Supplementary Material

Airbnb Data Analysis

Model Specification

We model each component with its own intercept and use Fourier terms for our seasonal variables, pairs of $\left(\sin \frac{2k\pi t}{w_{\text{season}}}, \cos \frac{2k\pi t}{w_{\text{season}}}\right)$ for $k = 1, \ldots, K_{\text{season}} \leq \frac{w_{\text{season}}}{2}$ where we take $w_{\text{season}} = w_{\text{year}} = 12$ for yearly seasonality and $K_{\text{year}} = 5$. Our scale parameter ϕ_t is modeled with the same seasonal variables as well as an intercept.

Priors

The prior distributions of our B-DAR(1) are:

$$\begin{aligned} A_{1,ij} &\sim \mathcal{N}(0,1), \quad \text{for all } i,j, \\ \beta_k &\sim \mathcal{N}(0,1), \quad \text{for Fourier terms}, \\ \beta_{\text{intercept}} &\sim \mathcal{N}(0,2^2), \\ \gamma_{\text{intercept}} &\sim \mathcal{N}(0,2^2) \\ \gamma_k &\sim \mathcal{N}(0,1) \quad \text{for Fourier terms} \end{aligned}$$

The B-DAR(1) model is fit with STAN using the R interface where we run 4 chains with 2000 iterations each with a warm up of 1000 iterations for a total of 4000 posterior samples. Initial values are selected randomly from the interval $[-1, 1]$.