7. Quiz: Composite Hypotheses for Bernoulli models

(a)

1/1 point (graded)

Let $X_1, \ldots, X_n$ be i.i.d. **Bernoulli** random variables with unknown parameter $p \in (0,1)$.

Find a function $T_{n,p}\left(\overline{X}_n\right)$, which depends on $\overline{X}_n, n,$ and p, such that

$$T_{n,p}\left(\overline{X}_n\right) \xrightarrow[n\to\infty]{(\mathrm{d})} \mathcal{N}(0,1),$$

by

- using the Central Limit Theorem on $\overline{X}_n$ and
- **substituting any occurrence of p in the variance by a plug-in estimator for p.**

Note: If $T_{n,p} \xrightarrow[n\to\infty]{(\mathrm{d})} \mathcal{N}(0,1)$, then so does $-T_{n,p}$. For this problem and the next part, use the expression for $T_{n,p}\left(\overline{X}_n\right)$ that is of the form $\left(\overline{X}_n - p\right) f\left(n, \overline{X}_n\right)$ where $f\left(n, \overline{X}_n\right)$ is always **positive**. (Or very loosely speaking, use $\left(\overline{X}_n - p\right)$ and not $\left(p - \overline{X}_n\right)$ where applicable.)

(Enter **barX_n** for $\overline{X}_n$).

$T_{n,p}(\overline{X}_n) =$ sqrt(n)*(barX_n-p)/sqrt(barX_n*(1-barX_n)) ✔

STANDARD NOTATION

Submit You have used 2 of 3 attempts

✔ Correct (1/1 point)

(b)

3/3 points (graded)
(This is a quiz, hence only 1 attempt.)

Select a test with asymptotic level α, in terms of the function $T_{n,p}\left(\overline{X}_n\right)$, for each of the following pairs of hypotheses:
(Choose one for each column. Note the absolute values in the first 2 rows.)

$H_0 : p = 0.5$ vs $H_1 : p \neq 0.5$: $H_0 : p \leq 0.5$ vs $H_1 : p > 0.5$: $H_0 : p \geq 0.5$ vs $H_1 : p < 0.5$:

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● $\mathbf{1}\left(\left\|T_{n,0.5}\left(\overline{X}_n\right)\right\| > q_{\alpha/2}\right)$	○ $\mathbf{1}\left(\left\|T_{n,0.5}\left(\overline{X}_n\right)\right\| > q_{\alpha/2}\right)$	○ $\mathbf{1}\left(\left\|T_{n,0.5}\left(\overline{X}_n\right)\right\| > q_{\alpha/2}\right)$
○ $\mathbf{1}\left(\left\|T_{n,0.5}\left(\overline{X}_n\right)\right\| > q_{\alpha}\right)$	○ $\mathbf{1}\left(\left\|T_{n,0.5}\left(\overline{X}_n\right)\right\| > q_{\alpha}\right)$	○ $\mathbf{1}\left(\left\|T_{n,0.5}\left(\overline{X}_n\right)\right\| > q_{\alpha}\right)$
○ $\mathbf{1}\left(T_{n,0.5}\left(\overline{X}_n\right) > q_{\alpha/2}\right)$	○ $\mathbf{1}\left(T_{n,0.5}\left(\overline{X}_n\right) > q_{\alpha/2}\right)$	○ $\mathbf{1}\left(T_{n,0.5}\left(\overline{X}_n\right) > q_{\alpha/2}\right)$
○ $\mathbf{1}\left(T_{n,0.5}\left(\overline{X}_n\right) > q_{\alpha}\right)$	● $\mathbf{1}\left(T_{n,0.5}\left(\overline{X}_n\right) > q_{\alpha}\right)$	○ $\mathbf{1}\left(T_{n,0.5}\left(\overline{X}_n\right) > q_{\alpha}\right)$
○ $\mathbf{1}\left(T_{n,0.5}\left(\overline{X}_n\right) < -q_{\alpha/2}\right)$	○ $\mathbf{1}\left(T_{n,0.5}\left(\overline{X}_n\right) < -q_{\alpha/2}\right)$	○ $\mathbf{1}\left(T_{n,0.5}\left(\overline{X}_n\right) < -q_{\alpha/2}\right)$
○ $\mathbf{1}\left(T_{n,0.5}\left(\overline{X}_n\right) < -q_{\alpha}\right)$	○ $\mathbf{1}\left(T_{n,0.5}\left(\overline{X}_n\right) < -q_{\alpha}\right)$	● $\mathbf{1}\left(T_{n,0.5}\left(\overline{X}_n\right) < -q_{\alpha}\right)$
○ $\mathbf{1}\left(T_{n,0.5}\left(\overline{X}_n\right) < q_{\alpha/2}\right)$	○ $\mathbf{1}\left(T_{n,0.5}\left(\overline{X}_n\right) < q_{\alpha/2}\right)$	○ $\mathbf{1}\left(T_{n,0.5}\left(\overline{X}_n\right) < q_{\alpha/2}\right)$
○ $\mathbf{1}\left(T_{n,0.5}\left(\overline{X}_n\right) < q_{\alpha}\right)$	○ $\mathbf{1}\left(T_{n,0.5}\left(\overline{X}_n\right) < q_{\alpha}\right)$	○ $\mathbf{1}\left(T_{n,0.5}\left(\overline{X}_n\right) < q_{\alpha}\right)$
✔	✔	✔

Submit You have used 1 of 1 attempt

✔ Correct (3/3 points)

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? Why make the variance dependent on the estimator? 3

Not sure if I understand the correct answer format for part a
does the expression involve ' >s'? 1

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