Likelihood Ratio

- Given likelihood estimates for two alternative hypothesis:

$$H_1 | \mu = \mu_1 : \mathscr{L}_1 \left(\mu_1, \sigma^2 | y_1, \ldots, y_n \right)$$
$$H_2 | \mu = \mu_2 : \mathscr{L}_1 \left(\mu_2, \sigma^2 | y_1, \ldots, y_n \right)$$

- we can compute a relative likelihood

$$\frac{\mathscr{L}_2 \left(\mu_2, \sigma^2 | y_1, \ldots, y_n \right)}{\mathscr{L}_1 \left(\mu_1, \sigma^2 | y_1, \ldots, y_n \right)}$$

Likelihood Ratio

- We typically use log-likelihoods

$$\ell_1\left(\mu_1, \sigma^2 \,|\, y_1, \ldots, y_n\right) = \log\left\{\mathscr{L}_1\left(\mu_1, \sigma^2 \,|\, y_1, \ldots, y_n\right)\right\}$$

- and

$$\frac{\mathscr{L}_2\left(\mu_2, \sigma^2 \,|\, y_1, \ldots, y_n\right)}{\mathscr{L}_1\left(\mu_1, \sigma^2 \,|\, y_1, \ldots, y_n\right)} = \ell_2\left(\mu_2, \sigma^2 \,|\, y_1, \ldots, y_n\right) - \ell_1\left(\mu_1, \sigma^2 \,|\, y_1, \ldots, y_n\right)$$