5. P-Values Formulas

In each of the following questions, you are given an i.i.d. sample and two hypotheses. For any $\alpha \in (0,1)$, define a test with asymptotic level α, then give a formula for the asymptotic p-value of your test.

(a)

1/1 point (graded)

$X_1, \ldots, X_n \overset{i.i.d.}{\sim}$ Poiss (λ) for some unknown $\lambda > 0$;

$$H_0 : \lambda = \lambda_0 \quad \text{v.s.} \quad H_1 : \lambda \neq \lambda_0 \qquad \text{where } \lambda_0 > 0.$$

(Type **barX_n** for $\overline{X}_n$, **lambda_0** for λ_0. . If applicable, type **abs(x)** for $|x|$, **Phi(x)** for $\Phi(x) = \mathbf{P}(Z \leq x)$ where $Z \sim \mathcal{N}(0,1)$, and **q(alpha)** for q_α, the $1-\alpha$ quantile of a standard normal variable, e.g. enter **q(0.01)** for $q_{0.01}$.)

Asymptotic p-value = 2-2*Phi(sqrt(n)*abs(barX_n-lambda_0)/sqrt(lambda_0)) ✔

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✔ Correct (1/1 point)

(b)

1/1 point (graded)

$X_1, \ldots, X_n \overset{i.i.d.}{\sim}$ Poiss (λ) for some unknown $\lambda > 0$;

$$H_0 : \lambda \geq \lambda_0 \quad \text{v.s.} \quad H_1 : \lambda < \lambda_0 \qquad \text{where } \lambda_0 > 0.$$

(Type **barX_n** for $\overline{X}_n$, **lambda_0** for λ_0. . If applicable, type **abs(x)** for $|x|$, **Phi(x)** for $\Phi(x) = \mathbf{P}(Z \leq x)$ where $Z \sim \mathcal{N}(0,1)$, and **q(alpha)** for q_α, the $1-\alpha$ quantile of a standard normal variable.)

Asymptotic p-value $=$ Phi(sqrt(n)*(barX_n-lambda_0)/sqrt(lambda_0)) ✔

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(c)

1/1 point (graded)

$X_1, \ldots, X_n \overset{i.i.d.}{\sim}$ Exp (λ) for some unknown $\lambda > 0$;

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$$H_0 : \lambda = \lambda_0 \quad \text{v.s.} \quad H_1 : \lambda \neq \lambda_0 \qquad \text{where } \lambda_0 > 0.$$

(Type **barX_n** for $\overline{X}_n$, **lambda_0** for λ_0. If applicable, type **abs(x)** for $|x|$, **Phi(x)** for $\Phi(x) = \mathbf{P}(Z \leq x)$ where $Z \sim \mathcal{N}(0,1)$, and **q(alpha)** for q_α, the $1-\alpha$ quantile of a standard normal variable.)

Asymptotic p-value = 2-2*Phi(sqrt(n)*lambda_0*abs(barX_n-1/lambda_0)) ✔

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question posted 2 days ago by **NataliaBor**

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NataliaBor

2 days ago - marked as answer a day ago by **karenechu** (Staff)

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