STT200 4-13-09

WE CAN AT THIS POINT FEEL OF LOTS OF TESTS:

eg A. $H_0: \mu = \mu_0$ $H_1: \mu > \mu_0$

TEST STATISTIC $\boxed{\dfrac{\bar{X} - \mu_0}{\sigma/\sqrt{n}}}$ IF H_0 $\sim Z$

(REJ H_0 IF T.S. IS LARGE)

$n \neq 0$

TREAT CONTROL

eg B. $H_0: \mu_1 = \mu_2$ $H_1: \mu_1 \neq \mu_2$

TEST STATISTIC $\dfrac{\bar{X}_1 - \bar{X}_2}{\sqrt{\sigma_1^2/n_1 + \sigma_2^2/n_2}}$ IF H_0 $\sim Z$

REJ H_0 IF TEST STAT IS FAR FROM ZERO

BUT WE'LL NOT GO DOWN THIS PATH

INSTEAD CH 26 CHI SQUARE METHOD!

Ch 19+20 FOCUSED ON

TESTS (a) $H_0: p = p_0$ $H_1: p > p_0$

(b) $H_0: p = p_0$ $H_1: p < p_0$

(c) $H_0: p = p_0$ $H_1: p \neq p_0$.

TEST STATISTIC SAME IN ALL CASES:

p_0 SPECIFIED

$$\frac{\hat{p} - p_0}{\sqrt{p_0(1-p_0)/n}}$$

IF H_0 $\sim Z$

$n \neq 0$

$p \neq 0$

$q \neq 0$

(a) REJECT H_0 IF TEST STATISTIC TOO LARGE $\gg 0$

(b) REJECT H_0 IF TEST STATISTIC TOO SMALL $\ll 0$

(C) TEST STATISTIC TO FAR FROM 0.

CH 26. CHI SQUARE TEST.

VARIOUS FORMS USE χ^2 (CHI SQ) TABLE

USE DF (DEGREES OF FREEDOM)

PURPOSE IS TO QUOTE P-VALUE FOR COUNT DATA.
IN COMPARISON W/ SOME MODEL.

FIRST TYPE: GOODNESS OF FIT.

MODEL: SWEATSHIRTS TODAY ≈ HALF OF CLASS.

	SS	NOT SS	
OBS.	25	18	TOTAL 43
EXPECTED UNDER 50% MODEL	$\frac{43}{2}$	$43/2$	

$$\chi^2_{STAT} = \frac{\left(25 - \frac{43}{2}\right)^2}{43/2} + \frac{\left(18 - \frac{43}{2}\right)^2}{43/2}$$

HOW TO MEASURE DEPARTURE OF

OBS	25	18
EXP	$43/2$	$43/2$

$$\chi^2_{STAT} = \sum \frac{(OBS - EXP)^2}{EXP}$$

$$\chi^2_{STAT} = \frac{\left(2 - \frac{43}{2}\right)^2}{43/2}(2)$$ (2-CATEGORY CASE)

$$= 2\,\frac{(25-21.5)^2}{21.5}$$ CK THIS IS SAME AS PREV PAGE

$$= \frac{2(12.25)}{21.5} = > 1$$

$25 - 21.5 = 3.5$

$(3.5)^2 = 12.25$

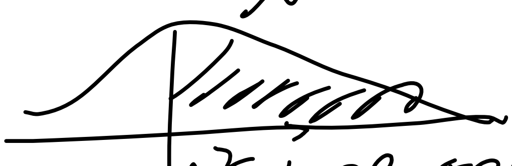
$3.4 \quad .25$

$(9.5)^2 = (9.10) \quad .25$

WHAT IS $\Pr\left(\chi^2_{STAT} > 1\right)$
UNDER MODEL

$DF = 2-1 = 1$

χ^2



$\chi^2 = 1$ OBSERVED

$DF = \#CELLS - 1$ THIS APP'L $= 2 - 1 = 1$

df	.1	.05	.025	...
1	2.7	3.84	...	

FIND OUR χ^2 STAT ≈ 1

Where is our $\chi^2 \approx 1$??
Off table..

WILL POST A
DENSE TABLE !!

SECOND EXAMPLE FOR GOODNESS OF FIT χ^2:

CUSTOMERS ORDER	ITEM 1	ITEM 2	ITEM 3	
PAST (EXPECTED)	30	50	20	TOTAL OF 100 CUSTOMERS
OBSERVED.	25	40	35	

SAMPLE 100 CUSTOMERS.

χ^2 STATISTIC $= \dfrac{(25-30)^2}{30} + \dfrac{(40-50)^2}{50} + \dfrac{(35-20)^2}{20}$

$\sum_1^1 \dfrac{(obs - Exp)^2}{Exp}$

$= \dfrac{25}{30} + \dfrac{100}{50} + \dfrac{25}{20} = .8 + 2 + 1.25$

$\chi^2_{STAT} = \approx 3.$

DF $= 3-1 = 2$

TABLE

df	.10
2	4.6

ALL CAN SAY IS

$P > .10$

NOT SO RARE

SECOND TYPE OF χ^2: CALLED TEST OF HOMOGENEITY

(INDEPENDENCE)

SS NOT

MEN

WOMEN.

IF SEX INDEP OF SS.

$$P(SS)$$

$$P(m) \quad P(m)P(SS)\,n$$

$$\frac{\#m}{n}\,\frac{\#SS}{\cancel{n}}\,\cancel{n}$$

CRITERION IS EXP COUNTS ≥ 5 ALL

$\Rightarrow$ FORMULA

EXPECTED COUNT UNDER MODEL OF INDEP

	SS	SSC	
M	7 obs		18
W			25
	17	24	43

"EXP COUNT FOR M SS"

$$\frac{17 \cdot 18}{43} \geq 5$$

	S.S	NOD	
M	7 OBS	11 OBS	18
W	10 OBS	15	25
	17		43 GRAND TOTAL

OBS

$$\frac{\left(7 - \frac{17 \cdot 18}{43}\right)^2}{17 \cdot 18/43}$$

$$\frac{\left(10 - \frac{17 \cdot 25}{43}\right)^2}{17 \cdot 25/43}$$

EXPECTED

χ^2 STAT

DF $(R-1)(C-1)$