Statcast Study

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Story

- New Statcast system records the exit velocity (mph) of each batted ball
- Collect the exit velocities of batted balls for all "regular" players during 2017 season
- Interested in how they hit ahead in the (pitch) count and behind the count

Model

- Let y_{ij} denote the jth exit velocity for the ith player
- Let $x_{ij} = 1$ if we have a batter's count and $x_{ij} = 0$ otherwise
- Consider varying-intercepts, varying-slopes model

$$y_{ij} \sim N(\mu_{ij}, \sigma)$$

where

$$\mu_{ij} = \alpha_{j[i]} + \beta_{j[i]} x_{ij}$$

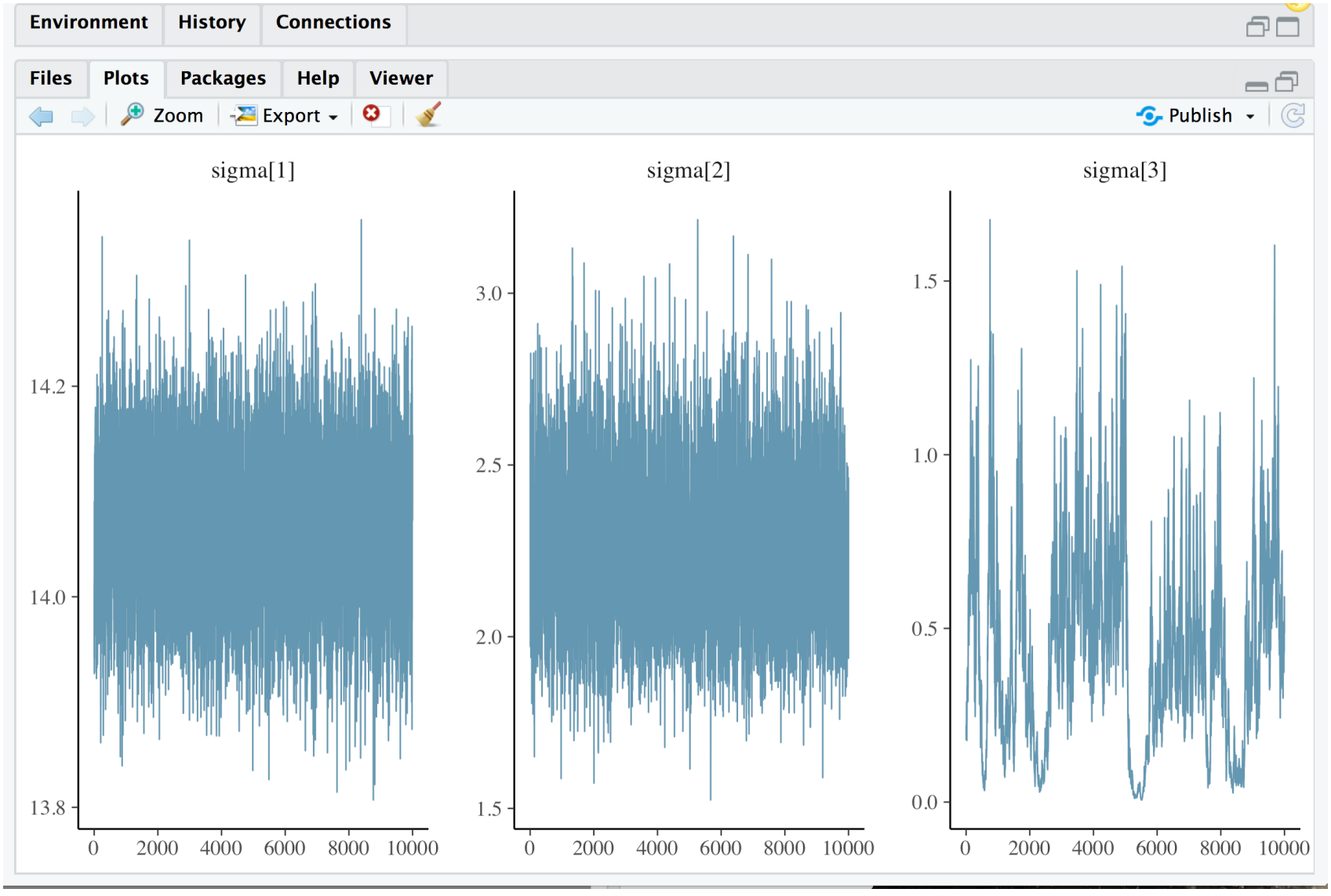
where

$$\alpha_j \sim N(\mu_\alpha, \sigma_\alpha), \beta_j \sim N(\mu_\beta, \sigma_\beta)$$

JAGS script

```
modelString = "
model {
for(i in 1:N){
mu.y[i] <- alpha[j[i]]  + beta[j[i]] * x [i]
y[i] ~ dnorm(mu.y[i], tau[1])
}
for (p in 1:J){
alpha[p] ~ dnorm(mu.alpha, tau[2])
beta[p] ~ dnorm(mu.beta, tau[3])
}
mu.alpha ~ dnorm(0, .0001)
mu.beta ~ dnorm(0, .0001)
for(p in 1:3){
tau[p] <- pow(sigma[p], -2)
sigma[p] ~ dunif(0, 100)
}
}
"
```

Traceplots of random effects sds



Posterior estimates at random effects sds

```
                  Mean             SD       Naive SE
sigma[1] 14.0646960 0.07147698 0.0007147698
sigma[2]  2.2578289 0.21042994 0.0021042994
sigma[3]  0.4381792 0.27899597 0.0027899597
         Time-series SE
sigma[1]    0.000845912
sigma[2]    0.003106246
sigma[3]    0.036697126
```

Scatterplot of regression estimates