

Predictive Distributions

STAT 251, Prior-/Posterior- Predictive Distributions, Part 2

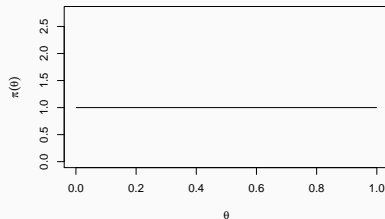
Comparison of Distributions

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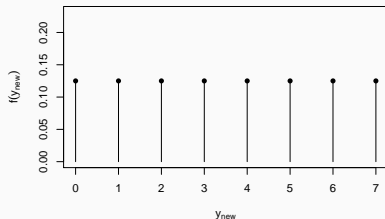
Beta-Binomial Setting: $Y|\theta \sim \text{Binom}(n, \theta)$, $\theta \sim \text{Beta}(a, b)$

Suppose $n_{\text{obs}} = 10$, $y_{\text{obs}} = 4$, $a = 1$, $b = 1$, and $n_{\text{new}} = 7$.

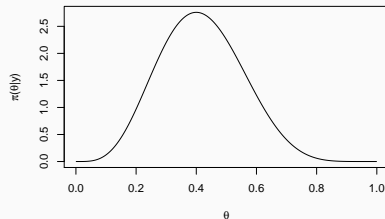
Prior Distribution



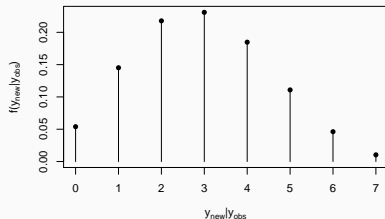
Prior Predictive Distribution



Posterior Distribution



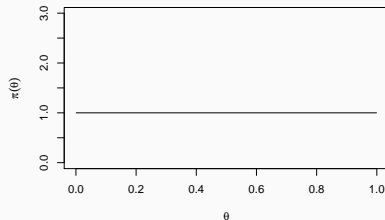
Posterior Predictive Distribution



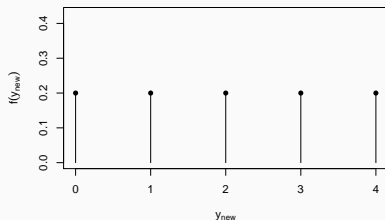
Beta-Binomial Setting: $Y|\theta \sim \text{Binom}(n, \theta)$, $\theta \sim \text{Beta}(a, b)$

Suppose $n_{\text{obs}} = 2$, $y_{\text{obs}} = 0$, $a = 1$, $b = 1$, and $n_{\text{new}} = 4$.

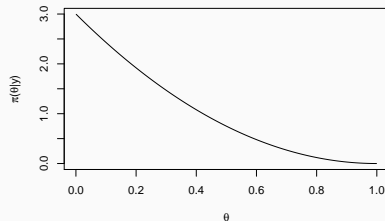
Prior Distribution



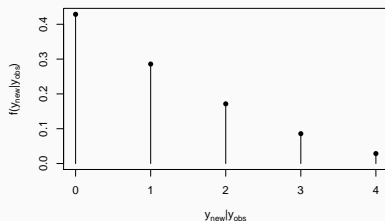
Prior Predictive Distribution



Posterior Distribution



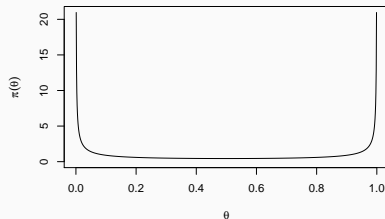
Posterior Predictive Distribution



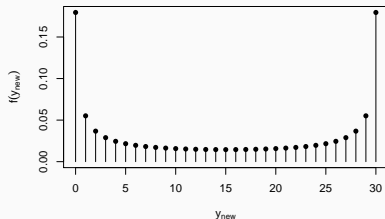
Beta-Binomial Setting: $Y|\theta \sim \text{Binom}(n, \theta)$, $\theta \sim \text{Beta}(a, b)$

Suppose $n_{\text{obs}} = 50$, $y_{\text{obs}} = 12$, $a = .3$, $b = .3$, and $n_{\text{new}} = 30$.

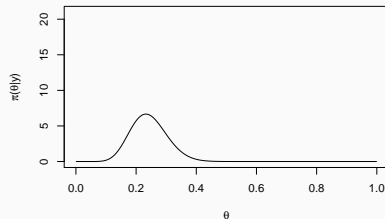
Prior Distribution



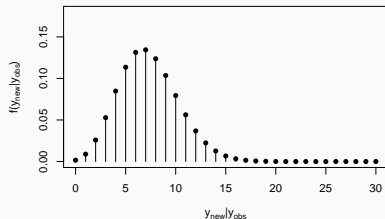
Prior Predictive Distribution



Posterior Distribution



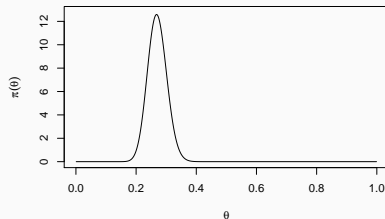
Posterior Predictive Distribution



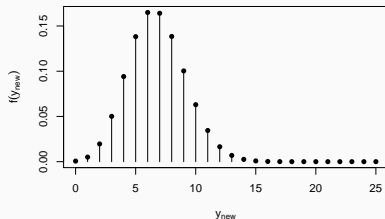
Beta-Binomial Setting: $Y|\theta \sim \text{Binom}(n, \theta)$, $\theta \sim \text{Beta}(a, b)$

Suppose $n_{\text{obs}} = 40$, $y_{\text{obs}} = 32$, $a = 53$, $b = 143$, and $n_{\text{new}} = 25$.

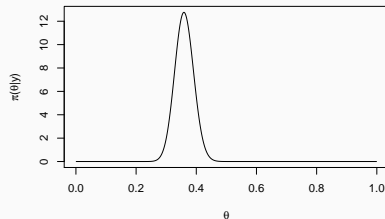
Prior Distribution



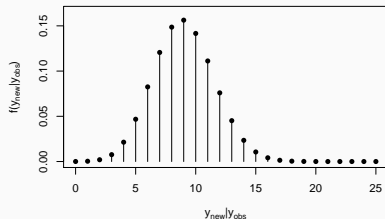
Prior Predictive Distribution



Posterior Distribution



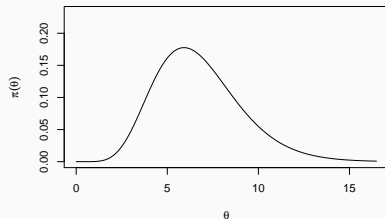
Posterior Predictive Distribution



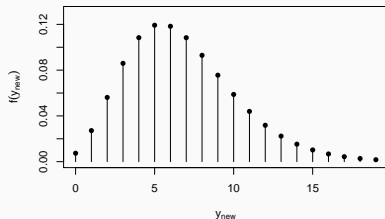
Gamma-Poisson Setting: $Y|\theta \sim \text{Poisson}(\theta)$, $\theta \sim \text{Gamma}(a, b)$

Suppose $y_{\text{obs}} = 7$, $a = 8.1$, $b = 1.2$.

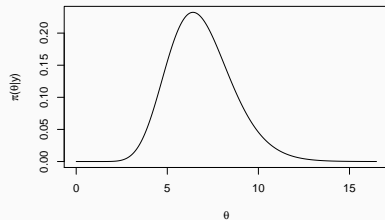
Prior Distribution



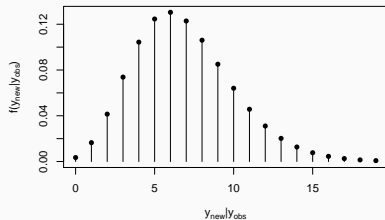
Prior Predictive Distribution



Posterior Distribution



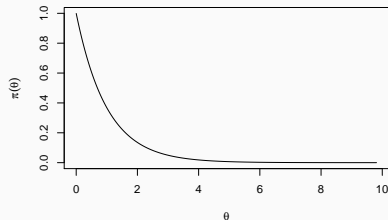
Posterior Predictive Distribution



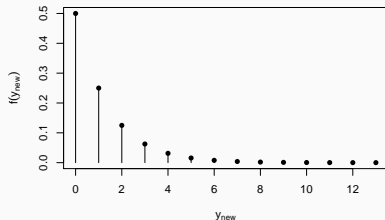
Gamma-Poisson Setting: $Y|\theta \sim \text{Poisson}(\theta)$, $\theta \sim \text{Gamma}(a, b)$

Suppose $y_{\text{obs}} = 7$, $a = 1$, $b = 1$.

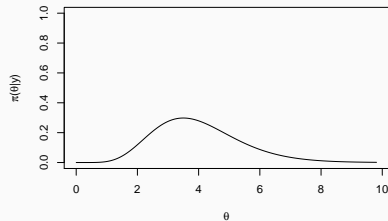
Prior Distribution



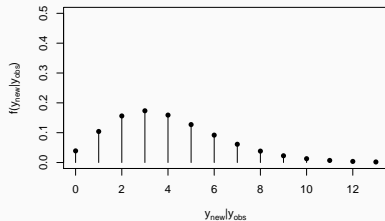
Prior Predictive Distribution



Posterior Distribution



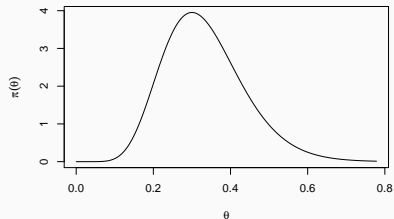
Posterior Predictive Distribution



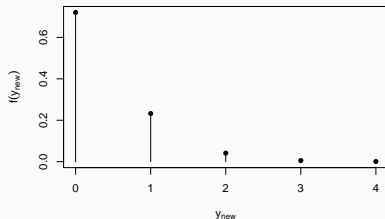
Gamma-Poisson Setting: $Y|\theta \sim \text{Poisson}(\theta)$, $\theta \sim \text{Gamma}(a, b)$

Suppose $y_{\text{obs}} = 1$, $a = 10$, $b = 30$.

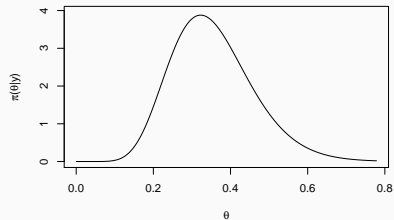
Prior Distribution



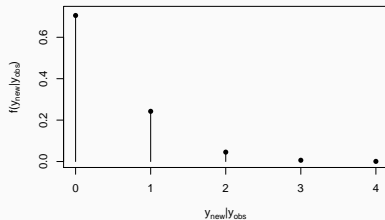
Prior Predictive Distribution



Posterior Distribution



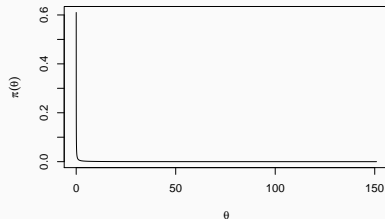
Posterior Predictive Distribution



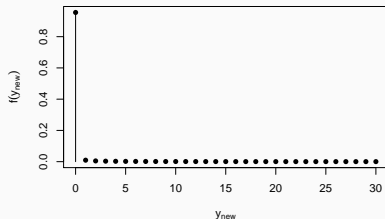
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Suppose $y_{\text{obs}} = 14$, $a = .01$, $b = .01$.

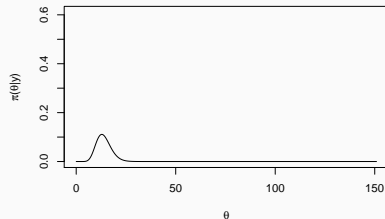
Prior Distribution



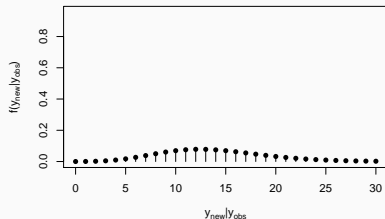
Prior Predictive Distribution



Posterior Distribution



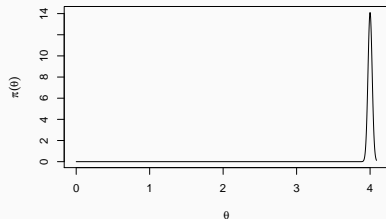
Posterior Predictive Distribution



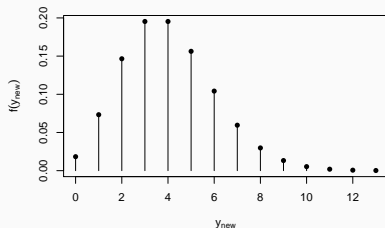
Gamma-Poisson Setting: $Y|\theta \sim \text{Poisson}(\theta)$, $\theta \sim \text{Gamma}(a, b)$

Suppose $y_{\text{obs}} = 3$, $a = 20000$, $b = 5000$.

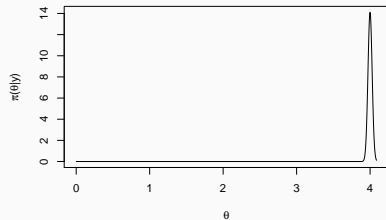
Prior Distribution



Prior Predictive Distribution



Posterior Distribution



Posterior Predictive Distribution

