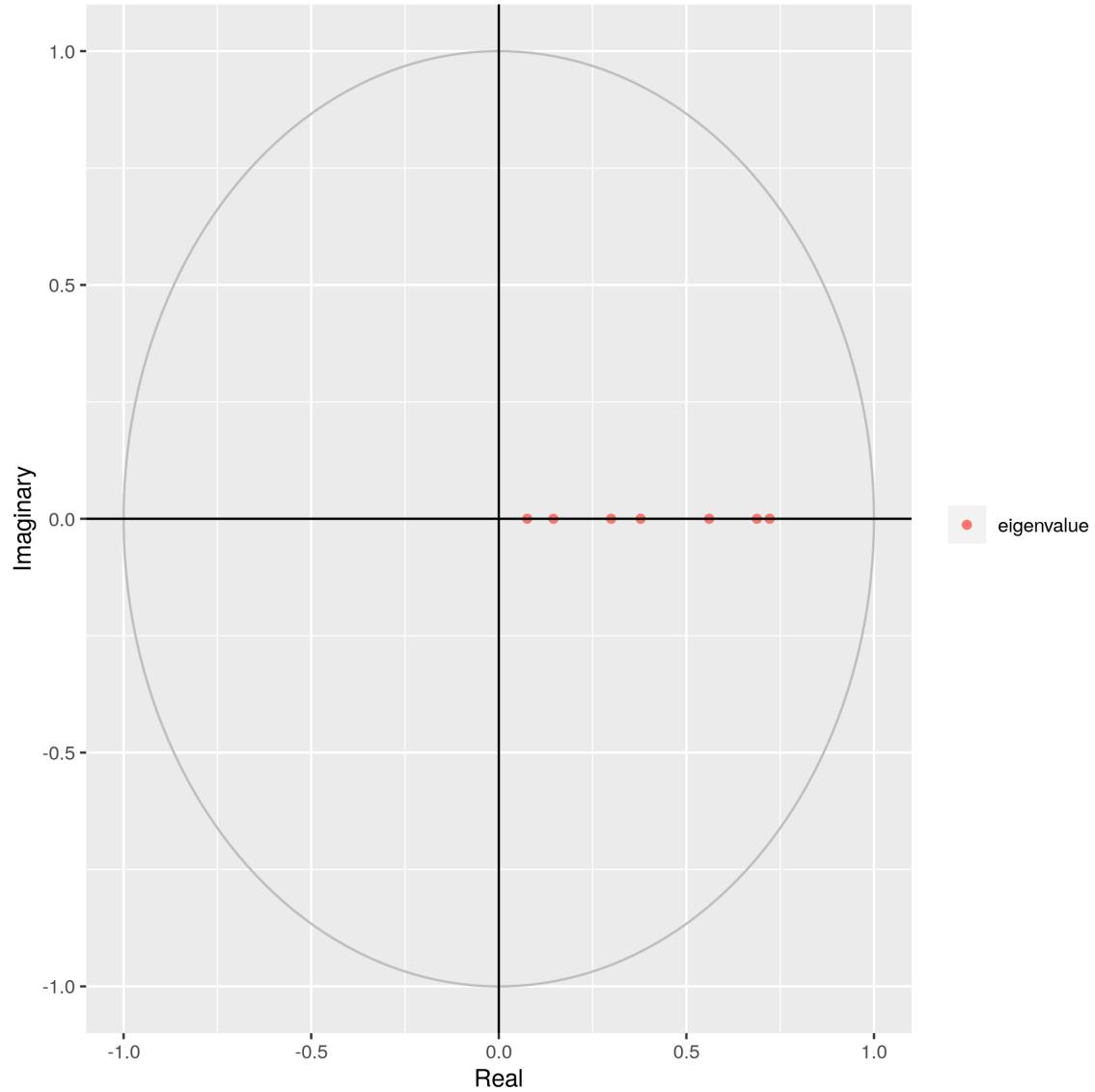


Figure 21: Eigenvalues of the state transition matrix  $B$ . Click on the figure to open the interactive version.

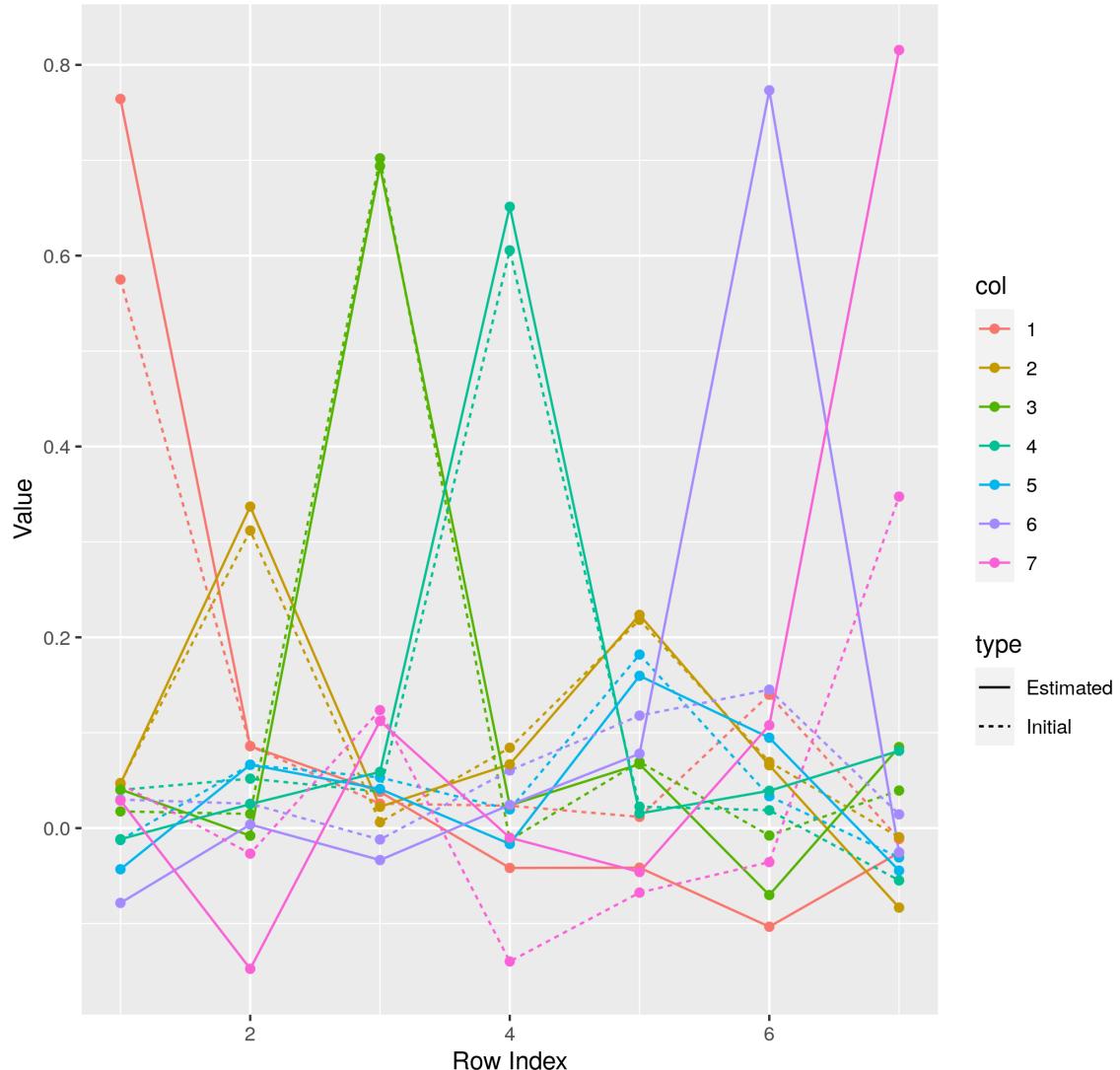


Figure 22: Columns of the state transition matrix B. Click on the figure to open the interactive version.

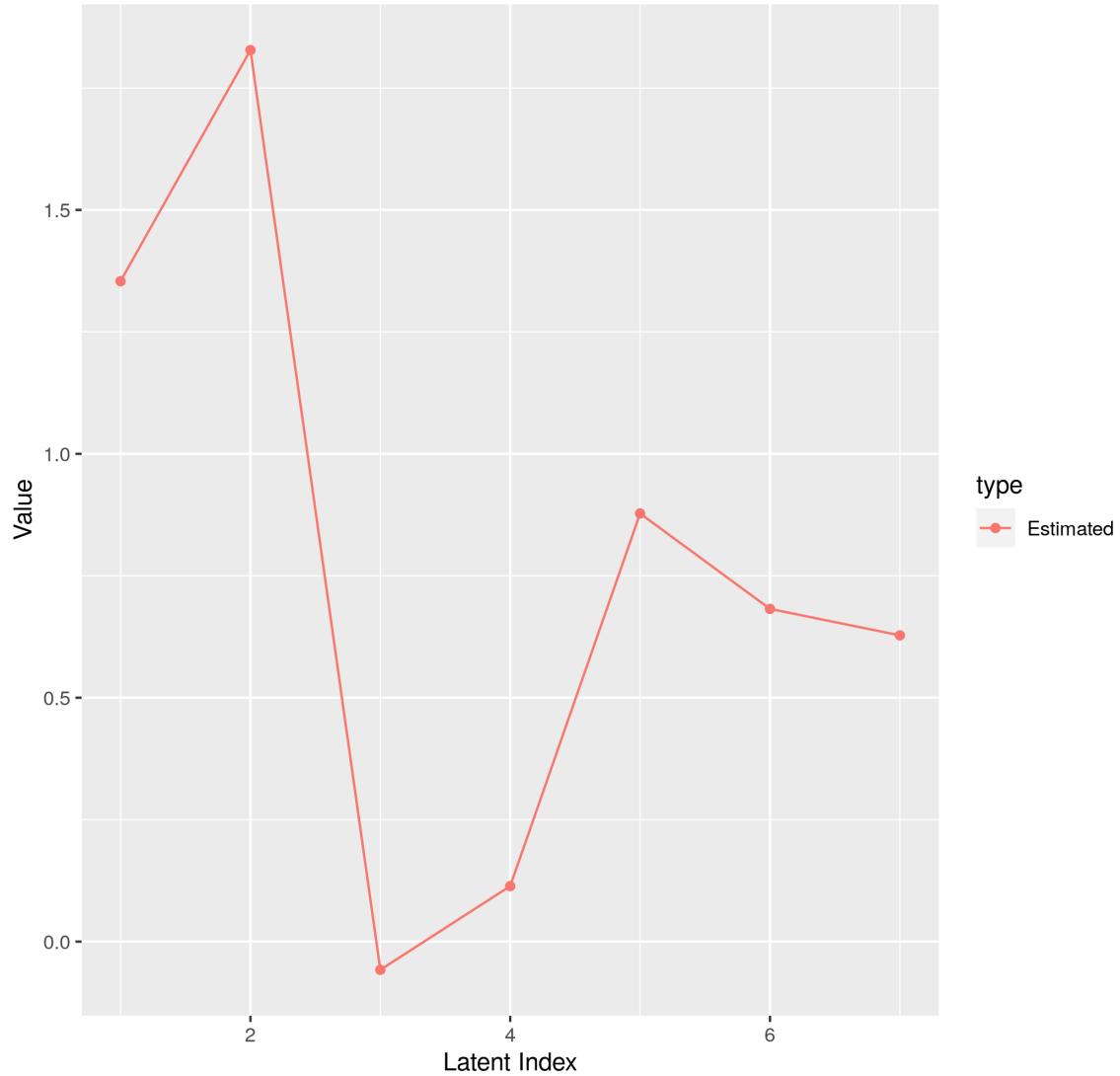


Figure 23: State drift vector  $u$ . Click on the figure to open the interactive version.

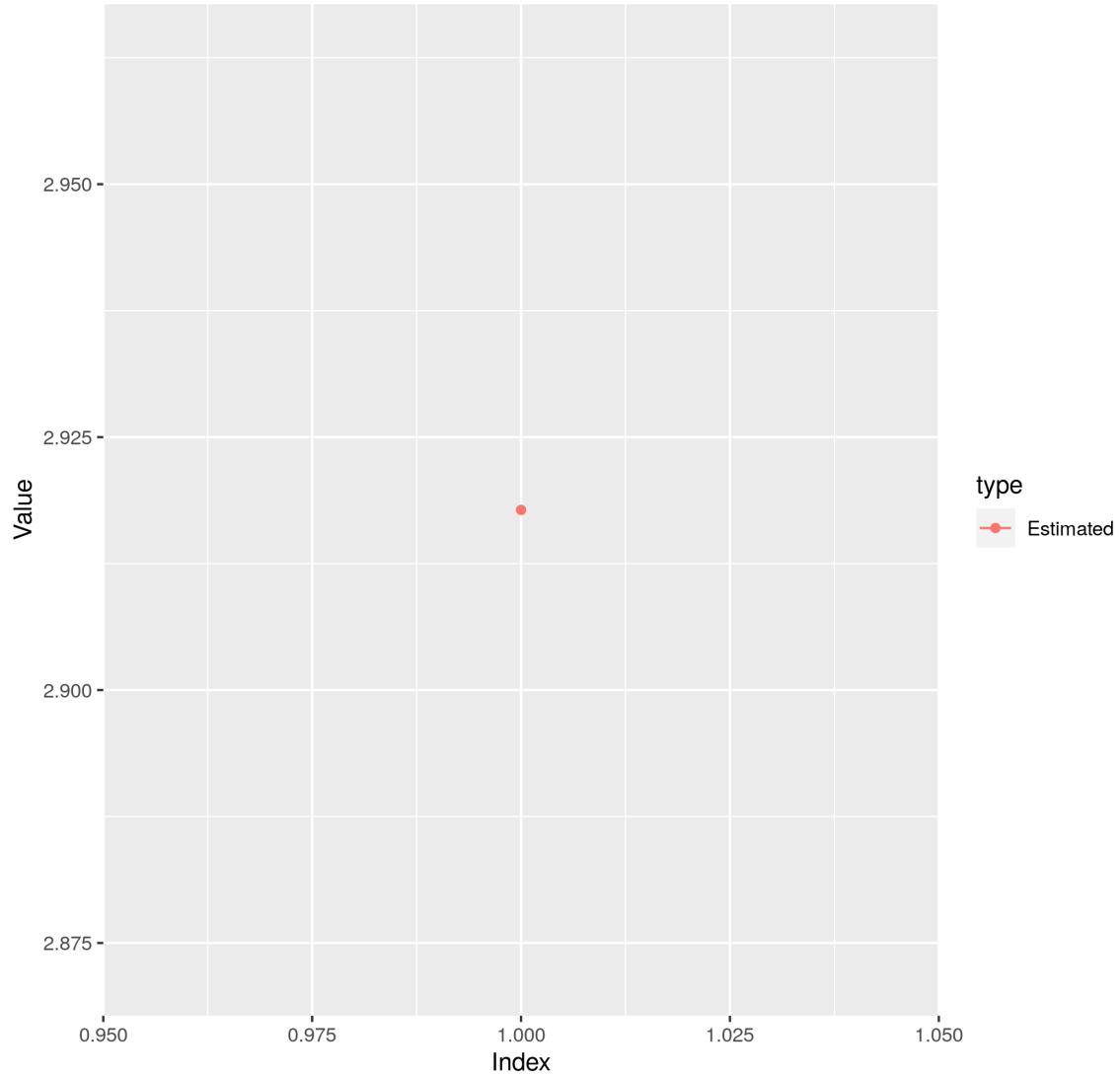


Figure 24: State noise variance. Click on the figure to open the interactive version.

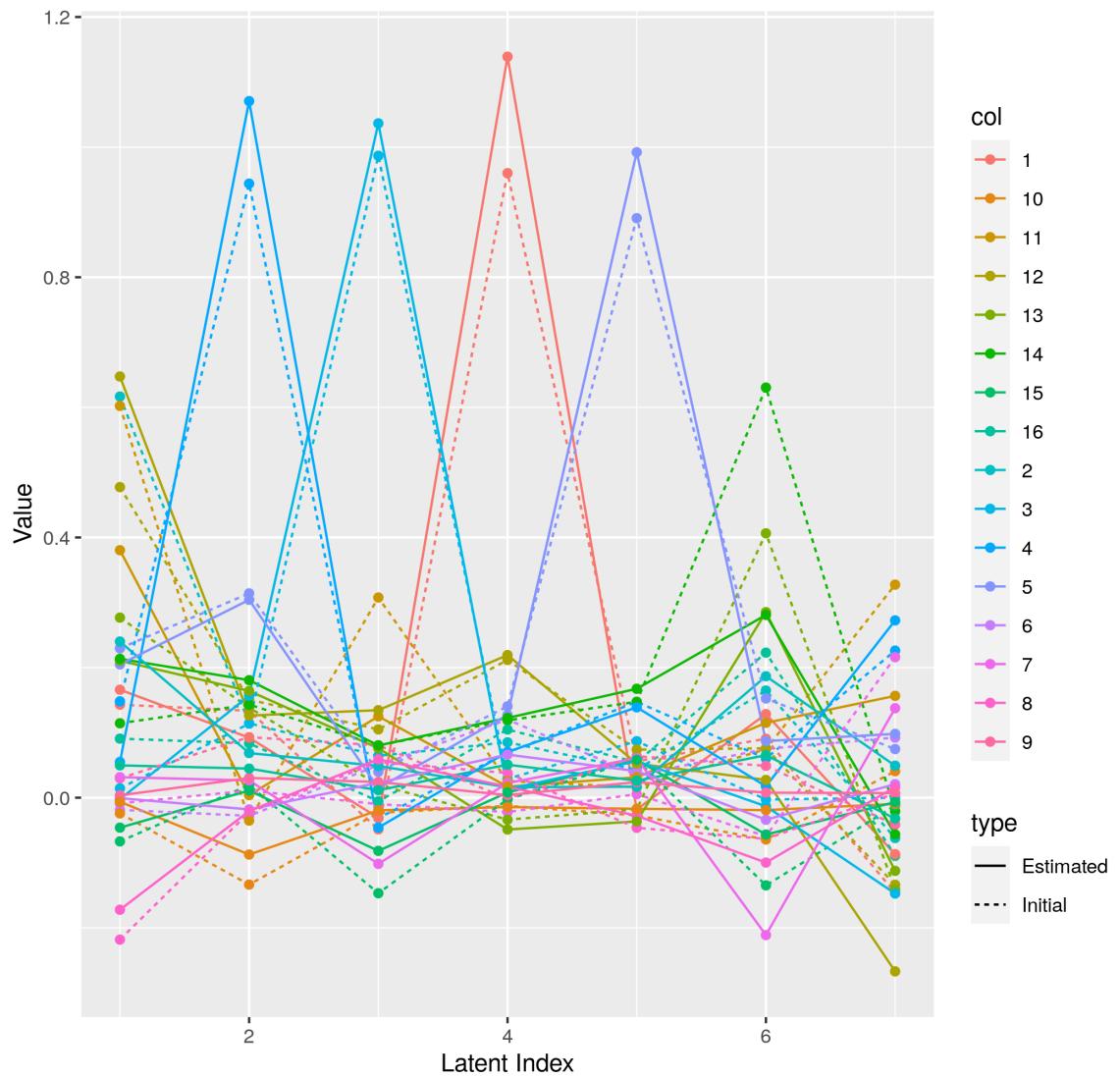


Figure 25: Columns of the observation matrix  $Z$ . Click on the figure to open the interactive version.

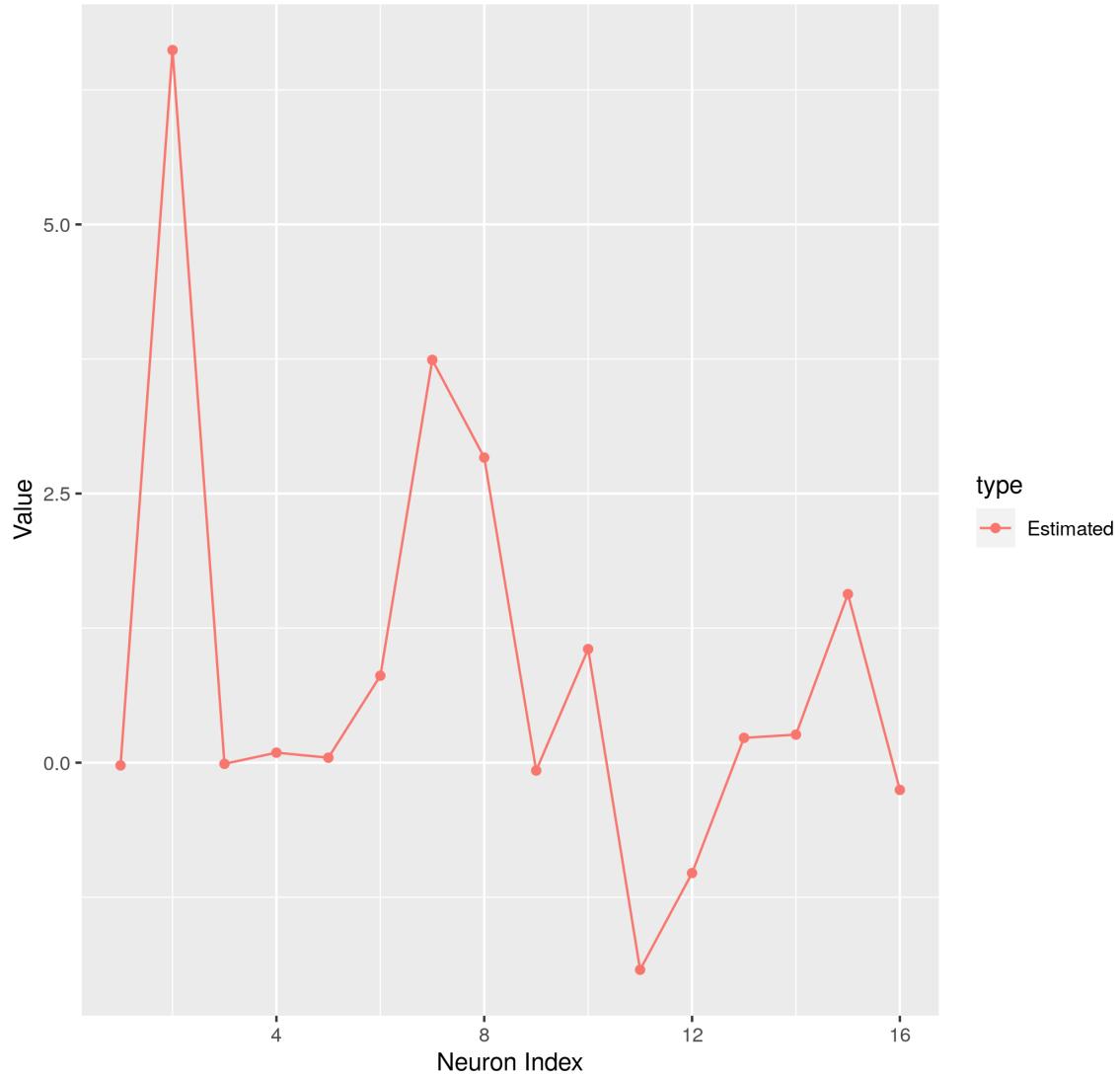


Figure 26: Observation constant term a. Click on the figure to open the interactive version.

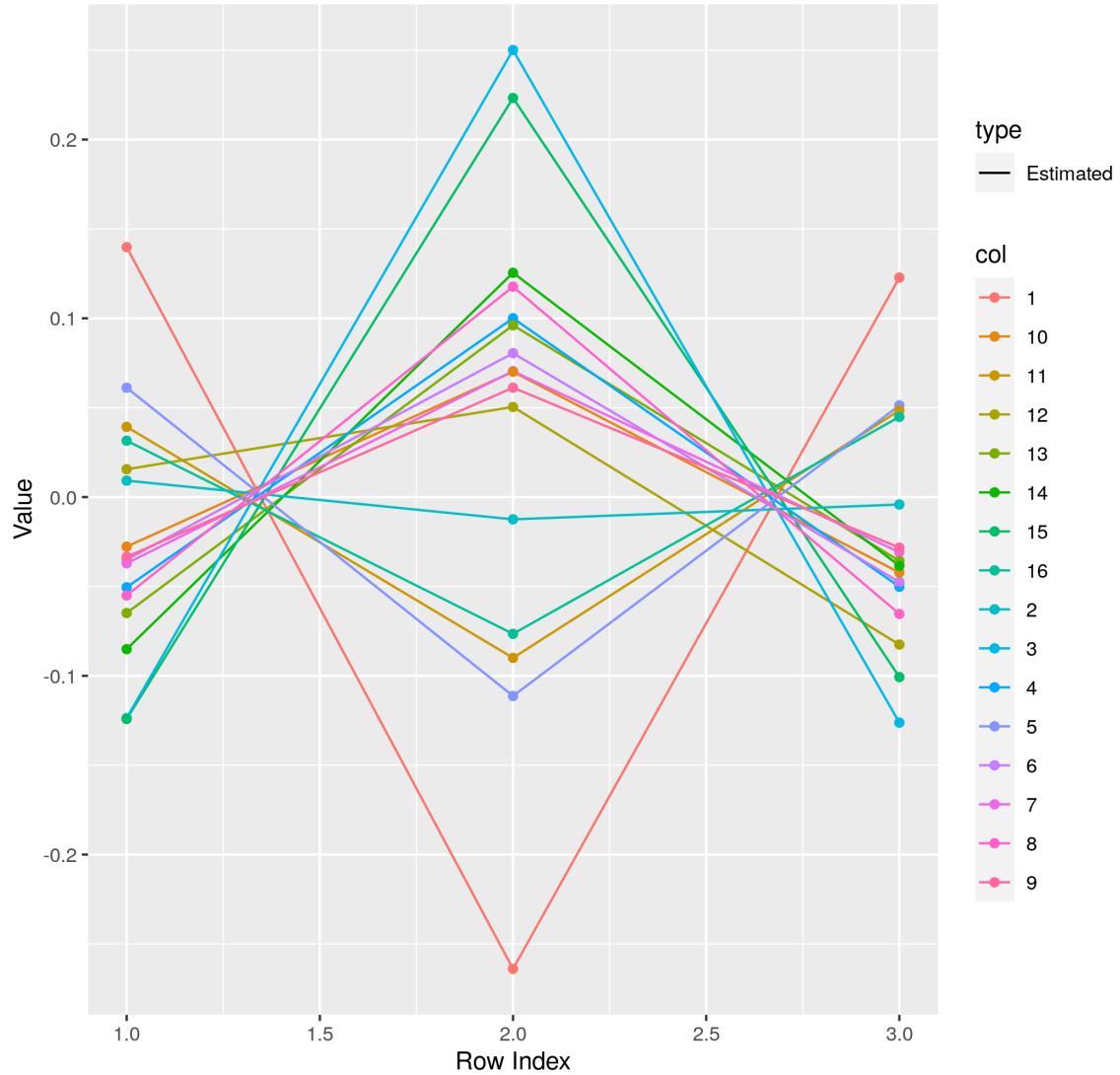


Figure 27: Rows of the observation input matrix D. Click on the figure to open the interactive version.

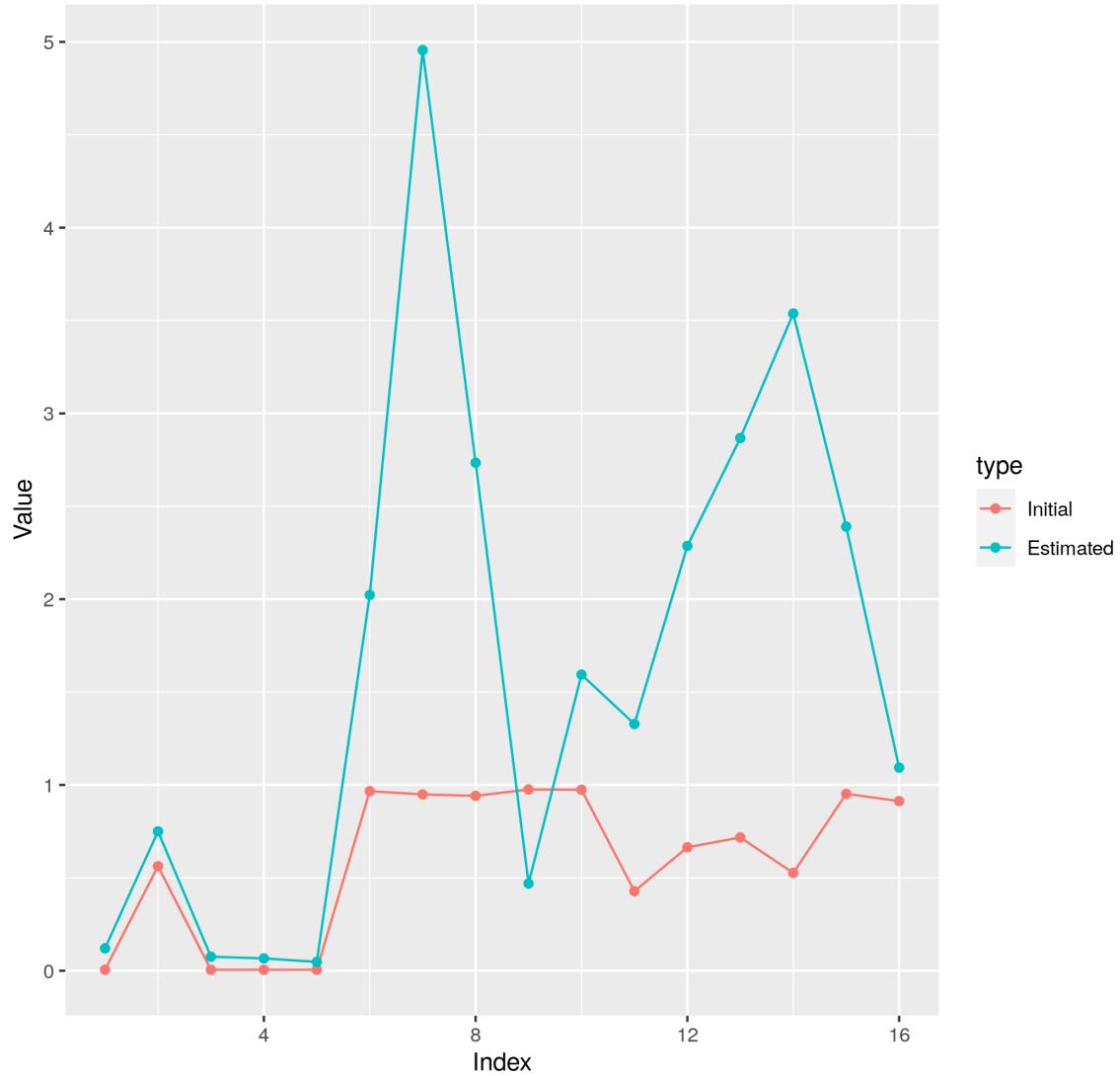


Figure 28: Diagonal of the diagonal observations covariance matrix.