Hypothesis Testing with P-values: Exercise I

Question

a. In hypothesis testing, the common level of significance is a = 0.05. Some might argue for a level of significance greater than 0.05. Suppose that web designers tested the proportion of potential web page visitors with a preference for a new web design over the existing web design. The null hypothesis was that the population proportion of web page visitors preferring the new design was 0.50, and the alternative hypothesis was that it was not equal to 0.50. The p-value for the test was 0.20.

1) State, in statistical terms, the null and alternative hypotheses for this example.
2) Explain the risks associated with Type I and Type II errors in this case.
3) What would be the consequences if you rejected the null hypothesis for a p-value of 0.20?
4) What might be an argument for raising the value of a?
5) What would you do in this situation?
6) What is your answer in (5) if the p-value equals 0.12? What if it equals 0.06?

Answer

Question a)

1) H0 : 0.5, H1 : 0.5

2) The level of significance is the probability of committing a Type I error, which is the probability of concluding that the population proportion of web page visitors preferring the new design is not 0.50 when in fact 50% of the population proportion of web page visitors prefer the new design. The risk associated with Type II error is the probability of not rejecting the claim that 50% of the population proportion of web page visitors prefer the new design when it should be rejected.

3) If you reject the null hypothesis for a p-value of 0.20, there is a 20% probability that you may have incorrectly concluded that the population proportion of web page visitors preferring the new design is not 0.50 when in fact 50% of the population proportion of web page visitors prefer the new design.

4) The argument for raising the level of significance might be that the consequences of incorrectly concluding the proportion is not 50% are deemed not very severe.

5) Before raising the level of significance of a test, you have to genuinely evaluate whether the cost of committing a Type I error is really not as bad as you have thought.

6) If the p-value is actually 0.12, you will be more confident about rejecting the null hypothesis. If the p-value is 0.06, you will be even more confident that a Type I error is much less likely to occur.