

SGupta_HW03Q2

The Major League Baseball player Reggie Jackson, known as “Mr. October” for his outstanding performances in the World Series played 2,820 regular-season games during his career, hitting a total of 563 home runs. Additionally, he played in 27 World Series games and hit 10 home runs during those games.

Prior part of this question is uploaded separately as scanned copy

```
# Regular season data:
n_reg <- 2820
y_reg <- 563
alpha_reg <- y_reg + 1
beta_reg <- n_reg - y_reg + 1

# World Series data:
n_world <- 27
y_world <- 10
alpha_world <- y_world + 1
beta_world <- n_world - y_world + 1

# Posterior summaries:
mean_reg <- alpha_reg / (alpha_reg + beta_reg)
mean_world <- alpha_world / (alpha_world + beta_world)
ci_reg <- qbeta(c(0.025, 0.975), alpha_reg, beta_reg)
ci_world <- qbeta(c(0.025, 0.975), alpha_world, beta_world)

print(" Regular Season Posterior for home run rate: ")
```

```
[1] " Regular Season Posterior for home run rate: "
```

```
print(paste(" Posterior ~ Beta(", alpha_reg, ",", beta_reg, ")", sep = ""))
```

```
[1] " Posterior ~ Beta(564,2258)"
```

```
print(paste(" Mean =", round(mean_reg, 3)))
```

```
[1] " Mean = 0.2"
```

```
print(paste(" 95% Credible Interval = [", round(ci_reg[1], 3), ",", round(ci_reg[2], 3), "]")
```

```
[1] " 95% Credible Interval = [ 0.185 , 0.215 ]"
```

```
print(" World Series Posterior for home run rate: ")
```

```
[1] " World Series Posterior for home run rate: "
```

```
print(paste(" Posterior ~ Beta(", alpha_world, ",", beta_world, ")", sep = ""))
```

```
[1] " Posterior ~ Beta(11,18)"
```

```
print(paste(" Mean =", round(mean_world, 3) ))
```

```
[1] " Mean = 0.379"
```

```
print(paste(" 95% Credible Interval = [", round(ci_world[1], 3), ",", round(ci_world[2], 3), "]")
```

```
[1] " 95% Credible Interval = [ 0.215 , 0.559 ]"
```

```
# Monte Carlo comparison: Compute the probability that theta_world_Series > theta_regular_gam
set.seed(123)
```

```
Nsimulation <- 100000
```

```
theta_reg_simulation <- rbeta(Nsimulation, alpha_reg, beta_reg)
```

```
theta_worldseries_simulation <- rbeta(Nsimulation, alpha_world, beta_world)
```

```
probability <- mean(theta_worldseries_simulation > theta_reg_simulation)
```

```
print(paste("Posterior probability that World Series rate > Regular season rate:",
  round(probability, 4)))
```

```
[1] "Posterior probability that World Series rate > Regular season rate: 0.9845"
```

Regular Season Posterior is Beta(564,2258), mean 0.200 and 95% CI is (0.185, 0.215)

World Series Posterior Beta(11,18), mean 0.379 and 95% CI (0.215, 0.559)

Monte Carlo Probability 0.9845

So basically if we start with a flat (uninformative) prior, the analysis shows that Reggie regular season home run rate is about 20% and that estimate is pretty tight. But in the World Series, his rate jumps to around 38%. Overall there is about a 98.45% chance that his World Series rate is higher than his regular-season rate, which is really strong evidence that he performs better in October.