# S3 Appendix: Varying the variance of $r_t$ in simulation 2.

In simulation 2, the variance of the fluctuating covariance ($\sigma_r$) in the main text was set to 0.1. Simulation 2 was run with $\sigma_r$ set to 0.08 and 0.12 as well. S3 Appendix, Figures AB show the posterior distributions of $\beta$ for each TVC method (same as Fig. 6 in the main text). The evaluation of model fit is displayed in S3 Appendix, Table A-F.

Overall the results are similar to those in Fig. 6 in the main text. Here we can see that changing $\sigma_r$ effects the magnitude of $\beta$ but does not effect how the different methods perform. The reason for the magnitude of $\beta$ increasing as $\sigma_r$ increases is because $r_t$ is varying more. This decreases the uncertainty of identifying $r_t$ since the time series covariance is drawn from distributions where $r_t$ is a parameter. If $r_t$ varies more, it entails that draws from distributions with different $r_t$ values are more dissimilar.

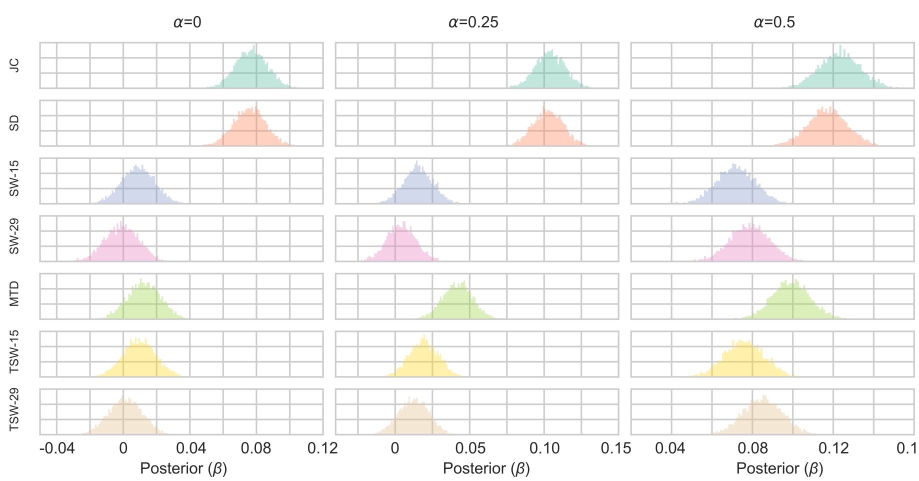


Figure A: Posterior distributions of the $\beta$ parameter of the Bayesian linear regression models in Simulation 2. The figure shows the results for varying values of the autocorrelation parameter ($\alpha$) where the variance of the fluctuating covariance ($\sigma_r$) is equal to 0.08. Compliments Fig. 6 in main text.

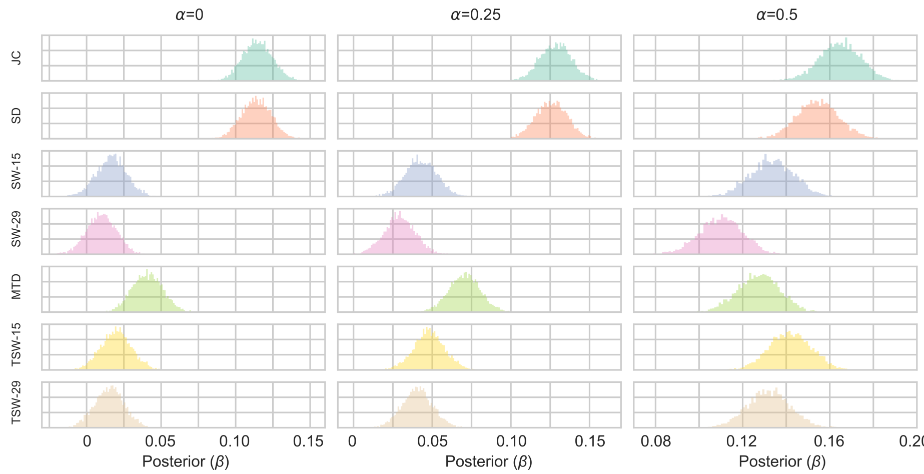


Figure B: Posterior distributions of the $\beta$ parameter of the Bayesian linear regression models in Simulation 2. The figure shows the results for varying values of the autocorrelation parameter ($\alpha$) where the variance of the fluctuating covariance ($\sigma_r$) is equal to 0.12. Compliments Fig. 6 in main text.

Table A: Results of Simulation 2 where $\alpha = 0.0$ and $\sigma_{r_t} = 0.08$. Tables shows WAIC, WAIC standard error, and difference in WAIC from the best performing method. A lower WAIC indicates a better fit.

| Model | WAIC | WAIC SE | $\Delta$ WAIC |
|---|---|---|---|
| JC | 28244.9 | 142.892 | 0 |
| SD | 28247 | 142.899 | 2.01576 |
| MTD | 28302.7 | 143.018 | 57.7415 |
| TSW-15 | 28303.4 | 142.98 | 58.4582 |
| SW-15 | 28303.5 | 142.974 | 58.5909 |
| TSW-29 | 28304.4 | 143.02 | 59.4662 |
| SW-29 | 28304.6 | 143.003 | 59.6281 |

Table B: Results of Simulation 2 where $\alpha = 0.0$ and $\sigma_{r_t} = 0.12$. Tables shows WAIC, WAIC standard error, and difference in WAIC from the best performing method. A lower WAIC indicates a better fit.

| Model | WAIC | WAIC SE | $\Delta$ WAIC |
|---|---|---|---|
| JC | 28172 | 141.092 | 0 |
| SD | 28174.2 | 141.028 | 2.25273 |
| MTD | 28287.7 | 141.207 | 115.766 |
| TSW-15 | 28300.5 | 141.157 | 128.541 |
| SW-15 | 28301.5 | 141.104 | 129.497 |
| TSW-29 | 28302.1 | 141.132 | 130.127 |
| SW-29 | 28303.5 | 141.212 | 131.521 |

Table C: Results of Simulation 2 where $\alpha = 0.25$ and $\sigma_{r_t} = 0.08$. Tables shows WAIC, WAIC standard error, and difference in WAIC from the best performing method. A lower WAIC indicates a better fit.

| Model | WAIC | WAIC SE | $\Delta$ WAIC |
|---|---|---|---|
| JC | 28195.6 | 141.754 | 0 |
| SD | 28198.5 | 141.853 | 2.92245 |
| MTD | 28286.7 | 141.931 | 91.1147 |
| TSW-15 | 28300.7 | 141.838 | 105.12 |
| SW-15 | 28301.9 | 141.795 | 106.334 |
| TSW-29 | 28302.8 | 141.82 | 107.248 |
| SW-29 | 28304.1 | 141.771 | 108.562 |

Table D: Results of Simulation 2 where $\alpha = 0.25$ and $\sigma_{r_t} = 0.12$. Tables shows WAIC, WAIC standard error, and difference in WAIC from the best performing method. A lower WAIC indicates a better fit.

| Model | WAIC | WAIC SE | $\Delta$ WAIC |
|---|---|---|---|
| JC | 28138.9 | 141.114 | 0 |
| SD | 28145.3 | 140.982 | 6.37803 |
| MTD | 28254.4 | 140.782 | 115.542 |
| TSW-15 | 28281.1 | 140.996 | 142.241 |
| SW-15 | 28285.9 | 141.052 | 147.029 |
| TSW-29 | 28287.8 | 141.055 | 148.901 |
| SW-29 | 28295.7 | 141.116 | 156.845 |

Table E: Results of Simulation 2 where $\alpha = 0.5$ and $\sigma_{r_t} = 0.08$. Tables shows WAIC, WAIC standard error, and difference in WAIC from the best performing method. A lower WAIC indicates a better fit.

| Model | WAIC | WAIC SE | $\Delta$ WAIC |
|---|---|---|---|
| JC | 28152 | 139.126 | 0 |
| SD | 28166.1 | 139.043 | 14.0644 |
| MTD | 28205.9 | 139.032 | 53.8909 |
| TSW-29 | 28231.8 | 139.104 | 79.7723 |
| SW-29 | 28242 | 138.986 | 90.0124 |
| TSW-15 | 28246.3 | 139.075 | 94.3044 |
| SW-15 | 28252.6 | 139.01 | 100.576 |

Table F: Results of Simulation 2 where $\alpha = 0.5$ and $\sigma_{r_t} = 0.12$. Tables shows WAIC, WAIC standard error, and difference in WAIC from the best performing method. A lower WAIC indicates a better fit.

| Model | WAIC | WAIC SE | $\Delta$ WAIC |
|---|---:|---:|---:|
| JC | 28029.7 | 142.163 | 0 |
| SD | 28063.2 | 142.201 | 33.5364 |
| TSW-15 | 28101 | 142.122 | 71.2716 |
| SW-15 | 28124.7 | 142.106 | 94.9784 |
| TSW-29 | 28128.8 | 142.219 | 99.1359 |
| MTD | 28140.9 | 142.147 | 111.182 |
| SW-29 | 28183 | 142.237 | 153.295 |