جامعة تكريت

كلية التربية للبنات

قسم الرياضيات

المرحلة : الرابعة

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Testing of Hypothesis

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Testing of Hypothesis

There are two major areas of Statistical inference, The estimation of parameter and the Testing of Hypothesis. In the estimation problem, we try to determine the value of some unknown parameter θ from experimental observations . In testing of Hypothesis we have some preconceived idea of what values the parameters should be, and the purpose of conducting an experiment is then either to confirm our believe about the parameter θ or reject the hypothesis value of θ .

General Concepts and Definition:

Def: A Hypothesis

Is statement of claim about the stat of nature.

Def : A Statistical Hypothesis

Is an assertion about the stat of nature that is described by a defined probability model.

We shall denote a statistical hypothesis by capital H followed (:), followed by the assertion that specifies the hypothesis.

Def : A Simple Hypothesis

Is a statement that completely specifies the probability law for random variable.

Ex:

1- H: $\mu = 1500$

2- H: $\boldsymbol{\sigma^2 = 20}$

3- H **: P =**$\frac{1}{2}$

Def : A Composite Hypothesis

Is a Hypothesis that is not simple.

Ex :

$1 - x \sim N(\mu, \sigma^2)\ ; H: \mu \leq 17$

$2\ - x \sim B\ (n, p\ ), H\ :\ P\ \neq \frac{1}{4}$

Example: the statement that:

a - X is the Normal with μ = 60 and variance = 25 , is simple hypothesis.

b - X is the Normal , is a Composite hypothesis.

c- X is exponential, with θ=0.02 ,is a simple hypothesis.

d- $H_0\ \ : \theta = 75$, is a simple hypothesis.

e- $H_0\ \ : \theta < 75\ \ ,\ is\ composite\ hypothesis$

f- In General a Hypothesis H: $\theta\ \in w$
is called simple hypothesis if w consist of single point, while if w has more than one element , H is composite.

Def: A test of Hypothesis

Is a rule which when the experimental sample value have obtained , leads of decision to accept or to reject the hypothesis under consideration.

Remark:-

To distinguish between the two hypothesis considered , we will call one of them the Null hypothesis denoted by H_0 , and the other the Alternative hypothesis denoted by H_1 .

To test H_0 versus H_1 , the rule must for any possible observed sample values , tell us which of the two hypothesis to accept.

Thus (accept H_0) is equivalent to (reject H_1) and vice versa (often the Null hypothesis is a hypothesis of no difference).

Let the score of a test in statistic be Normally distribution with

$H_0 : \theta \leq \theta_0$

against the Alternative hypothesis

$H_1 : \theta > \theta_0$

are composite hypothesis while H_0 : $\theta=\theta_0$

Is called simple Null hypothesis.

- Types of error and size of error

Def. In testing hypothesis , we could make two different possible errors:

i- Rejection of H_0 when H_0 is true is called type I error.

ii- Acceptance of H_0 when H_0 is false ,is called type II error.

	H_0 is true	H_0 is false
Accept H_0	No error	type II error
Reject H_0	type I error	No error

iii- $\alpha =$ The size of a type I error is defined to be the probability that a type I error is made

pr.[rej. H_0 when H_0 is true] = pr.[rej. H_0 | H_0 $is\ true$]

the significance level of the test of statistical hypothesis H_0

iv- β = the size of a type Ⅱ error is defined to be the probability that a type Ⅱ error is made.

pr.[Acc. H_0 when H_0 is false] = pr.[Acc. H_0 | H_0 $is\ false$] = [Accept H_0 | H_1 is true]

The level of significance α is determined before the test , and in practical applications we usually choose α equal to ($\alpha = 0.01, \alpha = 0.05$, $\alpha = 0.10$) .

The smaller the value of α , it means a reduction in the Critical region, its means an increase in the acceptance region.

Def. Power of the test

Probability rejection H_0 when H_0 is false it's called Power of test and denoted by p.o t . as

p.o.t. = pr.[reject H_0 when H_0 is false]

= 1- pr.[accept H_0 when H_0 is false]

= 1- β