Hypothesis Testing - ver2

Testing Claims about a Population Proportion *p*

Assumptions:

1. Observations are from a simple random sample.
2. Conditions for the Binomial are present.
3. Conditions for approximating the Binomial with the Normal are present.

Format of an hypothesis test on *p*:

H_0: $p = p_0$ (*p* is some specified value.)

Ha: (1) $p > p_0$ (upper tailed test)
(2) $p < p_0$ (lower tailed test)
(3) $p \neq p_0$ (two tailed test)

Test Statistic:

$$z = \frac{(\hat{p} - p_0)}{\sqrt{\frac{p_0 q_0}{n}}}$$

Rejection Criteria: Reject Ho with probability of false rejection α under the following conditions (z_α is the value of the standard normal with table value 1-α).:

(1) For an upper tailed test, reject Ho if $z > z_\alpha$

(2) For a lower tailed test, reject Ho if $z < - z_\alpha$

(3) For a two tailed test, reject Ho if $z < - z_{\alpha/2}$ or if $z > z_{\alpha/2}$

[As an option to rejecting the null hypothesis, one can report the "p-value". The "p-value" is the probability of getting results at least as extreme as those obtained, given that the null hypothesis is true.]

Testing Claims about a Population Mean μ with σ Known

Assumptions:

1. Observations are from a simple random sample.
2. The value of the population standard deviation σ is known.
3. The population is Normally distributed OR $n > 30$ OR both.

Format of an hypothesis test on μ:

H_0: $\mu = \mu_0$ (μ is some specified value.)

Ha: (1) $\mu > \mu_0$ (upper tailed test)
(2) $\mu < \mu_0$ (lower tailed test)
(3) $\mu \neq \mu_0$ (two tailed test)

Test Statistic:

$$z = \frac{\bar{x} - \mu_0}{\frac{\sigma}{\sqrt{n}}}$$

Rejection Criteria: Reject Ho with probability of false rejection α under the following conditions (z_α is the value of the standard normal with table value 1-α).:

1. For an upper tailed test, reject Ho if $z > z_\alpha$
2. For a lower tailed test, reject Ho if $z < -z_\alpha$
3. For a two tailed test, reject Ho if $z > z_{\frac{\alpha}{2}}$ or $z < -z_{\frac{\alpha}{2}}$

[As an option to rejecting the null hypothesis, one can report the "p-value". The "p-value" is the probability of getting results at least as extreme as those obtained, given that the null hypothesis is true.]

Testing Claims about a Population Mean μ with σ NOT Known

Assumptions:

4. Observations are from a simple random sample.
5. The value of the population standard deviation σ is not known.
6. The population is Normally distributed OR $n > 30$ OR both.

Format of an hypothesis test on μ:

H_0: $\mu = \mu_0$ (μ is some specified value.)

Ha: (1) $\mu > \mu_0$ (upper tailed test)
(2) $\mu < \mu_0$ (lower tailed test)
(3) $\mu \neq \mu_0$ (two tailed test)

Test Statistic:

$$t = \frac{\bar{x} - \mu_0}{\frac{s}{\sqrt{n}}}$$

Rejection Criteria: Reject Ho with probability of false rejection α under the following conditions ($t_{\alpha,n-1}$ is the value of the t distribution with n-1 degrees of freedom and with area in one tail = α).:

1. For an upper tailed test, reject Ho if $t > t_{\alpha,n-1}$
2. For a lower tailed test, reject Ho if $t < -t_{\alpha,n-1}$
3. For a two tailed test, reject Ho if $t > t_{\frac{\alpha}{2},n-1}$ or $t < -t_{\frac{\alpha}{2},n-1}$

[As an option to rejecting the null hypothesis, one can report the "p-value". The "p-value" is the probability of getting results at least as extreme as those obtained, given that the null hypothesis is true.]