

Testing of Hypothesis

What is Hypothesis Testing

- A statistical method that is used in making statistical decisions using experimental data.
- We can test many different types of null hypothesis
 - Mean value of a population
 - Variance of a population
 - Mean difference between two different population
 - Probability distribution followed by a population

Hypothesis Testing - Steps involved

- Many of the assumptions about a dataset take the form of hypothesis tests
 - Hypothesis testing is six-step procedure designed to determine if an assumed statement is TRUE or FALSE
1. Null Hypothesis
 2. Alternative Hypothesis
 3. Level of Significance
 4. Test statistics
 5. Critical Value(s)
 6. Decision

Step -1 : Null Hypothesis - H_0

- Null Hypothesis is a statement that's assumed to be true unless there is a strong evidence against it
- If the null Hypothesis is that the population mean equals a specified value it would be written as

$$H_0 : \mu = \mu_0$$

Step -2: Alternative Hypothesis - H_1

- The alternative hypothesis is a **statement** that is accepted if the **null hypothesis is rejected**
- Below shows the alternative hypothesis that may used for the previous example

	Alternative Hypothesis
Right-tailed test	$H_1: \mu > \mu_0$
Left-tailed test	$H_1: \mu < \mu_0$
Two-tailed test	$H_1: \mu \neq \mu_0$

Null vs. Alternative Hypothesis

Null Hypothesis

$$H_0$$

A statement about a population parameter.

We test the likelihood of this statement being true in order to decide whether to accept or reject our alternative hypothesis.

Can include =, ≤, or ≥ sign.

Alternative Hypothesis

$$H_a$$

A statement that directly contradicts the null hypothesis.

We determine whether or not to accept or reject this statement based on the likelihood of the null (opposite) hypothesis being true.

Can include a ≠, >, or < sign.



One-Tailed Test vs Two-Tailed Test

One-tailed test

- A test of a statistical hypothesis , where the region of rejection is on only one side of the sampling distribution , is called a one-tailed test.

Two-tailed test

- A statistical test in which the critical area of a distribution is two-sided and tests whether a sample is greater than or less than a certain range of values.
- If the sample being tested falls into either of the critical areas, the alternative hypothesis is accepted instead of the null hypothesis.

Step -3: Level of Significance - α

- The probability of rejecting the null hypothesis when it is actually true - Type I error
- Type II error - when you fail to reject the null hypothesis when it's actually false
- The smaller level of significance the less likely there is to be a Type I error but more Type II error
- In many Applications in finance and economics, the level of significance is chosen to be 0.05 (5 percent)

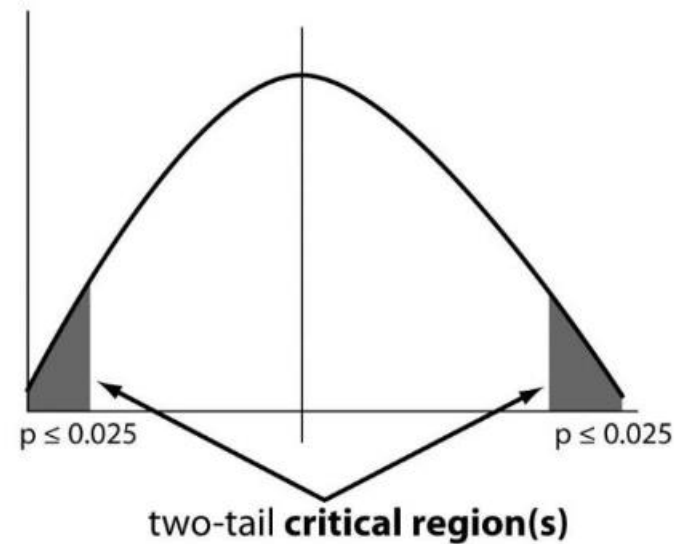
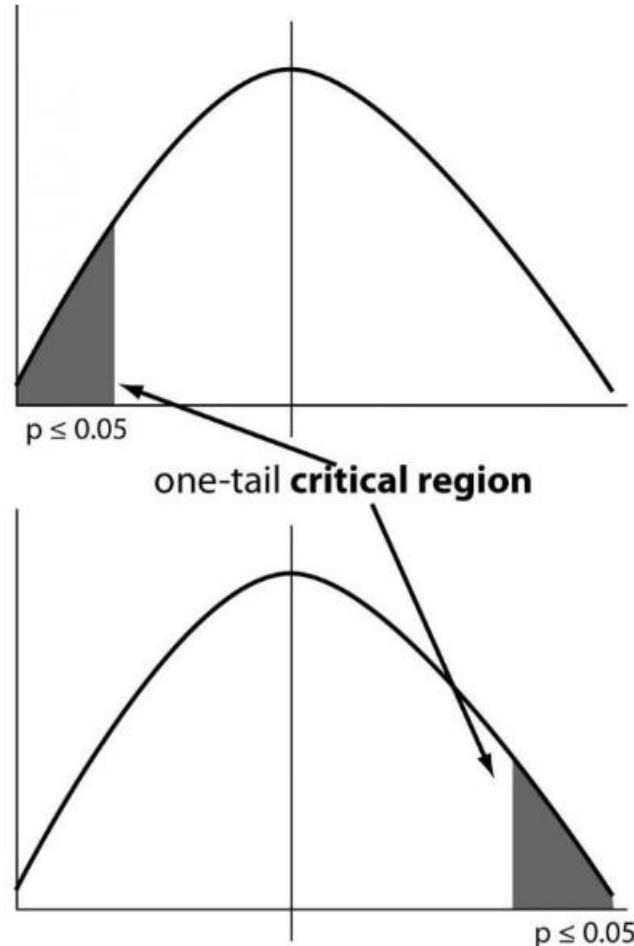
Step -4 :Test statistic

- A numerical measure that is computed from sample data to determine whether or not the null hypothesis should be rejected
- Test statistic depends on the type of null hypothesis that is being testing

Step -5 : Critical Value(s)

- To determine whether a hypothesis should be rejected, the test statistic is compared with one or two critical values
- The critical values depend on the type of null hypothesis being tested as well as the alternative hypothesis being used

Critical region for One-Tailed and Two-Tailed Test



Step -6 : Decision

- Decision on whether or not to reject the null hypothesis in one of two ways
 1. Compare test statistic with the critical value(s)
 2. Compare the probability value (p-value) to the level of significance

Hypothesis Testing - types

- T Test (Student T test)
- Z Test
- ANOVA Test
- Chi-Square Test