

Variance stabilizing transformations

Recap: delta method

Suppose $\hat{\theta}$ is an estimate of $\theta \in \mathbb{R}$, such that

$$\sqrt{n}(\hat{\theta} - \theta) \xrightarrow{d} N(0, \sigma^2)$$

for some σ^2 , and g is a continuously differentiable function with $g'(\theta) \neq 0$. Then

$$\sqrt{n}(g(\hat{\theta}) - g(\theta)) \xrightarrow{d} N(0, \sigma^2[g'(\theta)]^2)$$

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Example

Let $X_1, \dots, X_n \stackrel{iid}{\sim} \text{Exponential}(\theta)$, with density $f(x|\theta) = \theta e^{-\theta x}$.

Example

Suppose that $X_1, \dots, X_n \stackrel{iid}{\sim} \text{Bernoulli}(p)$.

Comparison

Two approaches to Wald confidence intervals for binomial probability:

How could we investigate their relative performance?