

Chapter 20

MORE ABOUT TESTS AND INTERVALS

1

CRITICAL VALUES

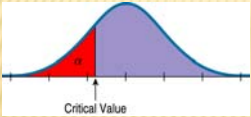
- ✗ The α level you choose corresponds to a critical z-value (the z^*).
- ✗ The traditional critical values from the normal model are

α	1-sided	2-sided
0.05	1.645	1.96
0.01	2.28	2.575
0.001	3.09	3.29

2

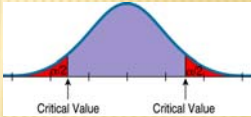
CRITICAL VALUES

- ✗ When the alternative is one-sided, the critical value puts all of α on one side:



The diagram shows a normal distribution curve with a single vertical line labeled 'Critical Value' on the right side. The area under the curve to the right of this line is shaded red, representing the significance level α .

- ✗ When the alternative is two-sided, the critical value splits α equally into two tails:



The diagram shows a normal distribution curve with two vertical lines labeled 'Critical Value' on both the left and right sides. The areas under the curve to the left of the left critical value and to the right of the right critical value are shaded red, representing the significance level α split between the two tails.

3

MAKING ERRORS

- ✘ When we perform a hypothesis test, we can make mistakes in two ways:
 - I. The null hypothesis is true, but we mistakenly reject it. (Type I error)
The probability of a Type I error is α
 - II. The null hypothesis is false, but we fail to reject it. (Type II error)
The probability of a Type II error is β

MAKING ERRORS (CONT.)

- ✘ Which type of error is more serious depends on the situation at hand. In other words, the gravity of the error is context dependent.
- ✘ Here's an illustration of the four situations in a hypothesis test:

		The Truth	
		H_0 True	H_0 False
My Decision	Reject H_0	Type I Error	OK
	Retain H_0	OK	Type II Error

MAKING ERRORS (CONT.)

- ✘ How often will a Type I error occur?
 - + Since a Type I error is rejecting a true null hypothesis, the probability of a Type I error is our α level.
- ✘ When H_0 is false and we reject it, we have done the right thing.
 - + A test's ability to detect a false hypothesis is called the **power** of the test.
 - + Power is given by $1 - \beta$
