

Two Population Proportions

Confidence Interval:

- Final Answer: Lower Value $< P_1 - P_2 <$ Upper Value
 - Margin of Error:
$$E = \frac{\text{C.I. Upper Value} - \text{C.I. Lower Value}}{2}$$
 - Confidence Interval formula:
$$(\hat{P}_1 - \hat{P}_2) - E < P_1 - P_2 < (\hat{P}_1 - \hat{P}_2) + E$$
 - Margin of error formula:
$$E = Z_{\alpha/2} \sqrt{\frac{\hat{P}_1(1 - \hat{P}_1)}{n_1} + \frac{\hat{P}_2(1 - \hat{P}_2)}{n_2}}$$
 - Pooled Sample Proportion:
$$\bar{P} = \frac{x_1 + x_2}{n_1 + n_2}$$
 - Using TI: STAT > TESTS > 2-PropZInt > ENTER
-

Critical Value(s):

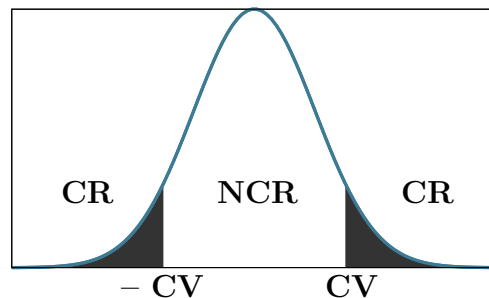
- Using TI Calculator PRGM > ZVAL > ENTER (Twice)
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Hypothesis Testing:

Two-Tail Test:

$$H_0 : P_1 = P_2$$

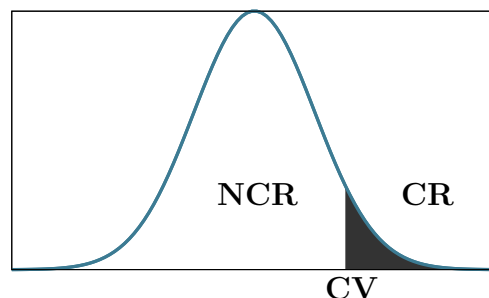
$$H_1 : P_1 \neq P_2$$



Right-Tail Test:

$$H_0 : P_1 \leq P_2$$

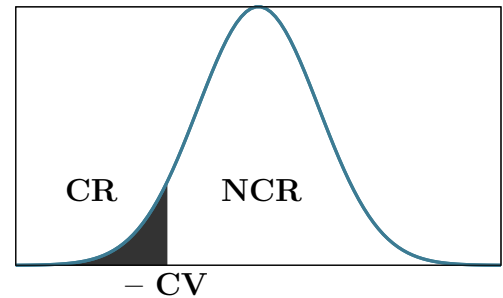
$$H_1 : P_1 > P_2$$



Left-Tail Test:

$$H_0 : P_1 \geq P_2$$

$$H_1 : P_1 < P_2$$



Computed Test Statistic & P-Value:

- Using TI Calculator

STAT > TESTS > 2-PropZTest

- Using formula for C.T.S.:

$$z = \frac{(\hat{p}_1 - \hat{p}_2) - (P_1 - P_2)}{\sqrt{\frac{\bar{p}(1 - \bar{p})}{n_1} + \frac{\bar{p}(1 - \bar{p})}{n_2}}}$$

- Using normalcdf(for P-Value:

2ND > VARS > normalcdf(> ENTER

Example: Consider the chart below:

Sample 1	Sample 2
$x_1 = 50$	$x_2 = 40$
$n_1 = 84$	$n_2 = 76$

- Find the pooled proportion.

Solution:

Using the formula, we get $\bar{p} = \frac{50 + 40}{84 + 76} = \frac{90}{160} \approx 0.563$

- Find 99% confidence interval for the difference of two population proportions.

Solution:

Using 2-PropZInt, we get $-0.133 < P_1 - P_2 < 0.271$

- Test the claim that $P_1 > P_2$.

Solution:

Here we have $H_0 : P_1 \leq P_2, H_1 : P_1 > P_2$ RTT, Claim

With no α , using ZVAL, we get C.V. $Z = 1.645$

Using 2-PropZTest, we get C.T.S. $Z = 0.878$, P-Value $p = 0.190$

Final Conclusion: **Reject the Claim**