

575_HW3

Matthew Stoebe

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```
set.seed(123)
S <- 1000

y_A <- c(12,9,12,14,13,13,15,8,15,6)
sy_A <- sum(y_A); n_A <- length(y_A)

y_B <- c(11,11,10,9,9,8,7,10,6,8,8,9,7)
sy_B <- sum(y_B); n_B <- length(y_B)

#Prior A
a_A <- 120
b_A <- 10

#Prior B
a_B <- 12
b_B <- 1

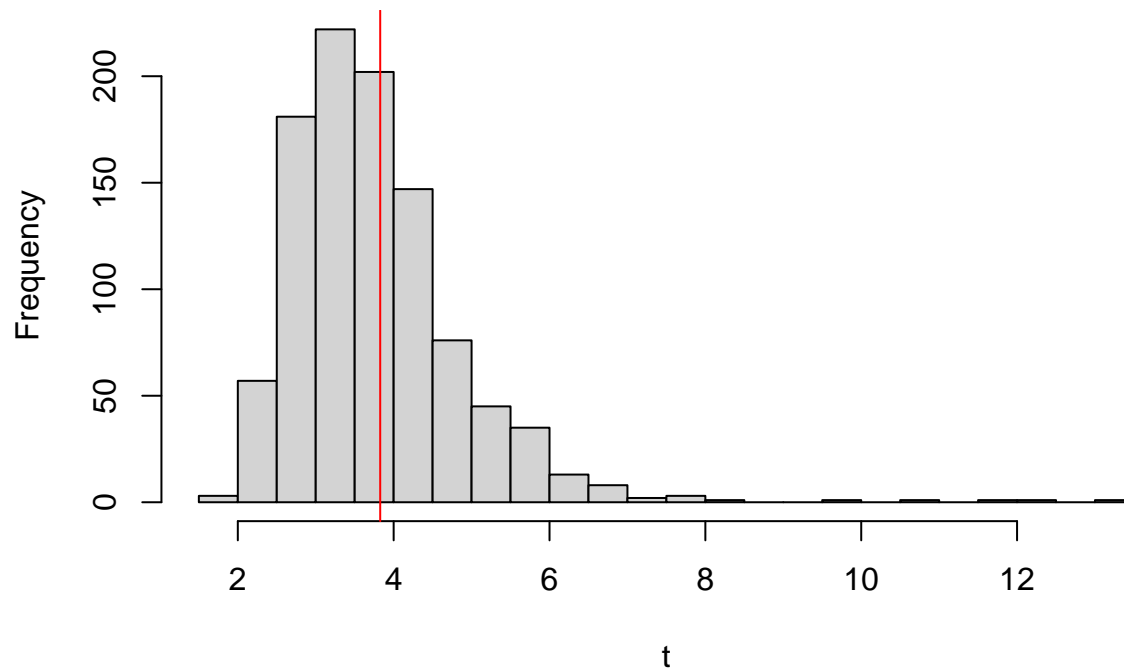
post_a_A <- a_A + sy_A
post_b_A <- n_A + b_A

post_a_B <- a_B + sy_B
post_b_B <- n_B + b_B

# Population A
theta_A <- rgamma(S, post_a_A, post_b_A)
yA_rep <- sapply(theta_A, function(lambda) rpois(n_A, lambda))
t_rep_A <- apply(yA_rep, 2, function(y) mean(y)/sd(y))
t_obs_A <- mean(y_A)/sd(y_A)

hist(t_rep_A, main="Population A: Posterior Predictive t", breaks=30, xlab="t")
abline(v=t_obs_A, col="red")
```

Population A: Posterior Predictive t

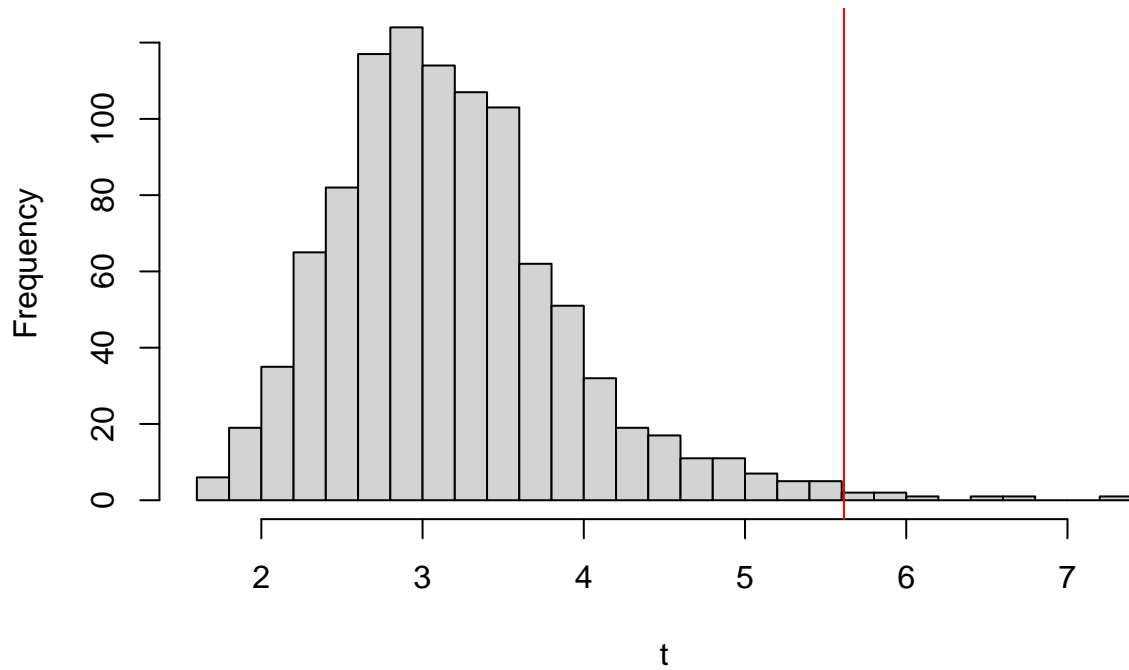


```
p_value_A <- mean(t_rep_A >= t_obs_A)

# Population B
theta_B <- rgamma(S, post_a_B, post_b_B)
yB_rep <- sapply(theta_B, function(lambda) rpois(n_B, lambda))
t_rep_B <- apply(yB_rep, 2, function(y) mean(y)/sd(y))
t_obs_B <- mean(y_B)/sd(y_B)

hist(t_rep_B, main="Population B: Posterior Predictive t", breaks=30, xlab="t")
abline(v=t_obs_B, col="red")
```

Population B: Posterior Predictive t



```
p_value_B <- mean(t_rep_B >= t_obs_B)
```

```
cat("Bayesian p-value (A):", p_value_A, "\nBayesian p-value (B):", p_value_B)
```

```
## Bayesian p-value (A): 0.394
```

```
## Bayesian p-value (B): 0.008
```