



JBstatistics



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Suppose we test:

$$H_0: \mu = 10$$

$$H_a: \mu > 10$$

and we reject H_0 at $\alpha = 0.05$.

One of two things occurred:

- ▶ The null hypothesis is false and we made the correct decision.
- ▶ The null hypothesis is true, and we made a Type I error.

Possible outcomes of a hypothesis test:

		Underlying reality	
		H_0 is false	H_0 is true
Conclusion from test	Reject H_0	Correct decision	Type I error
	Do not reject H_0	Type II error	Correct decision

Unknown

Known

Type I error: Convicting a person who, in reality, did not commit the crime.

Type II error: Acquitting a person who, in reality, committed the crime.

The power of a test is the probability of rejecting the null hypothesis, given it is false.

$$\text{Power} = 1 - P(\text{Type II error}) = 1 - \beta$$

The power of a test depends on several factors, including the choice of α , the sample size, and the true value of the parameter.

The relationship between α and β for a test of $H_0: \mu = 0$:



(β calculated for $H_a: \mu > 0$, $\mu = 1$, $\sigma = 5$, $n = 20$)



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