Bayesian Project Proposal

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Fantasy sports are a popular form of sports gambling where participants select professional athletes from a particular sports league and earn fictitious points from a pre-determined scoring system. The game can take numerous forms, of varying strategic involvement. The 'Lock-in' format (created by the app Sleeper) involving NBA basketball players is particularly interesting. In this format, athletes play in- and therefore earn points in- multiple games each week, but participants may only select one game to contribute to the participant's total score each week. After each game, the participant must "lock" the athlete's score or hope the athlete will perform better in a later game that week.

We model the performance of an athlete for a particular game i as follows:

$$y_i \sim N(\theta_i, \sigma^2)$$

where θ_i can be interpreted as the athlete's *expected performance* for a game and has the prior

$$\theta_i \sim N(\mu_i, \sigma_\theta^2)$$

We derive μ_i from Sleeper's expected points model, and interpret σ_θ^2 as measuring the *accuracy* of Sleeper's expected points. We give σ_θ^2 Jeffrey's non-informative prior

$$p(\sigma_\theta^2) \propto \frac{1}{\sigma_\theta^2}$$

σ^2 is arguably the most important parameter in our model, and represents the player's *consistency*. It has the prior

$$\sigma^2 \sim \text{IG}(\alpha_\sigma, \beta_\sigma)$$

We derive α_σ and β_σ from data from the athlete's previous season.

It is likely that we will add another tier to our hierarchical model to account for the athlete's potential to miss future games. Our ultimate goal is to identify the probability that an athlete will exceed his score in the week's remaining games and to incorporate decision theory to estimate a decision boundary for the participant. If this model progresses, we hope to expand this decision boundary to include multiple players.