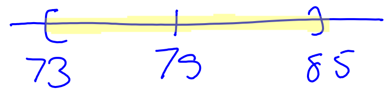
2013-11-14-C02

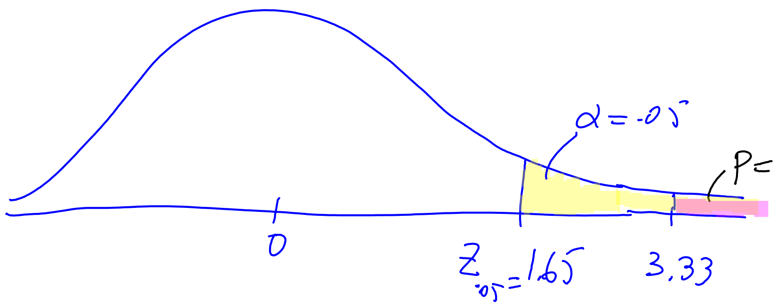
Thursday, November 14, 2013

10:08 AM

95% CI for exam μ

$n=8$, $\bar{x}=79$, $s=7$,





$$z = \frac{\bar{x}-\mu_0}{\sigma/\sqrt{n}} = 3.33$$

If $p<\alpha$, reject H_0

Ex. GMAT

http://profs.degroote.mcmaster.ca/ads/parlar/courses/q600/ChapterComments/documents/GMAT-05.xls

2005

	GMAT-2005
count	101
mean	630.50
minimum	490
maximum	720
range	230
population variance	1,919.56
population standard deviation	43.81

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$\alpha = .05$

2006

$H_0: \mu \geq 630$

$H_a: \mu < 630$

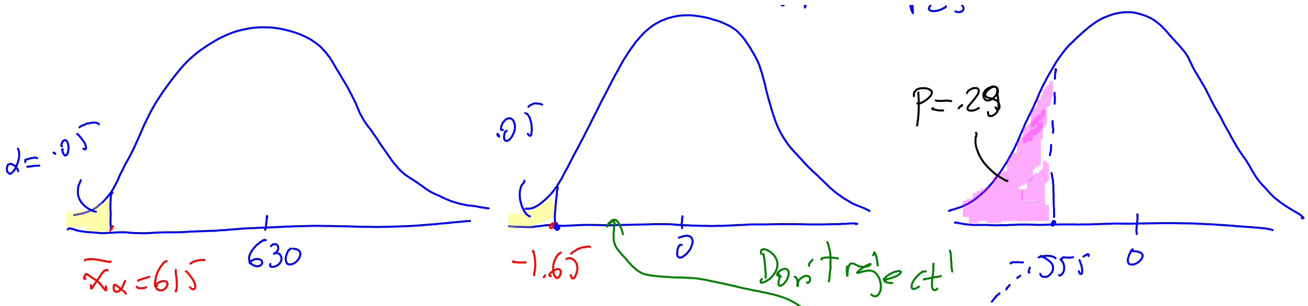
May '06.

$n=25$

$\bar{x}=625$

$\sigma=45$

$$\frac{\sigma}{\sqrt{n}} = \frac{45}{\sqrt{25}} = 9$$



$$z = \frac{\bar{x}-\overset{630}{\mu_0}}{\sigma/\sqrt{n}} = -.555$$

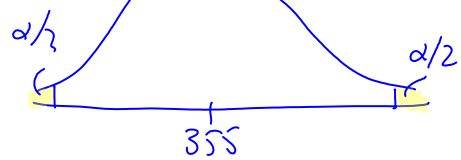
$$-1.65 = \frac{\bar{x}_\alpha - 630}{9} \Rightarrow \bar{x}_\alpha = 615$$

Ex. Bottling comp. pb. 8-11, 8-45
p. 259, 274

Ideal am't 355 mL

H₀: $\mu = 355$

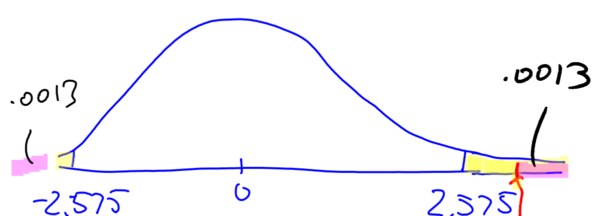
Hₐ: $\mu \neq 355$



$\alpha = .01$, $n = 36$, $\sigma = .1$

$$z = \frac{\bar{x} - 355}{.1/\sqrt{36}}$$

(a) $\bar{x} = 355.05$: $\boxed{z = 3}$



Reject H₀

$$p = 2(.0013) = .0026 < \alpha = .01$$

b) t-test about μ (σ unknown)

↓

Use s

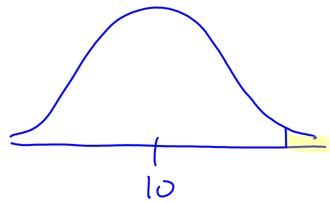
Use $t = \dfrac{\bar{x} - \mu_0}{s/\sqrt{n}}$, $df = n-1$

Ex. Cigarettes

$H_0: \mu \le 10$ "μ_0"

$H_a: \mu > 10$

σ unknown



$\alpha = .05$, $n = 10$

9
11
10.5
12
9.5
10
10.5
9
8
13

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	10.0000	hypothesized value		
$\bar{x}$	~~10.2500~~	mean Data		
s	1.4954	std. dev.		
	0.4729	std. error		
n	10	n		
	9	df		
	0.53	t		
	.3049	p-value (one-tailed, upper)		

$\leftarrow \dfrac{s}{\sqrt{n}} = .4729$

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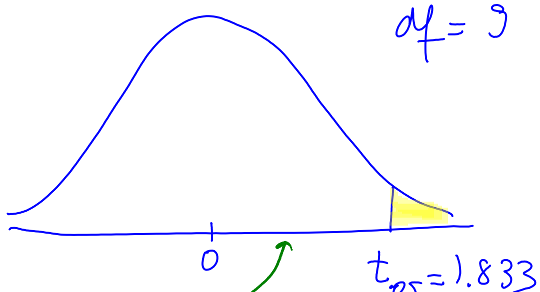
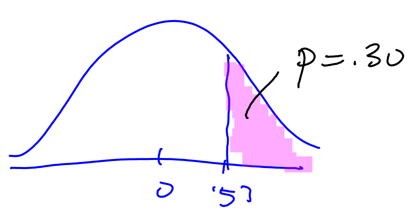
$df = 9$

$t = \dfrac{10.25 - 10}{.4729} = \boxed{.53}$



Don't reject H_0

Since $\underset{.30}{p} > \underset{.05}{\alpha}$, don't reject



Ch.9 Statistical inference based on two samples

[exclude 9.2, 9.3, 9.4, 9.5]

Ex. Atkins vs. conventional

μ_1 $\qquad\qquad$ μ_2

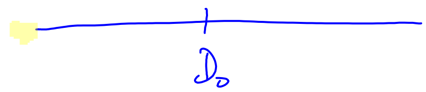
$H_0: \mu_1 - \mu_2 \geq 4$

$H_a: \mu_1 - \mu_2 < 4$

[9.1] a) z-test for $\mu_1 - \mu_2$ (σ_1^2, σ_2^2 known)

In general $\qquad H_0: \mu_1 - \mu_2 \geq D_0$

$\qquad\qquad\qquad H_a: \mu_1 - \mu_2 < D_0$



Recall

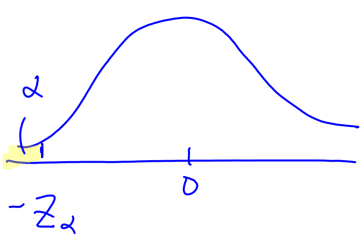
One pop

$$z = \frac{\bar{x} - \mu_0}{\sigma/\sqrt{n}}$$

Two pop

$$z = \frac{(\bar{x}_1 - \bar{x}_2) - D_0}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

} ch.7



Ex. Atkins vs. Conv

		Initial	6-month	Loss at			Initial	6-month	Loss at
	Diet	Weight (lbs)	Weight	6 Months (Atk)		Diet	Weight (lbs)	Weight	6 Months (Con)
1	Atkins	310	292.7	17.3	1	Conventional	256	259.5	-3.5
2	Atkins	309	275.1	33.9	2	Conventional	198	186.3	11.7

3	Atkins	257	217.7	39.3	3	Conventional	311	299.9	11.1
4	Atkins	227	221.1	5.9	4	Conventional	246	231.6	14.4
5	Atkins	231	204.5	26.5	5	Conventional	170	182.2	-12.2
6	Atkins	195	148	47	6	Conventional	244	251.2	-7.2
7	Atkins	190	179.7	10.3	7	Conventional	179	180	-1
8	Atkins	164	131.1	32.9	8	Conventional	204	202.1	1.9
9	Atkins	190	162.7	27.3	9	Conventional	261	265.5	-4.5
10	Atkins	140	125.2	14.8	10	Conventional	271	260.3	10.7

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A C

$H_0: \mu_1 - \mu_2 \geq 4$ $(D_0 = 4)$

$H_a: \mu_1 - \mu_2 < 4$

	6 Months (Atk)
count	33
mean	15.424
sample variance	206.528
sample standard deviation	14.371
minimum	-17.3
maximum	47
range	64.3

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	6 Months (Con)
count	30
mean	7.007
sample variance	152.788
sample standard deviation	12.361
minimum	-12.9
maximum	36.5
range	49.4

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A C

$n_1 = 33$ $n_2 = 30$

$\bar{x}_1 = 15.42$ $\bar{x}_2 = 7.0$

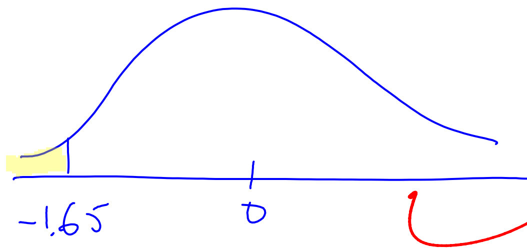
$\sigma_1 = 8$ $\sigma_2 = 6$

$D_0 = 4$

$$z = \frac{(\bar{x}_1 - \bar{x}_2) - D_0}{\quad} = \frac{8.42 - 4}{\sqrt{\sigma^2 \quad \sigma^2}} = \boxed{2.49}$$

$\sqrt{}$ $\sqrt{\frac{8}{33} + \frac{0}{30}}$

$\alpha = .05$



Don't reject! H_0

H_a

Exclude [9.2] $\mu_1 - \mu_2 \neq D_0$

[9.3, 9.4] t-test for $\mu_1 - \mu_2$

(9.5] proportion

(9.6) F-test for equality of variances, i.e., $\sigma_1^2 = \sigma_2^2$

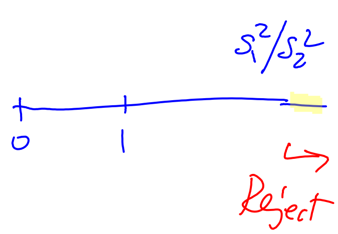
Ex. Atkins diet

$$s_1^2 = (14.37)^2 = 206.50$$
$$s_2^2 = (12.36)^2 = 152.77$$

$s_1^2 > s_2^2$

$H_0: \sigma_1^2 = \sigma_2^2$ | $H_0: \frac{\sigma_1^2}{\sigma_2^2} = 1$

$H_a: \sigma_1^2 > \sigma_2^2$ | $H_a: \frac{\sigma_1^2}{\sigma_2} > 1$



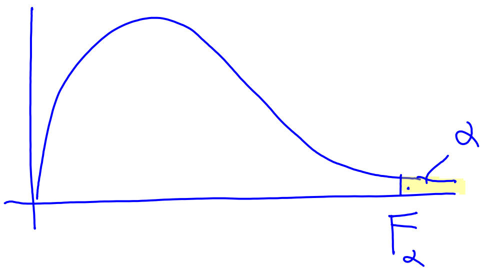
Result (Fisher)

If H_0 is true, then

$\frac{s_1^2}{s_2^2}$ is F-distributed

df_1: numerator $n_1 - 1$

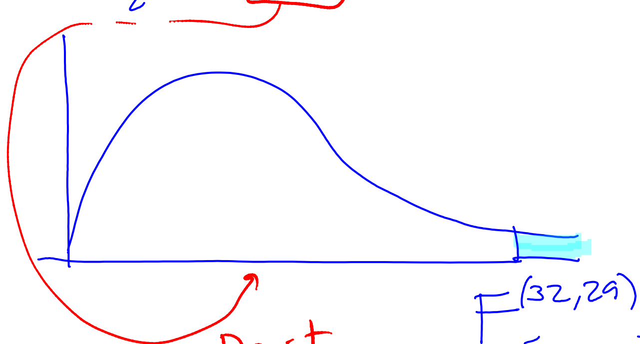
df_2: denominator $n_2 - 1$



Atkins	Conv
$n_1 = 33$	$n_2 = 30$
$s_1^2 = 206.5$	$s_2^2 = 152.77$
$df_1 = 32$	$df_2 = 29$

Test stat $F = \frac{s_1^2}{s_2^2} = \boxed{1.35}$

Let $\alpha = .05$



$F_{.05}^{(32,29)} \approx 1.85$

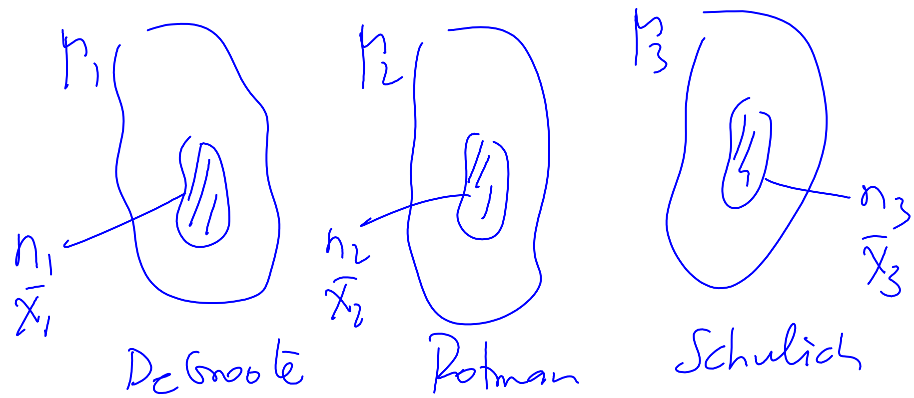
Don't reject H_0

<u>Remark</u> if $s_1^2 < s_2^2$

$$F = \frac{s_2^2}{s_1^2}$$

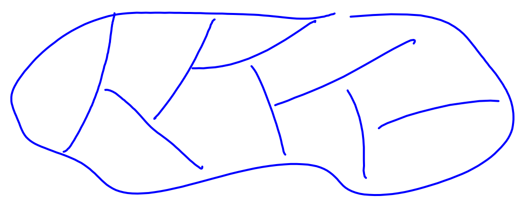
Ch.10 Experimental design &

analysis of variance (ANOVA)



a) Experimental design

Ex. Influence of fertilizer levels (L, M, H) on wheat yield



Factors (ind't var) $\xrightarrow{\text{influence}}$ dep't var
- fertilizer
- moisture

dep't var
- yield

level(s) of factors: treatments L, M, H ⟶ yield level

Ex. Experimental farm

1 M	2 H	3 L	4 M	5 L	6 M
7 L	8 L	9 H	10 H	11 M	12 L
13 H	14 M	15 H	16 M	17 H	18 L

Completely randomized one-way

experimental design (single factor with $k=3$ levels)

b) One-way ANOVA

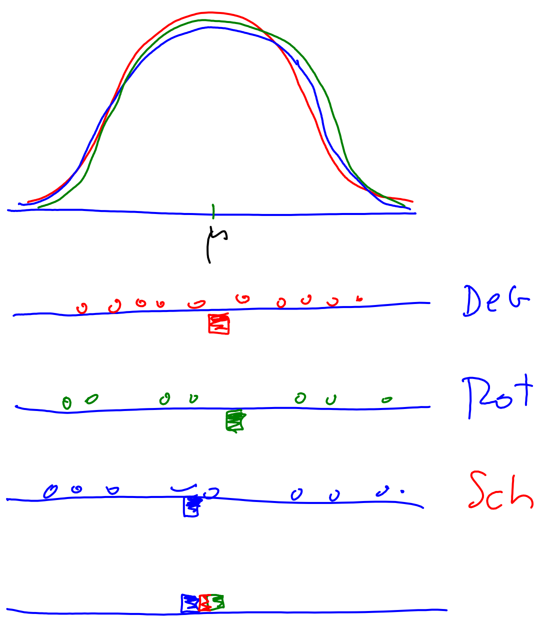
Ex. Three pop's

$H_0: \mu_1 = \mu_2 = \mu_3$

H_a: at least two differ

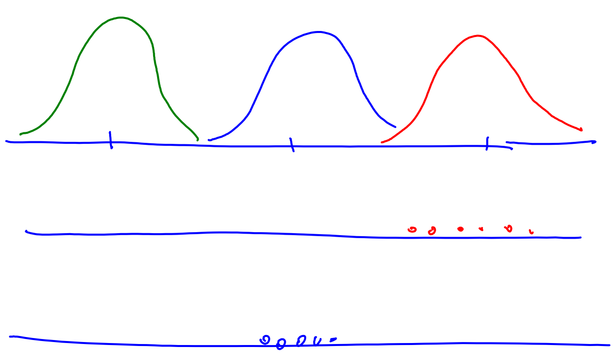
$\mu_1 \neq \mu_2$
$\mu_1 \neq \mu_3$
$\mu_2 \neq \mu_3$
$\mu_1 \neq \mu_2 \neq \mu_3$

Case 1



Don't reject H_0

Case 2



Reject H_0