Statistics

Fall 2022

Lecture 21

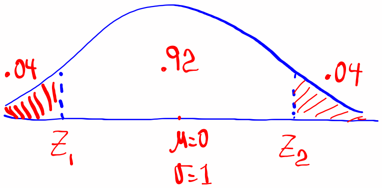
Feb 19-8:47 AM

Find two $\boxed{Z}$ values that Separate the $\boxed{\text{middle } 92\%}$ from the rest.

Area .92

$1 - .92 = .08$

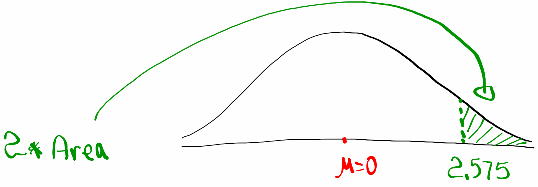
$.08 \div 2 = .04$



$Z_1 = P_4 = \text{invNorm}(.04, 0, 1) = \boxed{-1.751}$

$Z_2 = P_{96} = \text{invNorm}(.96, 0, 1) = \boxed{1.751}$

Find twice the area to the right of $Z = 2.575$.



$\sigma=1$

$2 * \text{normalcdf}(2.575, E99, 0, 1) = \boxed{.010}$

Nov 29-6:01 AM

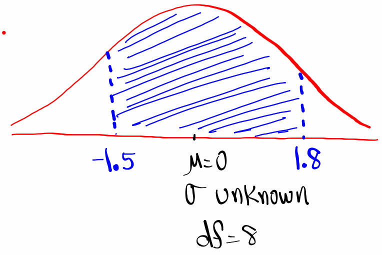
find $P(-1.5 < t < 1.8)$ with $df = 8$.

t-Dist.

$= tcdf(-1.5, 1.8, 8)$

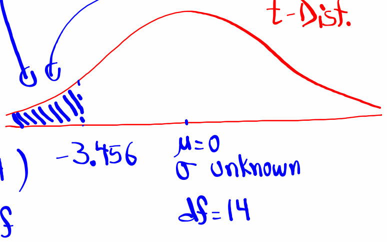
L U df

$= \boxed{.859}$



find twice the area to the left of $t = -3.456$ with $df = 14$.

t-Dist.



$2 * tcdf(-E99, -3.456, 14)$

L U df

$= \boxed{.004}$

Nov 29-6:10 AM

with $df = 15$, find a t-value that separates the top 5% from the rest.

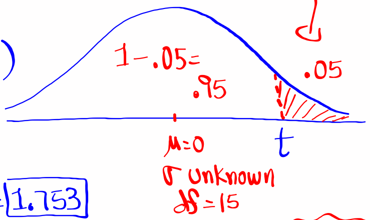
Right Area

$t = invT(.95, 15)$

left Area

df

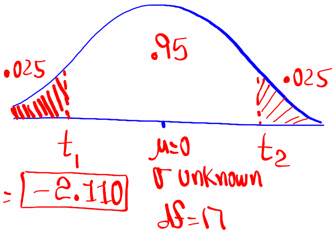
$= \boxed{1.753}$



Find two t-values that separate the middle 95% from the rest with $df = 17$.

$1 - .95 = .05$

$.05 \div 2 = .025$



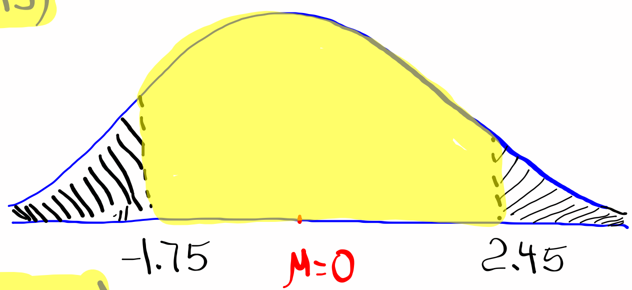
$t_1 = P_{2.5} = invT(.025, 17) = \boxed{-2.110}$

$t_2 = P_{97.5} = invT(.975, 17) = \boxed{2.110}$

Nov 29-6:16 AM

Find $P(t<-1.75 \text{ OR } t>2.45)$ with df=9.

$= \underset{\substack{\uparrow \\ \text{Total Area=1} \\ \text{Total Prob.=1}}}{1} - P(-1.75<t<2.45)$



σ unknown
df=9

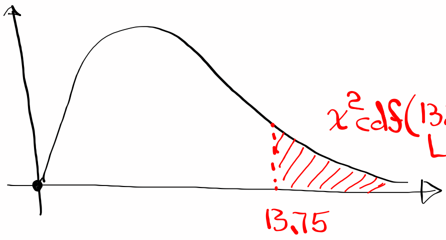
$=1-\text{tcdf}(\underset{L}{-1.75}, \underset{U}{2.45}, \underset{df}{9})$

$= \boxed{.075}$

Nov 29-6:24 AM

Find the area to the right of $\chi^2=13.75$ with df=10.

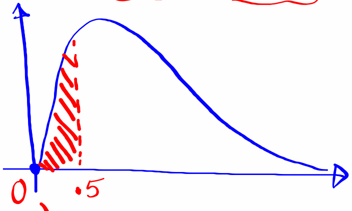
chi-Sqr Dist.



$\chi^2\text{cdf}(\underset{L}{13.75}, \underset{U}{E99}, \underset{df}{10})$

$= \boxed{.185}$

Find twice the area to the left of $\chi^2=.5$ with df=8.



$2 * \chi^2\text{cdf}(\underset{L}{0}, \underset{U}{.5}, \underset{df}{8})$

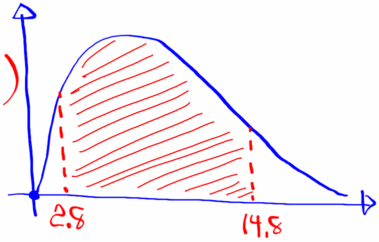
$\approx \boxed{2.7\times10^{-4}}$

Nov 29-6:30 AM

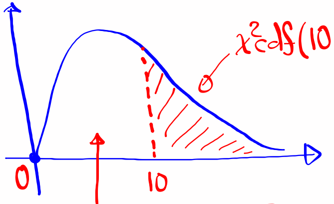
find $P(2.8 < \chi^2 < 14.8)$ with $df = 7$.

$= \chi^2\text{cdf}(\underset{L}{2.8}, \underset{U}{14.8}, \underset{df}{7})$

$= \boxed{.864}$



find the area on each side of $\chi^2 = 10$ with $df = 8$, then $\boxed{\text{multiply the smaller area by 2.}}$



$\chi^2\text{cdf}(10, E99, 8) = \boxed{.265}$

Total Area = $.735 + .265 = 1$ ✓

$\chi^2\text{cdf}(0, 10, 8) = \boxed{.735}$

$2 * (.265) = \boxed{.53}$

Nov 29-6:36 AM

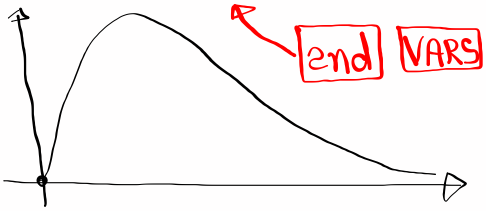
F - Dist.:

1) Graph is similar to χ^2-Dist.
   starts at 0, skewed to the right, not symmetric, total area = 1

2) It comes with two degrees of freedom
   Numerator df ⇒ Ndf
   Denominator df ⇒ Ddf

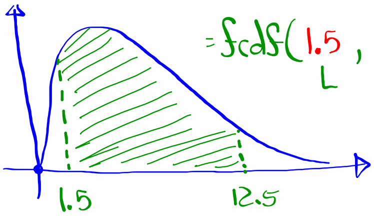
3) we use TI command fcdf(L, U, Ndf, Ddf)

$\boxed{\text{2nd}}$ $\boxed{\text{VARS}}$



Nov 29-6:45 AM

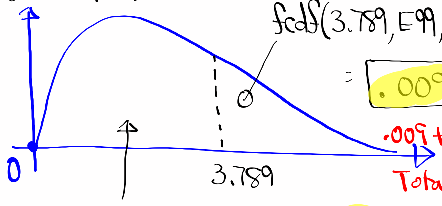
Find P(1.5<F< 12.5) with Ndf=4 & Ddf=25.



$=\text{fcdf}(\underset{L}{1.5}, \underset{U}{12.5}, \underset{Ndf}{4}, \underset{Ddf}{25})$

$= \boxed{.232}$

Find the area on each side of f=3.789 with Ndf=5 & Ddf=30.



fcdf(3.789, E99, 5, 30)

$= \boxed{.009}$

.009+.991=1✓

Total Area=1

fcdf(0 , 3.789, 5 , 30) = $\boxed{.991}$

Now multiply the Smaller area by 2.

2*(.009) = $\boxed{.018}$

Nov 29-6:49 AM

Estimating Parameters:

$\boxed{\text{SG 22\&23}}$

Parameters describe Populations

1) Population Proportion P
2) Population Mean μ
3) Population Standard deviation σ

Estimation of parameters will be in the form of range of values.

The range of values of the estimation is Called Confidence Interval.

Every Confidence Interval Comes with Confidence level.

Confidence level is $(1-\alpha)\cdot 100\%$ where $0<\alpha<1$, α is the Significance level.

If α not given ⇒ Use .05

If $\underbrace{\text{Conf. level}}_{\text{C-level}}$ not given ⇒ Use 95%

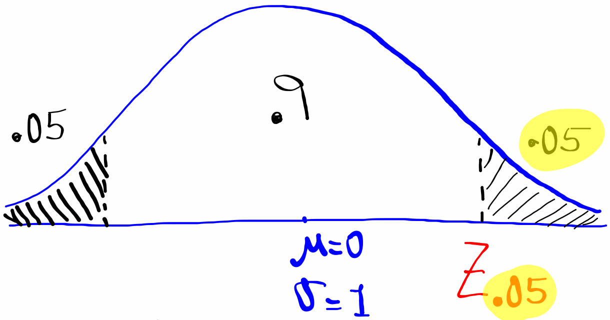
Nov 29-7:11 AM

$\underbrace{\text{Confidence level}}_{\text{C-level}}$ is the middle area of the graph of prob. dist.

Find Z-Value for 90% C-level → Middle Area .9

1 − .9 = .1

.1 ÷ 2 = .05



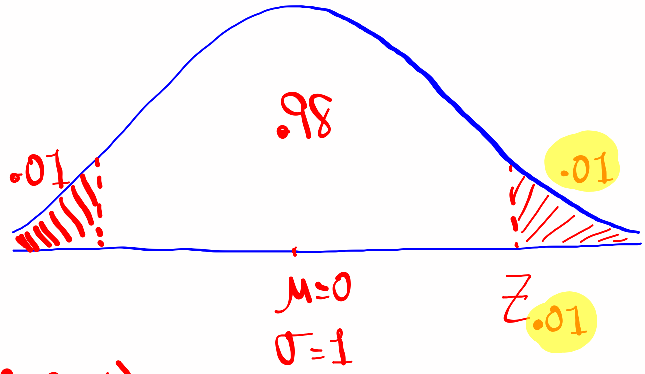
$Z_{.05}$ = invNorm(.95, 0, 1) = $\boxed{1.645}$

Nov 29-7:20 AM

Find Z-Value for 98% C-level → Middle Area .98

1 − .98 = .02

.02 ÷ 2 = .01



$Z_{.01}$ = invNorm(.99, 0, 1) = $\boxed{2.326}$

Nov 29-7:24 AM

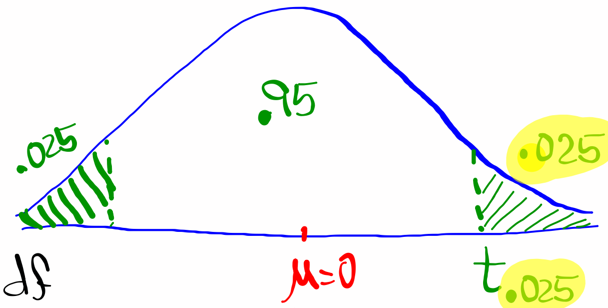
find t-value for 95% C-level with df=12.

t-Dist

Middle Area = .95

$1 - .95 = .05$

$.05 \div 2 = .025$



σ unknown
df=12

Left Area, df

$t_{.025} = \text{invT}(.975, 12) = \boxed{2.179}$

Nov 29-7:28 AM

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find t-value for $\alpha = .02$ with df = 14.

t-Dist

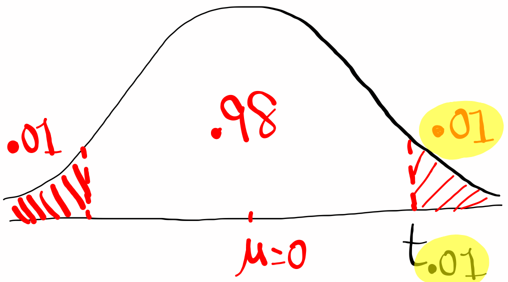
C-level $(1-\alpha)\cdot 100\% =$

$(1-.02)\cdot 100\% =$

$.98 \cdot 100\% =$

98%

Middle Area → 98%



σ unknown
df=14

$1 - .98 = .02$

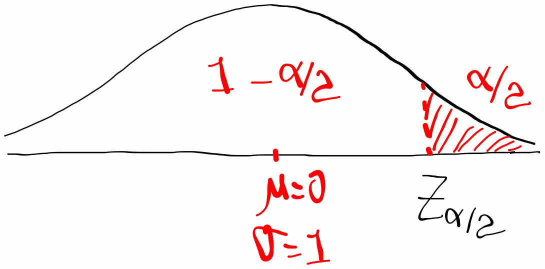
$.02 \div 2 = .01$

$t_{.01} = \text{invT}(.99, 14)$

$= \boxed{2.624}$

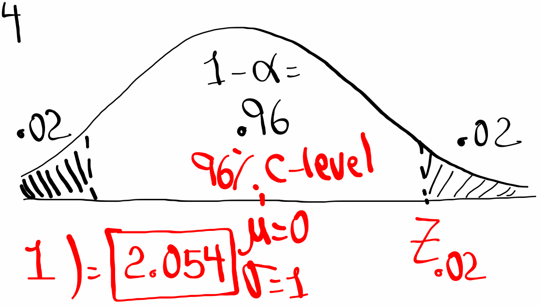
Nov 29-7:32 AM

$Z_{\alpha/2}$ is a value with right-Tail area of $\alpha/2$.



Find $Z_{\alpha/2}$ for $\alpha=.04$

$\alpha/2 = .02$

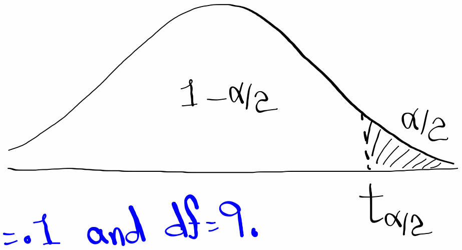


$Z_{.02} = \text{invNorm}(.98, 0, 1) = \boxed{2.054}$

Nov 29-7:37 AM

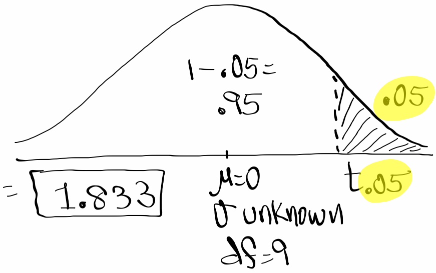
Similarly

$t_{\alpha/2}$ is a value with right-Tail area of $\alpha/2$.



Find $t_{\alpha/2}$ for $\alpha=.1$ and df=9.

$\alpha/2 = .1 \div 2 = .05$



$t_{.05} = \text{invT}(\underset{\overset{\uparrow}{\text{left Area}}}{.95}, \underset{\overset{\uparrow}{df}}{9}) = \boxed{1.833}$

Nov 29-7:41 AM

Find $t_{\alpha/2}$ for $\alpha = .01$ with df = 19.

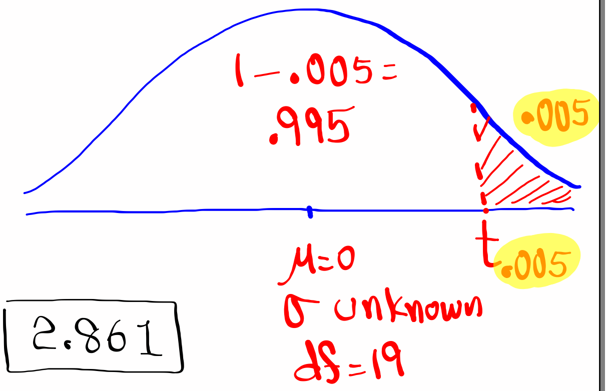
$\alpha/2 = .01 \div 2 = .005$

$t_{.005} = \text{invT}(.995, 19)$

↑ left Area

↑ df

$= \boxed{2.861}$



Nov 29-7:45 AM