

ECO240 Quiz I Answer [March 16, 2009]

Q1. Find 99% Confidence Interval for μ given $n = 25$, $s = 16$, $\bar{x} = 30$. Work with two-tail.

$$\bar{x} - t_{n-1,0.01/2} * \frac{s}{\sqrt{n}} < \mu < \bar{x} + t_{n-1,0.01/2} * \frac{s}{\sqrt{n}}$$
$$30 - t_{24,0.01/2} * \frac{16}{\sqrt{25}} < \mu < 30 + t_{24,0.01/2} * \frac{16}{\sqrt{25}}$$

$t_{24,0.01/2} = 2.797$ from t table

$$30 - 2.787 * \frac{16}{\sqrt{25}} < \mu < 30 + 2.787 * \frac{16}{\sqrt{25}}$$
$$\underline{21.0496 < \mu < 38.9504}$$

Note: Since you are given s (sample standard error) instead of σ (population standard deviation), you should use t table, instead of z table.

Q2. $n = 16$, $\sigma = 2$, $\mu_0 = 20$, $\alpha = 0.05$.

a. Determine the decision rule when we want to test $H_0: \mu \leq \mu_0$, $H_1: \mu > \mu_0$

Reject H_0 if $\bar{x} > \mu_0 + z_\alpha * \frac{\sigma}{\sqrt{n}} = 20 + z_\alpha * \frac{2}{\sqrt{16}}$

$P(z > z_\alpha) = 0.05$, $P(z < z_\alpha) = 1 - P(z > z_\alpha) = 0.95$. Look inside Z table and look for the z value yield the closest value to 0.45. $z_\alpha = 1.645$ (=1.64, = 1.65 are ok as well).

Therefore, the decision rule is

$$\text{Reject } H_0 \text{ if } \bar{x} > 20 + 1.645 * \frac{2}{\sqrt{16}} = 20.8225$$

Note1: Since you are now given σ , you should use Z table.

Note2: Since this is one-sided, upper-tail test, you should derive the decision rule just for the upper tail. Writing down both (upper and lower tail) decision rules does not earn any point since it shows that you do not know what kind of test you are implementing and logic behind the hypothesis testing itself.

b. Given the decision rule you derived, and given the observed $\bar{x} = 20.9$. Fill in the blanks.
We (**Reject**) H_0 and conclude that μ (**>**) 20 with (**5**) % probability of Type (**I**) Error

Note: 5% Probability of Type I error, not 0.05 % of Probability. $\alpha = 0.05$, and it means 5% significance level or Type I error.