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HYPOTHESIS TESTING IN RESEARCH METHODOLOGY: A REVIEW

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ABSTRACT

Hypothesis is usually considered as the principal instrument in research. It plays a major role in research. Its main function is to suggest new experiments and observations. It occupies a very small space in the thesis. A researcher cannot proceed in the research work without formulating one or more than one hypothesis. Hypothesis brings clarity, specificity and focus to a research problem. There are two types of hypothesis which are called the Null Hypothesis and the Alternative Hypothesis. There are four steps in hypothesis testing. After getting the results, the researcher tests whether the collected facts support the hypothesis formulated or not. There exist a number of statistical tools like t-test, F-test, chi-square test, D-W test, etc., to test the validity of hypothesis. Hypothesis testing shows whether the hypothesis should be accepted or rejected. It has been rightly said that "You torture the data until they confess". This paper include the introduction, steps of hypothesis testing, function of hypothesis and testing of hypothesis.

KEYWORDS: Research, Hypothesis, null hypothesis, alternate hypothesis, population, significance.

INTRODUCTION

Hypothesis testing allows us to carry out inferences about population parameters using data from a sample. Suppose I came home after dark, open the front door and reach inside for the switch that turns on a nearby table lamp i switch the light but there is no light. That time I begin to construct a series of reasonable guesses-hypothesis-to explain the lamp's failure:

(i) The bulb has burned out.
(ii) The lamp has not plugged into the wall outlet.
(iii) A recent weather event interrupted our electrical service.
(iv) The wire from the lamp to the wall outlet has defective.
(v) I forgot to pay our electrical bill.

Now I will go in search of information to determine which hypothesis is correct.

(i) I got a flashlight from my car, find a new bulb, and put the new bulb in the lamp. The lamp fails to light. (Hypothesis 1 is rejected).
(ii) I plugged the lamp in the wall outlet. (Hypothesis 2 is rejected).
(iii) I saw my neighbour's house. Everyone has electric power. (Hypothesis 3 is rejected).
(iv) I lifted the cord that connects the lamp to the wall outlet. Then lamp lighted briefly and then goes out. I lifted the cord again. Again the lamp lighted briefly. The connecting cord has defective. (Hypothesis 4 is accepted).

(v) I can reject Hypothesis 5 because my electric bill payment was up to date. By repairing or replacing the cord, I can count on adequate light from the lamp in the near future. This way Hypothesis 4 solved my problem.

STEPS OF HYPOTHESIS TESTING

In order to test a hypothesis in statistics, we must perform the following steps:
Step 1: State the hypotheses.
Step 2: Set the criteria for a decision.
Step 3: Compute the test statistic.
Step 4: Make a decision.
Next, we will examine each one of these steps.
Step 1: State the hypotheses: In order to undertake hypothesis testing we need to express our research hypothesis as a null and alternative hypothesis. If we are to compare method A with method B about its superiority and if we proceed on the assumption that both methods are equally good, then this assumption is termed as null hypothesis (H0) and if we think that the method A is superior or the method B is inferior, we are then stating what is termed as alternative hypothesis (Ha).
In other words we can say
H0: The Null Hypothesis
This is the hypothesis or claim that is initially assumed to be true.
Ha: The Alternative Hypothesis
This is the hypothesis or claim which we initially

assume to be false but which we may decide to accept if there is sufficient evidence.

Suppose we have to prove given hypothesis:

H1: The automobile A is performing as well as automobile B.

Therefore, the null and alternative hypotheses are:

H0: The automobile A is performing much better than automobile B.

Ha: The automobile A is not performing much better than automobile B.

Types of errors in testing of hypothesis: When a hypothesis is tested there are four possibilities:

1. The hypothesis is true but our test rejects it.(Type I error)
2. The hypothesis is true but our test rejects it.(Type II error)
3. The hypothesis is true but our test rejects it.(correct decision)
4. The hypothesis is true but our test rejects it.(correct decision)

Type I error means rejection of hypothesis which should have been accepted. It is denoted by α (alpha) known as α error, also called the level of significance of test.

Type II error means accepting the hypothesis which should have been rejected. It is denoted by β (beta) known as β error.

If Ha is of the type greater than (or of the type lesser than), we use a one-tailed test, but when Ha is of the type "whether greater or smaller" then we use a two tailed test.

Step 2: Set the criteria for a decision: The significance level for a given hypothesis are tested on a pre-determined level of significance, generally, in practice, either 5% level or 1% level is adopted.

Step 3: Compute the test statistic: Hypothesis establishes the relationships of concept with theory and specifies the test to be applied especially in the context of a meaningful judgment. To test a hypothesis we need to go through a process that comprises five phases:

1. Identify the Null hypothesis H0 and the Alternate Hypothesis Ha .
2. Determine a test size (significance level).
3. Select the test statistic and determine its value from the sample data. This value is called the observed value of the test statistic.'t' statistic is usually appropriate for a small number of samples; for large number of samples, a 'z' statistic can work well if data are normally distributed.
4. Compare the observed value of the statistic to

the critical value obtained.
5. Make a decision.

If the test statistics falls in the critical region: Reject H0 in favour of Ha.

If the test statistics does not fall in the critical region: Conclude that there in not enough evidence to reject H0.

Step 4: Make a decision: If P, is less than 0.05 or 0.001, we should reject the null hypothesis in favor of the alternative. Alternatively, if P is greater than 0.05, we should not reject the null.

THE FUNCTIONS OF A HYPOTHESIS
A hypothesis serves the following functions:

- The formulation of a hypothesis provides a study with focus. It tells us what specific aspects of a research problem to investigate.
- A hypothesis tells us what data to collect and what not to collect, thereby providing focus to the study.
- The construction of a hypothesis enhances objectivity in the study.
- It enables us to conclude specifically what is true or what is false.

TESTING OF HYPOTHESIS
Statisticians have developed several tests of hypothesis which are also known as the tests of significance and can be classified as:

1. Parametric Tests or Standard tests of hypothesis.
2. Non-parametric Tests or Distribution-free tests of hypothesis.

Parametric Tests or Standard tests of hypothesis: These tests are based on the assumption of normality.

(i) Z-test
(ii) T-test
(iii) Ψ^2-test
(iv) F-test

Non-parametric Tests or Distribution-free tests of hypothesis: Non-parametric tests do not make an assumption about the parameters of the population and thus do not make use of the parameters of the distributions. These are:

(i) Sign Tests
(ii) Fisher-Irwin Test
(iii) McNemer Test
(iv) Wilcoxon Matched-pairs Test
(v) Rank Sum Tests
(vi) One sample Runs Test
(vii) Spearman's Rank Correlation

CONCLUSION
The relationship between the two concepts is a

hypothesis. The testing of hypothesis reveals to the researcher the truth. It determines the validity of the assumption. In formulating a hypothesis it is important to ensure that it is simple, specific and conceptually clear, able to be verified, rooted in an existing body of knowledge and able to be operationalised. The null hypothesis and alternate hypothesis are chosen before the sample has drawn. Generally, in hypothesis testing we proceed on the basis of null hypothesis, keeping the alternative hypothesis in view because on the assumption that null hypothesis is true, one can assign the probabilities to different possible sample results, but this cannot be done if we proceed with the alternative hypothesis. In the process of research testing of formulated hypothesis is very important step.

REFERENCES

1. Research Methods in Business Studies, Third Edition, Pervez Ghauri &Kjell Gronhaug, Pearson Education, 2005, ISBN – 0-273-68156-7.
2. Research Methodology, Third Edition, Ranjit Kaur, sage publication, 2011, ISBN – 978-1-84920-301-2.
3. Research Methodology, Dr. Prasant Sarangi, Taxmann Publication, 2010 ISBN – 978-81-7194-737-9.
4. Practical Research, Tenth Edition, Paul D. Leedy & Jeanne Ellis Ormrod, Pearson, 2013, 978-0-13289950-5.
5. Research Methodology, Second Edition, C.R. Kothari, New age international publishers, 2004, ISBN (13):978-81-224-2488-1.
6. Dawson, Catherine, Practical Research Methods, New Delhi, UBS Publishers' Distributors, 2002
7. Shuttleworth,Martin(2008). http://www.experiment resources.com/definition-of-search.html.
8. Creswell, J. W. (2008). Educational Research: Planning, conducting, and evaluating quantitative and qualitative research (3rd ed.). Upper Saddle River: Pearson.