DATA SCIENCE WITH R

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HYPOTHESIS TESTING

Introduction to Hypothesis Testing

Basic Framework of a Hypothesis Test

Distance Measures

Central Limit Theorem

Types of Hypothesis Tests

Population Distribution Not Normal

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Example:

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Test Distribution?

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Conclusion:

Manufacturer’s claim is NOT justified, and brand preference is actually less than 40%, at a 95% level of confidence

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* Not really appropriate to use a normal distribution because sample size < 30

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Sample Sizes are Low

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We test if college students sleep a lot less than the general population - average sleep hours for the population is 8 hours.

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Taking a random sample of 10 college students, we get this data.

Student	Sleep Hrs
1	7
2	6.8
3	6
4	7
5	5.5
6	6.6
7	5.5
8	7.5
9	9
10	5.5
Avg	**6.64**

Hypothesis Testing T-Tests

<u>Example</u>:

We test if college students sleep a lot less than the general population - average sleep hours for the population is 8 hours.

Taking a random sample of 10 college students, we get this data.

Should we conclude that students sleep less than the general population?

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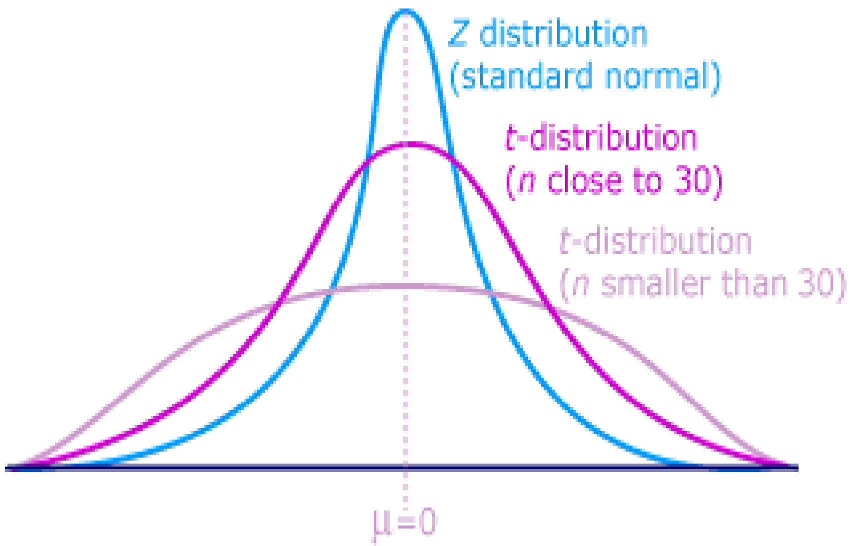

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$$t = \frac{\overline{x} - \mu}{s/\sqrt{n}}$$

Hypothesis Testing

Null Hypothesis

Alternate

Significance Level

Test Statistic

Critical Distance

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What happens when Test Statistic is negative?

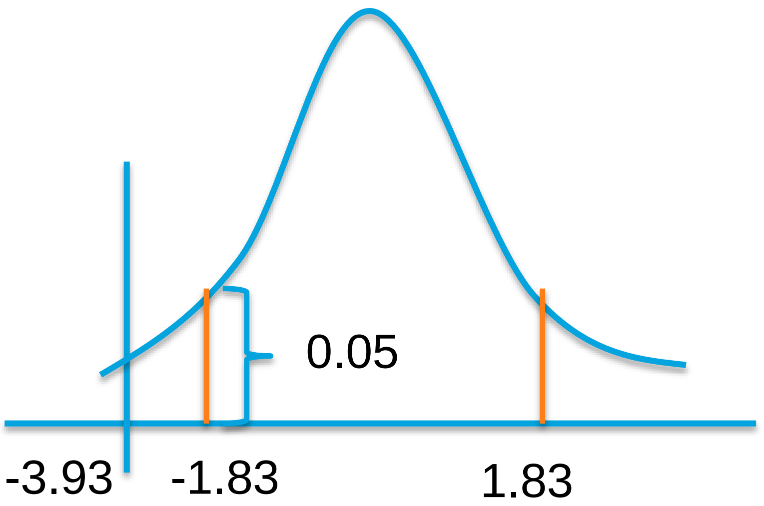
alpha one-tailed	.05	.025	.01	.005
alpha two-tailed	.10	.05	.02	.01
df				
1	6.314	12.706	31.821	63.657
2	2.920	4.303	6.965	9.925
3	2.353	3.182	4.541	5.841
4	2.132	2.776	3.743	4.604
5	2.015	2.571	3.365	4.032
6	1.943	2.447	3.143	3.707
7	1.895	2.365	2.998	3.499
8	1.869	2.306	2.896	3.355
9	1.833	2.262	2.821	3.250
10	1.812	2.228	2.764	3.169
11	1.796	2.201	2.718	3.106
12	1.782	2.179	2.681	3.055
13	1.771	2.160	2.650	3.012
14	1.761	2.145	2.624	2.977
15	1.753	2.131	2.602	2.947
16	1.746	2.120	2.583	2.921
17	1.740	2.110	2.567	2.898
18	1.734	2.101	2.552	2.878
19	1.729	2.093	2.539	2.861
20	1.725	2.086	2.528	2.845
21	1.721	2.080	2.518	2.831
22	1.717	2.074	2.508	2.819
23	1.714	2.069	2.500	2.807
24	1.711	2.064	2.492	2.797
25	1.708	2.060	2.485	2.787
30	1.697	2.042	2.457	2.750
40	1.684	2.021	2.423	2.704
60	1.671	2.000	2.390	2.660
120	1.658	1.980	2.358	2.617
inf	1.645	1.96	2.326	2.576

Hypothesis Testing

Critical Values calculated based on cut-off probabilities of outcomes to the right of the mean

If test statistic is negative, it simply implies that sample mean is < pop mean

Critical Value
=1.83 to right of mean=-1.83 to left of mean



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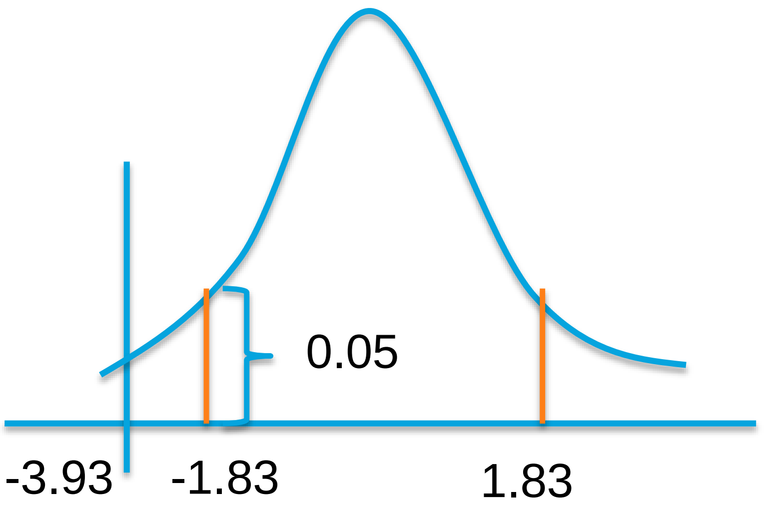
If test statistic is farther away from mean than critical value, reject null

Conclusion - Students sleep less than general population



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T.DIST(-3.90, 9, TRUE) = 0.00181

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Reject the null hypothesis and conclude that students sleep < general population

Coming Up

Types of Hypothesis Tests:

Population Std Deviation not known

THANK YOU