Hypothesis Testing I

Tests for the Mean

WEEK EIGHT

This worksheet relates to chapter eight of the text book (Statistics for Managers 4th Edition).

Put 'er there, Pal!

Rah!

This topic is crucial for the final exam and for further studies. Don't be afraid to ask questions. If you are wondering something it is likely that other people in the class are wanting to know the same thing.

DISCUSSION QUESTIONS

1.   When constructing and implementing hypothesis tests, what reasoning is used behind the statement of the null and alternative hypotheses? Why are hypothesis tests set up in this way?

2. What are type one and type two errors?

A government drug regulator believes that the toxicity level in a new drug is above the industry standard and is therefore unsafe for consumers. Explain what would be a Type I and Type II error in this case. Which error would be more serious? Explain how both of these errors could be minimised simultaneously.

Complete the table of errors…

MULTIPLE CHOICE PRACTICE

1. In a hypothesis test:

    (a) the null hypothesis is what we are trying to prove
    (b) the alternate hypothesis is always assumed to be true
    (c) the alternate hypothesis is accepted unless there is sufficient evidence to say otherwise
    (d) the null hypothesis is not rejected unless there is sufficient evidence to reject it.

2. Which of the following is TRUE?
    (a) the alternative hypothesis represents the conclusion for which evidence is sought
    (b) the statement of the null hypothesis never contains an equality
    (c) an increase in the risk of type I error also increases the risk of a type II error
    (d) the computed test statistic is also known as the critical value

    Final Exam, June 2005

3. Nestor Milk Powder is sold in packets with an advertised mean weight of 1.5kgs. The standard deviation is known to be 184 grams. A consumer group wishes to check the accuracy of the advertised mean and takes a sample of 52 packets finding an average weight of 1.49kgs. What is the set of hypotheses that should be used to test the accuracy of advertised weight?

    (a) $H_0 : \mu = 1.5$; $H_1 : \mu \neq 1.5$
    (b) $H_0 : \mu = 1.5$; $H_1 : \mu < 1.5$
    (c) $H_0 : \bar{x} = 1.49$; $H_1 : \bar{x} \neq 1.49$
    (d) $H_0 : \bar{x} = 1.5$; $H_1 : \bar{x} < 1.5$

Magic Bean.

You can do hypothesis testing on the computer! As long as you put the correct data into the pop up menu, the computer calculates everything for you, including the decision to accept or reject the null hypothesis.

4.   Mr Rumpole believes that the mean income of lawyers is now more than $65 thousand per year. Which is the correct set of hypotheses to test this belief?

(a) $H_0: \mu \geq 65\,000$; $H_1: \mu < 65\,000$
(b) $H_0: \mu \leq 65\,000$; $H_1: \mu > 65\,000$
(c) $H_0: \mu = 65\,000$; $H_1: \mu \neq 65\,000$
(d) $H_0: \mu < 65\,000$; $H_1: \mu \geq 65\,000$

5.   Suppose a business person wishes to open a store in a local shopping centre only if there is strong evidence that the average number of people in the centre is greater than 5000 per day. The null hypothesis will be

(a) $H_0: \mu \leq 5000$
(b) $H_0: \mu > 5000$
(c) $H_0: \mu \geq 5000$
(d) $H_0: \mu < 5000$
(e)   b or c

6.   If a test of a hypothesis has a type I error probability of 0.01, we mean
(a)   if the null hypothesis is true, we reject it 1% of the time
(b)   if the null hypothesis is true, we don't reject it 1% of the time
(c)   if the null hypothesis is false, we reject it 1% of the time
(d)   if the null hypothesis is false, we don't reject it 1% of the time
Final Exam, June 2005

7.   In hypothesis testing

(a)   rejecting the null might lead to a type II error
(b) $\beta = 1 - \alpha$
(c)   a type II error occurs whenever the null hypothesis is accepted
(d)   all of the above are incorrect
Final Exam, Nov 2003

CALCULATION QUESTION

1. A manufacturer of chocolate topping uses machines to dispense liquid ingredients into bottles that move along a filling line. The machine that dispenses toppings is working properly when 8 grams are dispensed. The standard deviation of the process is 0.15 gram. A sample of 50 bottles is selected periodically and the filling line is stopped if there is evidence that the average amount dispensed is actually less than 8 grams. Suppose that the average amount dispensed in a particular sample of 50 bottles is 7.983 grams.

    At the 0.05 level of significance, using the critical value approach to hypothesis testing, is there evidence that the average amount dispensed is less than 8 grams?

MORE MULTIPLE CHOICE PRACTICE

1. A tyre manufacturer claims that its tyres have a mean life of at least 50 000 kms. A random sample of 16 of these tyres is tested and the sample mean is 33 000 kms. Assume the populations standard deviation is 3000 kms and the lives of tyres are approximately normally distributed. To test the manufacturer's claim using the 5% level of significance the analyst should

    (a)   use a one tail test in the right tail and the test statistic Z
    (b)   use a one tail test in the left tail and the test statistic Z
    (c)   use a one tail test in the left tail and the test statistic t
    (d)   use a two tail test and the test statistic t

    Final Exam, Nov 2003

2. A drink vending machine is adjusted so that, on average, it dispenses 220 mls of fruit juice (with a standard deviation of 10mls) into a plastic cup. However, the machine has a tendency to go out of adjustment and periodic checks are made to determine the average amount of fruit juice actually being dispensed. A sample of 45 drinks is taken to test the adjustment of the machine. For $\alpha=5\%$, an appropriate decision rule would be

    (a)   reject the null if the calculated Z $>$ 1.96
    (b)   do not reject the null if $|$ calc Z$|$ is $<$ 1.96
    (c)   reject the null if the calculated Z $\neq$ 1.96
    (d)   reject the null if the calculated Z $>|$ 1.96$|$

    Final Exam, Nov 2003

3. A manufacturer of car batteries claims that his product will last at least 4 years on average. A sample of 50 is taken and the mean and standard deviation are found. The test statistic is calculated to be -1.656. Using a 5% level, the conclusion would be

    (a)   there is sufficient evidence for the manufacturer's claim to be considered correct
    (b)   there is insufficient evidence for the manufacturer's claim to be considered correct
    (c)   there is sufficient evidence for the manufacturer's claim to be considered incorrect

(d)   there is insufficient evidence for the manufacturer's claim to be considered incorrect

4.   If a hypothesis is not rejected at the 5% level of significance is

(a)   will never be rejected at the 1% level
(b)   will always be rejected at the 1% level
(c)   will sometimes not be accepted at the 1% level
(d)   there is insufficient information to say what will happen at the 1% level

notes