A (Very Brief) Introduction to Ideal Point Estimates

1. Identify a theoretical concept of human behavior of your interest and relate it to a statistical concept.
   - Decision making
   - Nominal Choice
2. Develop behavioral (formal) and statistical analogues
   - Utility maximization
   - Discrete choice modeling (Yea/Nay)
3. Unite the theoretical and statistical analogues in testable theory...

$$U_i(Y_j) = -(x_i - Y_j)^2 + \epsilon_{ijY}$$
$$U_i(N_j) = -(x_i - N_j)^2 + \epsilon_{ijN}$$
$$Pr(y_{ij} = 1) = Pr[U_i(Y_j) > U_i(N_j)] = f(x_i\beta_j - \alpha_j)$$

where:

$$\beta_j = 2(Y_j - N_j)$$
$$\alpha_j = Y_j^2 - N_j^2$$
$$\alpha_j/\beta_j = \frac{Y_j + N_j}{2}$$

Ideal Point Estimates

Ideal points estimates vary in assumptions about the deterministic and stochastic parameters

Quadratic loss

$$f(x_i, Y_j) - (x_i, N_j) = -(x_i - Y_j) + (x_i - N_j)^2 = x_i\beta_j - \alpha_j$$

Nominate

$$f(x_i, Y_j) - (x_i, N_j) = \beta[exp(-\frac{1}{2}(x_i - Y_j)^2) - exp(-\frac{1}{2}(x_i - N_j)^2)]$$

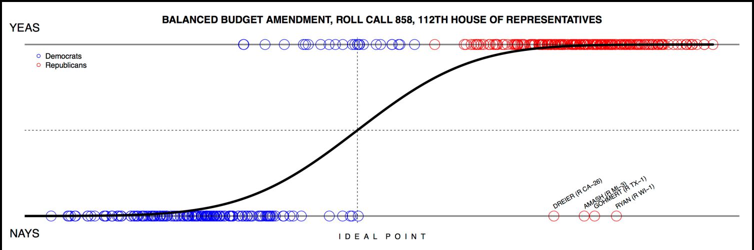
Parameter Identification

The model parameters are unidentified without further restrictions. Two potential solutions:

- "Anchoring" the estimates with respect to at least one individual
- Provide some informative priors

Item-Characteristic Curve

Jackman (2011)



Bayes Theorem

Bayes Theorem for the probability of two events A and B with Pr(B) > 0 states that

$$Pr(A|B) = \frac{Pr(B|A)Pr(A)}{Pr(B)}$$

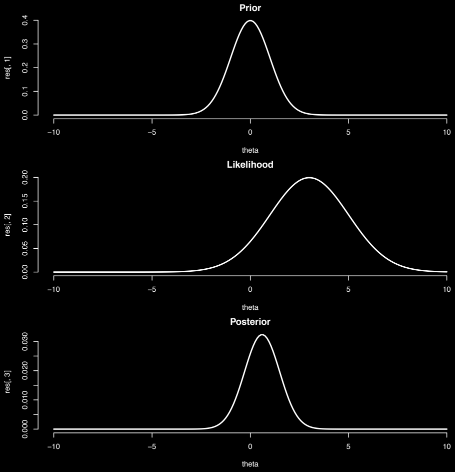
where:

- $Pr(A|B)$ posterior probability of A given B.
- $Pr(B|A)$ probability of B given A (likelihood).
- $Pr(A)$ prior probability of A (unconditional).
- $Pr(B)$ probability of B (unconditional; normalizes the posterior probability to 1).

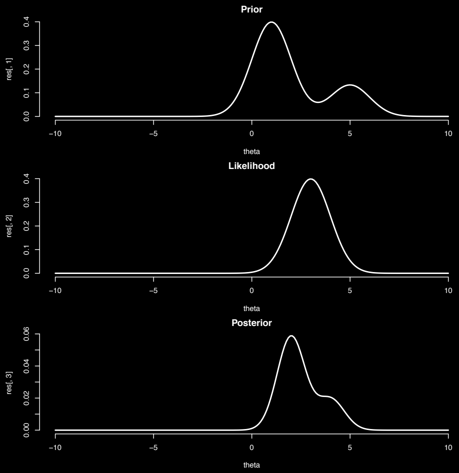
Contrast Frequentist Inference

	Bayesian	Frequentist
θ	random	fixed but unknown
$\hat{\theta}$	fixed	random
"random-ness"	subjective	sampling
distribution of interest	posterior	sampling distribution
	$p(\theta \mid y)$	$p(\hat{theta}(y) \mid \theta = \theta_{H_0})$

Prior, Likelihood, and Posteriors



Prior, Likelihood, and Posteriors



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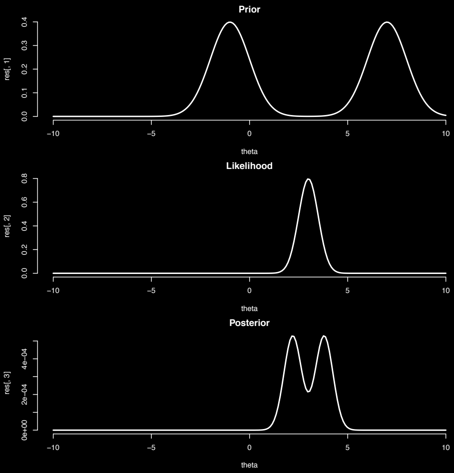

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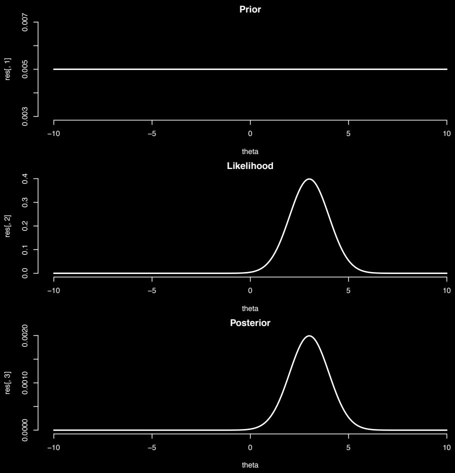

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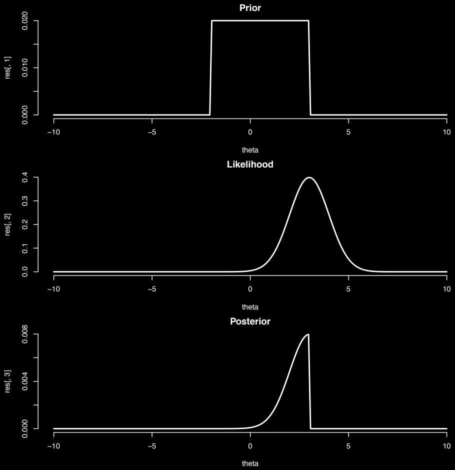

Monte Carlo methods

- We will usually find problems that are hard to solve analytically.
- It is often possible to create a set of simulated values from a target distribution that share the same distributional properties even if we can't describe analytically, or even sample directly from, that distribution.
- Applied Bayesian statistics describes posterior beliefs using empirical summaries of the posterior distribution sampled via monte carlo methods.