

'EXPERIMENT' IS PERFORMED n TIMES

PROB. OF SUCCESS IS θ y : # SUCCESSSES.

GIVEN y WHAT DO WE KNOW ABOUT θ ?

$$y \sim \text{BINOMIAL}(n, \theta) \quad \pi(y|\theta) = \text{BINOMIAL}(y; n, \theta)$$

NEW PRIOR: $\theta \sim \text{UNIFORM}(0, 1) \quad \pi(\theta) = 1$

$$\pi(\theta|y) = \frac{\theta^y (1-\theta)^{n-y}}{\int_0^1 \theta^y (1-\theta)^{n-y} d\theta} = \frac{\theta^y (1-\theta)^{n-y}}{\text{Beta}(y+1, n-y+1)} = \text{Beta}(\theta; y+1, n-y+1)$$

$$\text{Beta}(\theta; \alpha, \beta) = \frac{1}{B(\alpha, \beta)} \theta^{\alpha-1} (1-\theta)^{\beta-1}$$

$$\text{Beta}(\theta; y+1, n-y+1) = \frac{1}{B(y+1, n-y+1)} \theta^y (1-\theta)^{n-y}$$