One Mean

Parameter: μ

Point estimate: $\bar{x}$

Conditions for Distributional Approximation

1. Independent observations
2. Nearly normal population OR Large sample size ($n > 30$)

Hypothesis Test

Hypotheses

$H_0: \mu = \mu_0$

H_a: ① $\mu < \mu_0$

② $\mu \neq \mu_0$

③ $\mu > \mu_0$

Test Statistic Random Variable (Assuming H_0 true)

$$T = \frac{\bar{X} - \mu_0}{S/\sqrt{n}} \sim t_{n-1}$$

Observed Test Statistic

$$t_{obs} = \frac{\bar{x}_{obs} - \mu_0}{s_{obs}/\sqrt{n}}$$

P-value

① $P(\bar{X} \leq \bar{x}_{obs}) = P(T \leq t_{obs})$

② $2P(|\bar{X}| \geq |\bar{x}_{obs}|) = P(|T| \geq |t_{obs}|)$

③ $P(\bar{X} \geq \bar{x}_{obs}) = P(T \geq t_{obs})$

Confidence Interval

Formula for CI

$$\bar{x}_{obs} \pm \left[t^*_{df} \times \frac{s_{obs}}{\sqrt{n}} \right]$$