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CHAPTER 8

ESTIMATION AND TEST OF HYPOTHESIS

Hypothesis: A statement about the nature of a population.

Example: Students who eat breakfast will perform better on a stat exam than students who do not eat breakfast.

Test of Hypothesis: The statistical procedure which is used to verify any statement or assumption about population parameter on the basis of sample observations is known as test of significance.

Null Hypothesis: The hypothesis which we are going to test for possible rejection under the assumption that it is true. Null hypothesis is denoted by

$$H_0 ; H_0: \mu_1 = \mu_2$$

Alternative Hypothesis: Each of all possible hypothesis other than null hypothesis is called alternative hypothesis and is usually denoted by H_1 ; $H_0: \mu_1 \neq \mu_2$

Type-I error: The error of rejecting H_0 (accepting H_1) which is true is called error of first kind or Type-I error.

Type –II error: The error of accepting null hypothesis H_0 when it is false is called error of 2nd kind or H_1 . Type-II error is denoted by β

Level of significance: The probability of Type-I error denoted by α is called level of significance. Symbolically $\alpha = P(\text{rejecting } H_0 | H_0 \text{ is true})$. It is also known as size of a test

P –value:

The p value is the level at which the given value of the test statistic (such as t, F,) would be on the border line between the acceptance and rejection regions. The decision rules, which most researchers follow in stating their results, are as follows:

If $p < 0.01$, the results are regarded as highly significant

If $0.01 < p < 0.05$, the results are regarded as statistically significant

If $p > 0.10$, the results are considered not significant

Acceptance region:

The set of values of test statistic, which provides evidence to agree with the null hypothesis and lead to the acceptance of null hypothesis is called acceptance region.

Critical region:

A region of rejection is a set of possible values of the sample statistic, which provides evidence to contradict the null hypothesis and lead to a decision to reject the null hypothesis. It is denoted by

Power of a test:

The complement of the probability of Type-II error is called the power of a test. The probability of correct decision is called power of a test. Symbolically, $1 - \beta = P(\text{accepting } H_0 | H_0 \text{ is true}) = P(\text{rejecting } H_0 \text{ when } H_0 \text{ is false})$

One tailed test:

A one tailed test is a test which is concerned about possible deviation of the value of the parameter in only one direction from the specified value defined in the null hypothesis.

Example, $H_0: \mu = \mu_0$; $H_1: \mu > \mu_0$ or $\mu < \mu_0$

Two tailed test:

A two tailed test is a test which is concerned about the possible deviation of the parametric value in both the directions.

Example, $H_0: \mu = \mu_0$; $H_1: \mu \neq \mu_0$

Procedure of test of hypothesis

- i. Set of hypothesis**
- ii. Set up of suitable significance level**
- iii. Determination of suitable test statistic**
- iv. Determine the critical region**
- v. Doing computation**
- vi. Making decision**

COMMONLY USED TEST STATISTIC

1. The normal test (z-test):

- a. Testing the significance of population mean
 - i. Population variance known
 - ii. Population variance Unknown
- b. Testing the equality of two population means
- c. Testing the significance of single proportion
- d. Testing the equality of two Population proportions

2. The t test:

- a. To test the significance of population mean μ
- b. To test the significance in the difference between two population means
- c. To test the equality of two correlated means
- d. To test the significance of population correlation coefficient
- e. To test the significance of the regression coefficient
- f. To test the equality of two independent regression coefficients

3. Chi-square (χ^2) test

- a. To test the significance of a specified population variance
- b. To test the goodness of fit of a distribution
- c. To test the independence of attributes
- d. To test the equality of several correlation coefficients
- e. To test the homogeneity of several tests
- f. To test the homogeneity of several population variance

4. F-test:

- a. To test the equality of several population means
- b. To test the equality of two population variance
- c. To test the significance of regression
- d. To test the significance of multiple correlation coefficient



THANKS