Hypothesis tests for means and proportions

Assumption: Since the sample size is 30, According to Central Limit Theorem, the distribution of the sample mean tends to be normally distributed. We shall estimate the sample standard deviation in place of population standard deviation, in estimating the standard error.

Type of Test:

The test we will conduct will be one tail test (left tail test). Left tail test means that we are we have the condition of the population mean less than 12 ounces as our alternative hypothesis, whereas, the null hypothesis would be testing the weight of each bag of chips being either equal to or greater than 12 ounces. There is the one tail test because the condition of inequality will not be sufficient to reject the null hypothesis, which means that the null hypothesis will be rejected ONLY if the weight if the bag is less than 12. Thus, due to the condition of less than in alternative, it is one tail test, simple words; both inequalities (greater than and less than) do not support the idea to make complaint, rather only one inequality (less than) can fulfill the task.

Mathematically, it can be stated as:

Null Hypothesis (Ho) : Population mean of the bags of chips () 12. 0 ounces

Alternative Hypothesis (Ho) : Population mean of the bags of chips () < 12. 0 ounces

Type I error:

Type I error is defined as the error of rejecting a null hypothesis when it is true. In this case type error would be the error of inferring that the bags are less than 12. 0 ounces (less than claimed value) but in reality its weight is either 12. 0 ounces or even greater.

Level of Significance:

Level of significance refers to the probability of type I error, that means a fixed probability, in statistical hypothesis testing, of wrongly rejecting a null hypothesis Ho, when it is true. It is represented by .

In our case,

= 5 %

It means that we have fixed the 5% chances of making the type I error.

z-critical value:

-1. 645 (as given)

Decision Criteria:

We will reject Ho, if z-test statistics < -1. 645

z-test statistics:

–

z-test statistics = x -

.

n

= 11. 9 - 12

0. 4

30

= -0. 1/ (0. 4 / 5. 48)

= -0. 1/0. 073

= -1. 37

Conclusion:

At 5% level of significance, there is insufficient evidence to reject the null hypothesis. Thus we fail to reject the claim of the weight of potato chips being 12. 0 ounce or greater.

Conclusions in terms of the business problem:

As evident from the given problem, the investigator had a doubt that the claimed weight of the potato bags is greater than the actual weight. To verify the authenticity of this claim, he collected some 30 bags and found the mean of those bags, which came out to be 11. 9 ounces. Although the mean weight came out to be lesser than the claimed one. But the real question or logic behind hypothesis testing is that we want to ascertain that whether it would be appropriate to consider the difference of 0. 1 ounces from observing 30 bags with the standard deviation of 0. 4 a 'significant' one and infer this difference as on the entire population. Thus the above shown hypothesis test showed that how significant is the abovementioned difference, if we allow the 5% of the probability of type I error. The result of the test shows that the acquired value of z-test statistics is in the non-rejection region (above -1. 645). Thus, we can say that the difference in weight found from the sample of 30 bags is not significant to infer the difference on the entire population (all bags). Thus, it is not recommended to complaint for the lesser weight.

References

Spiegel, M., & Lindstrom, D. (2000). Statistics: Based on Schaum's Outline of Theory and Problems of Statistics by Murray R. Spiegel. Boston: McGraw Hill.