Midterm 2(L8-L16) review

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Announcements

- This week's office hours: 5-7pm Wednesday at R1475 MSC.
- Midterm 2 will NOT cover bootstrap, power and sample size calculations, but you need understand the concept of power.

Review of CI

- When using $\bar{X}$ to estimate μ, if the X_i are normal and σ is known, or n is large enough for the CLT to work, then a $100(1-\alpha)\%$ CI for μ is given by:

$$\bar{X} \pm z_{\alpha/2}\frac{\sigma}{\sqrt{n}}.$$

- When using $\bar{X}$ to estimate μ, if the X_i are normal, σ is unknown, and the sample size is small, then a $100(1-\alpha)\%$ CI for μ is given by:

$$\bar{X} \pm t_{(n-1,\alpha/2)}\frac{S}{\sqrt{n}}.$$

- So long as $n\pi > 5$ and $n(1-\pi) > 5$, an approximate $100(1-\alpha)\%$ CI for π would be of the form:

$$P \pm z_{\alpha/2}\sqrt{\frac{P(1-P)}{n}}.$$

Review of t-test

When the data is drawn from a population that has a normal distribution and σ is unknown, use a t-test. To test:

$$H_0 : \mu = \mu_0$$
$$H_A : \mu \neq \mu_0$$

at the significance level α, based on a sample of size n, use one of the following methods:

- Using the rejection region method, determine the value $t_{(n-1,\alpha/2)}$, then compute $t_{obs} = \frac{\bar{x}-\mu_0}{\frac{s}{\sqrt{n}}}$. Reject the null if $t_{obs} < -t_{(n-1,\alpha/2)}$ or $t_{obs} > t_{(n-1,\alpha/2)}$.

- Using the p-value method, compute

$$p - value = P(t_{(n-1)} < -|t_{obs}|) + P(t_{(n-1)} > |t_{obs}|).$$

  Reject if p-value$< \alpha$.

Review of sign test

When the data is not normal and n is too small to use the CLT, use sign test to test the population median.
If M is the population median, test:

$$H_0 : M = M_0$$
$$H_A : M > M_0$$

by computing $b =$ the number of observations strictly larger than M_0. If any observations are equal to M_0, remove them. The p-value is then $P(B \geq b)$, where $B \sim Bin(n, 0.5)$.

Review of test for population proportion

When making a test about population proportion π based on a sample of size n, if $n(\pi_0) > 5$ and $n(1-\pi_0) > 5$, then test:

$$H_0 : \pi = \pi_0$$
$$H_A : \pi \neq \pi_0.$$

by computing the sample proportion p, and then finding:

$$z_{obs} = \frac{(p-\pi_0)}{\sqrt{\frac{\pi_0(1-\pi_0)}{n}}}.$$

Then the p-value is $P(Z < -|z_{obs}|) + P(Z > |z_{obs}|)$. Reject if p-value $< \alpha$.

Practice problem

See problems from the Midterm 2 practice.