HELLENIC OPEN UNIVERSITY
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MBA Programme

Hypothesis Testing

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Hypothesis Testing

- The general goal of a hypothesis test is to rule out chance (sampling error) as a plausible explanation for the results from a research study.

- Hypothesis testing is a technique to help determine whether a specific treatment has an effect on the individuals in a population.
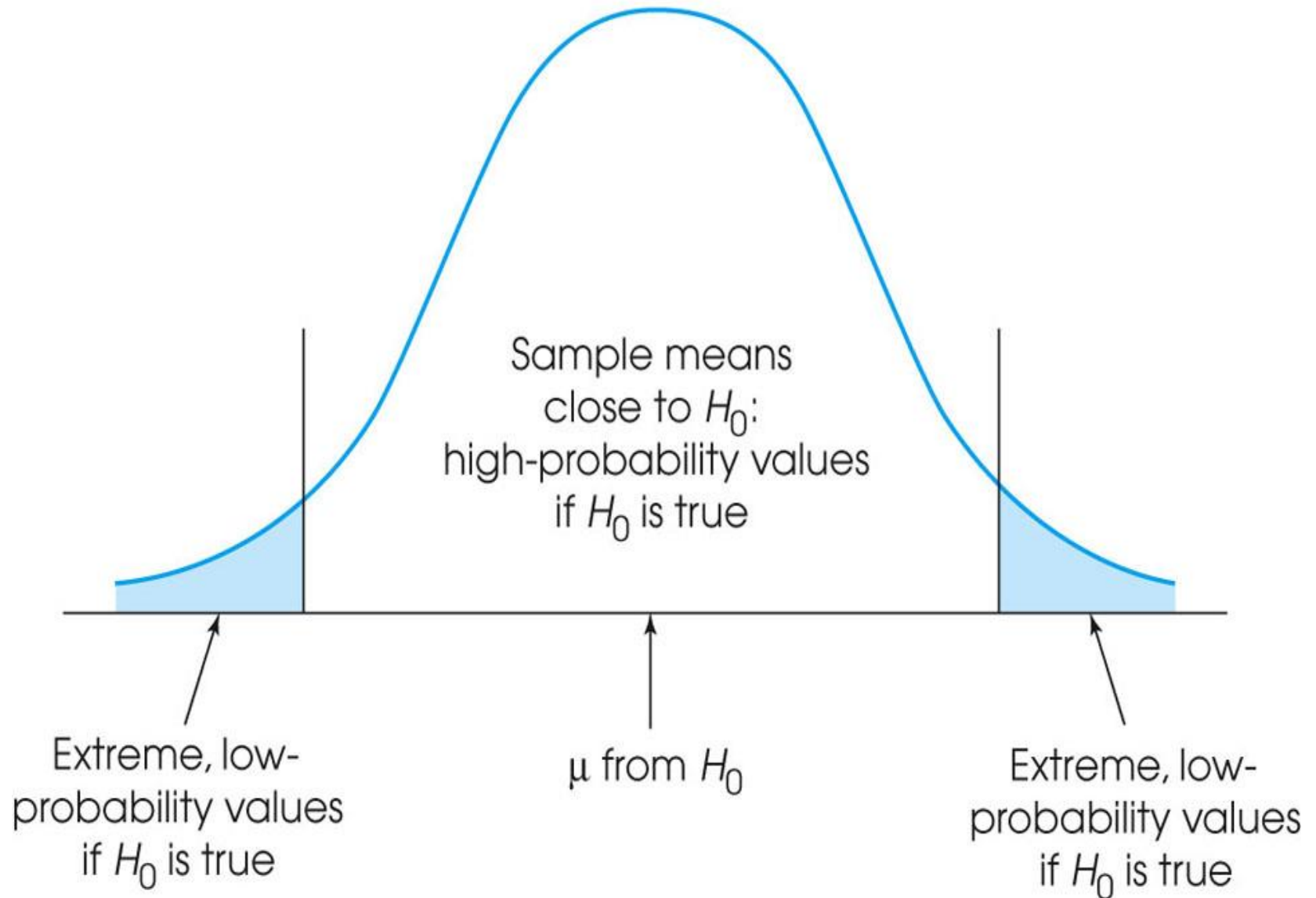
Hypothesis Testing (cont.)

- If the individuals in the sample are noticeably different from the individuals in the original population, we have evidence that the treatment has an effect.

- However, it is also possible that the difference between the sample and the population is simply sampling error

Hypothesis Testing (cont.)

○ The purpose of the hypothesis test is to decide between two explanations:

1. The difference between the sample and the population can be explained by sampling error (there does not appear to be a treatment effect)

2. The difference between the sample and the population is too large to be explained by sampling error (there does appear to be a treatment effect).

The distribution of sample means if the null hypothesis is true (all the possible outcomes)

Sample means close to H_0: high-probability values if H_0 is true

Extreme, low-probability values if H_0 is true

μ from H_0

Extreme, low-probability values if H_0 is true

The Null Hypothesis, the Alpha Level, the Critical Region, and the Test Statistic

- The following four steps outline the process of hypothesis testing and introduce some of the new terminology:
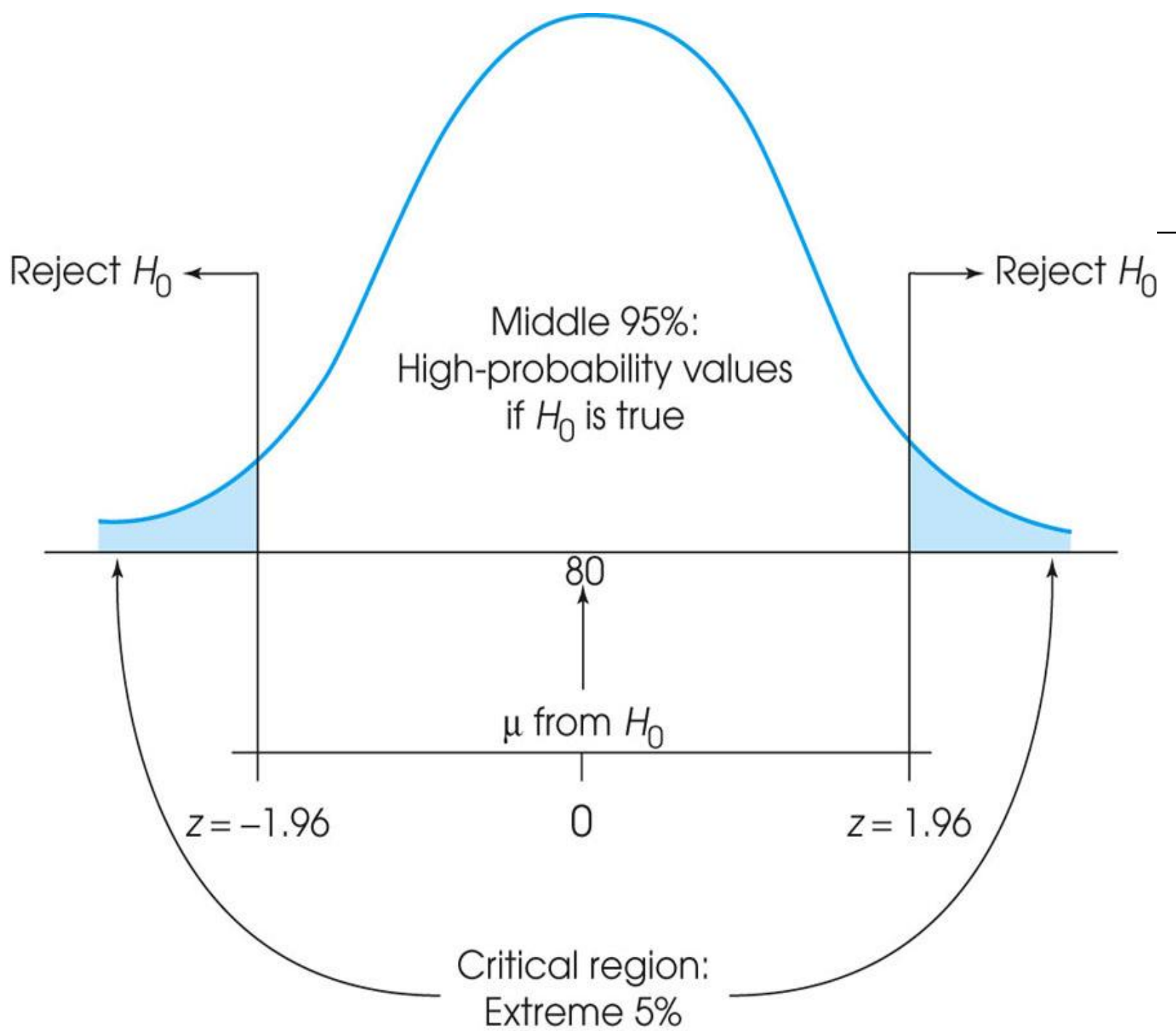
Step 1

State the hypotheses and select an α level. The **null hypothesis**, H**0**, always states that the treatment has no effect (no change, no difference). According to the null hypothesis, the population mean after treatment is the same is it was before treatment. The **α level** establishes a criterion, or "cut-off", for making a decision about the null hypothesis. The alpha level also determines the risk of a Type I error.
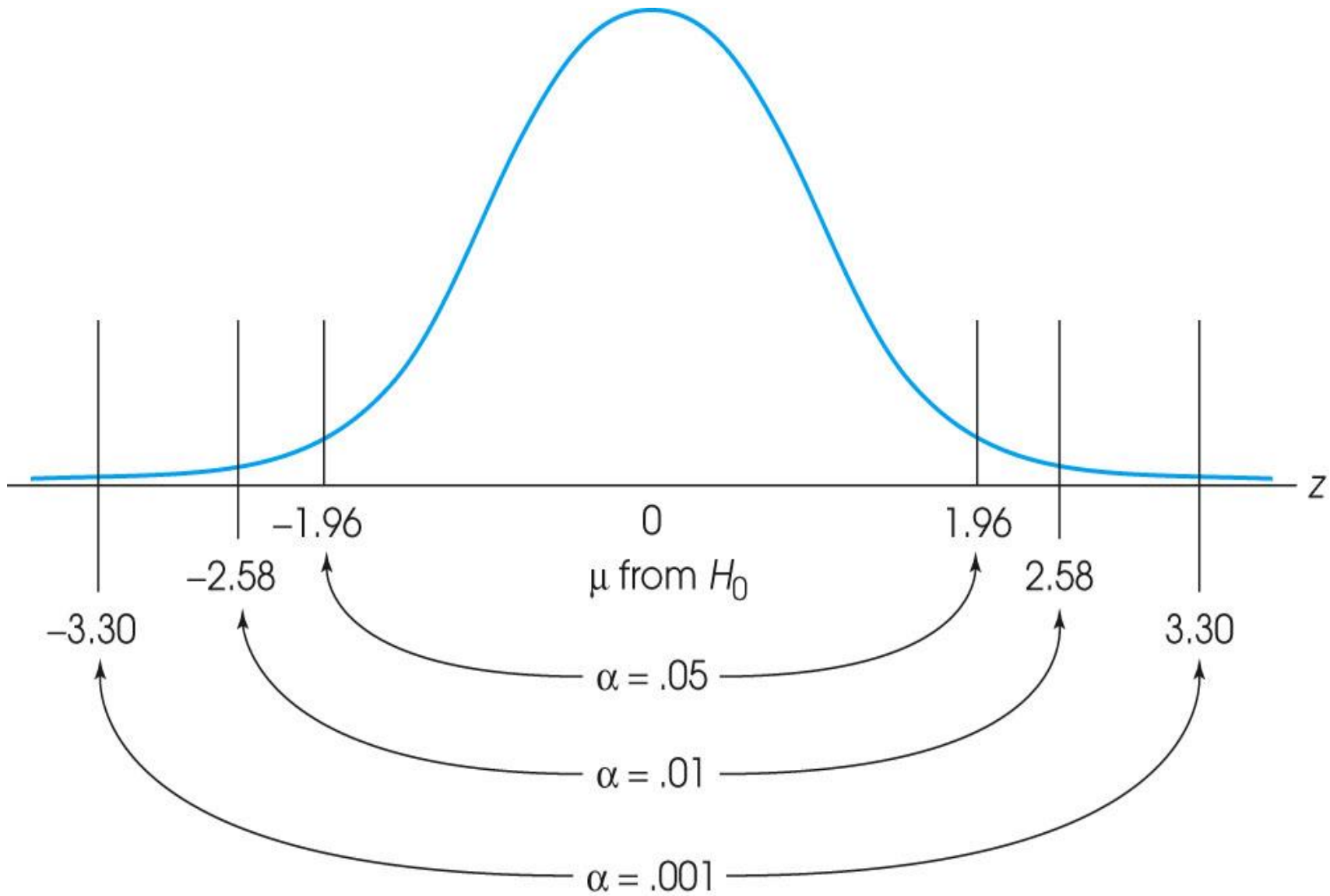
Step 2

Locate the critical region. The **critical region** consists of outcomes that are very unlikely to occur if the null hypothesis is true. That is, the critical region is defined by sample means that are almost impossible to obtain if the treatment has no effect. The phrase "almost impossible" means that these samples have a probability (p) that is less than the alpha level.

Reject H_0 ←   → Reject H_0

Middle 95%:
High-probability values
if H_0 is true

80

μ from H_0

$z = -1.96$ 0 $z = 1.96$

Critical region:
Extreme 5%

Step 3

Compute the test statistic. The **test statistic** (in this chapter a z-score) forms a ratio comparing the obtained difference between the sample mean and the hypothesized population mean versus the amount of difference we would expect without any treatment effect (the standard error).

Step 4

A large value for the test statistic shows that the obtained mean difference is more than would be expected if there is no treatment effect. If it is large enough to be in the critical region, we conclude that the difference is **significant** or that the treatment has a significant effect. In this case we reject the null hypothesis.   If the mean difference is relatively small, then the test statistic will have a low value. In this case, we conclude that the evidence from the sample is not sufficient, and the decision is fail to reject the null hypothesis.