QMS210: Hypothesis Testing

Smith, D., & Chua, C. (2020). ***Business Statistics 15th Custom Edition for Ryerson University.*** **New York: Pearson Education Inc.**

Decision rules for Hypothesis testing:

- If the test statistic is inside the critical value range, do not reject the null hypothesis
- If the test statistic is outside the critical value range, reject the null hypothesis
- **Example**: critical values -1.69, 1.69. We reject if test stat is less than -1.69 or more than 1.69

OR

- If p-value is greater than or equal to α, do not reject the null hypothesis
- If p-value is less than α, reject null hypothesis
- **Note:** α is the level of significance (1- confidence level)
- **Example:** 95% confidence is α = 0.05

Critical values

- **Z Tests:** Normal distribution (F5, F1), InvN (F3), tail on right, area is α, σ = 1, and μ = 0
- **T Tests:** T distribution (F5, F2), InvT (F3), area is α, df = n -1
- **F Tests:** After finding out both samples' standard deviation, F distribution (F5, F4), area is α, n:df is the
    - Degrees of freedom (n-1) of the sample with the higher standard deviation, d:df is the degrees of freedom of the sample with the lower standard deviation (given or found with Calc function)
- **Important:** the area must be divided by 2 for a 2-tailed test. (α = 0.1 two tailed test has area 0.05)

Hypothesis Testing: 1 Sample Tests (Chapter 11)

Two Tailed: (differs)	Right Tailed: (greater than)	Left Tailed: (less than)
H_0: $\mu = \#$	H_0: $\mu \leq \#$	H_0: $\mu \geq \#$
H_1: $\mu \neq \#$	H_1: $\mu > \#$	H_1: $\mu < \#$

Note: # is the value being tested (test whether the mean differs from 45, #=45)
Also for proportion tests replace μ with π in format

1 Sample Hypothesis Testing:

(σ known) = Z Test (1-S)

- STAT -> TEST -> Z -> 1-S

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(σ unknown) = T Test (1-S)

- STAT -> TEST -> T -> 1-S

Proportions = Z Test (1- P)

- STAT -> TEST -> Z -> 1-P

Hypothesis Testing: 2 Sample Tests (Chapter 12)

(σ known) = Z Test (2-S)

- ***When both σ 1 and σ 2 are known**
- STAT -> TEST -> Z -> 2-S

(σ unknown) = T Test (2-S) - Pooled On

- Pooled - **On**: used when both σ 1 and σ 2 are unknown and variance is equal
- STAT -> TEST -> T -> 2-S
- Df = (n1 + n2) - 2

(σ unknown) = T Test (2-S) - Pooled Off

- Pooled - **Off**: used when σ 1 and σ 2 are unknown and variance is not equal
- STAT -> TEST -> T -> 2-S
- Df = must be computed in the calculator by calculating t-test values first

$H_0: \mu_1 = \mu_2$ $H_1: \mu_1 \neq \mu_2$

$H_0: \mu_1 \leq \mu_2$ $H_1: \mu_1 > \mu_2$

$H_0: \mu_1 \geq \mu_2$ $H_1: \mu_1 < \mu_2$

(σ unknown) = T Test (2-S) Paired

- Paired: used when σ 1 and σ 2 are unknown and the samples are **dependent**
- STAT -> TEST -> T -> 1-S
- Df = n - 1

$H_0: \mu_D = 0$ $H_1: \mu_D \neq 0$

$H_0: \mu_D \leq 0$ $H_1: \mu_D > 0$

$H_0: \mu_D \geq 0$ $H_1: \mu_D < 0$

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Proportion (σ is known): Z Test (2 -P)

- Used to find out if there is a difference between two population proportions. Both σ 1 and σ 2 are known
- STAT -> TEST -> Z -> 2-P

Variance F-Test: F-Test (2-S)

- to determine whether to use pooled variance T test or not pooled variance T test
- STAT -> TEST -> F
- square root the variance provided in the question to get standard deviation
- degrees of freedom: n_1 - 1 and n_2 - 1

H_0: =
H_1: ≠

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