Chapter 12 Goodness of Fit

Another use of the $\chi 2$ Distribution.

The”experts” tell you one thing,
Your data says something else.
Who's correct?

- Goodness of Fit tests can tell you if your observed results are statistically different or the same as the expected results.

- Goodness of Fit tests can tell you if two groups are dependent or independent of each other.

- Goodness of Fit tests can tell you if there are characteristics common to otherwise separate groups.

•Goodness of Fit tests can tell you if your observed results are statistically different or the same as the expected results. An example

State of Oregon Population Ethnic Breakdown

White	Black	Native	Asian	Hispanic
78.8%	6.6%	1.3%	6.7%	8.5%

PSU Statistics Enrollment Ethnic Breakdown

White	Black	Native	Asian	Hispanic
65.4%	3.5%	1.3%	NA	4.8%

•Goodness of Fit tests can tell you if two groups are dependent or independent of each other.

An example

State of Oregon Population Gender Breakdown

Males	Females
49.4%	50.6%

PSU Statistics Enrollment Gender Breakdown

Males		Females	
Total	45.4%	Total	54.6%
Undergrad	46.9%	Undergrad	53.1%
PostGrad	40.4%	Postgrad	59.6%

The five step process for the $\chi 2$ Goodness of Fit test.

In brief:

1. State Hypotheses and identify the claim,
2. Find critical value,
3. Compute test value,
4. Make the decision,
5. Summarize.

The five step process for the $\chi 2$ Goodness of Fit test.

In full.

1. State Hypotheses and identify the claim.

H_0:
H_1:

These are dependent on the situation being tested.
For example:

H_0: Consumers show no preference for flavor.
H_1: Consumers show a preference.

The five step process for the $\chi 2$ Goodness of Fit test.

In full:

2. Find critical value

   Degrees of freedom = # categories – 1
   α will be given or chosen by you.
   Find critical value from $\chi 2$ table

The five step process for the $\chi 2$ Goodness of Fit test.

In full:

3. Compute test value

$$\chi 2 = \Sigma \frac{(O - E)^2}{E}$$

Σ is "sum of"
O is observed value
E is expected value

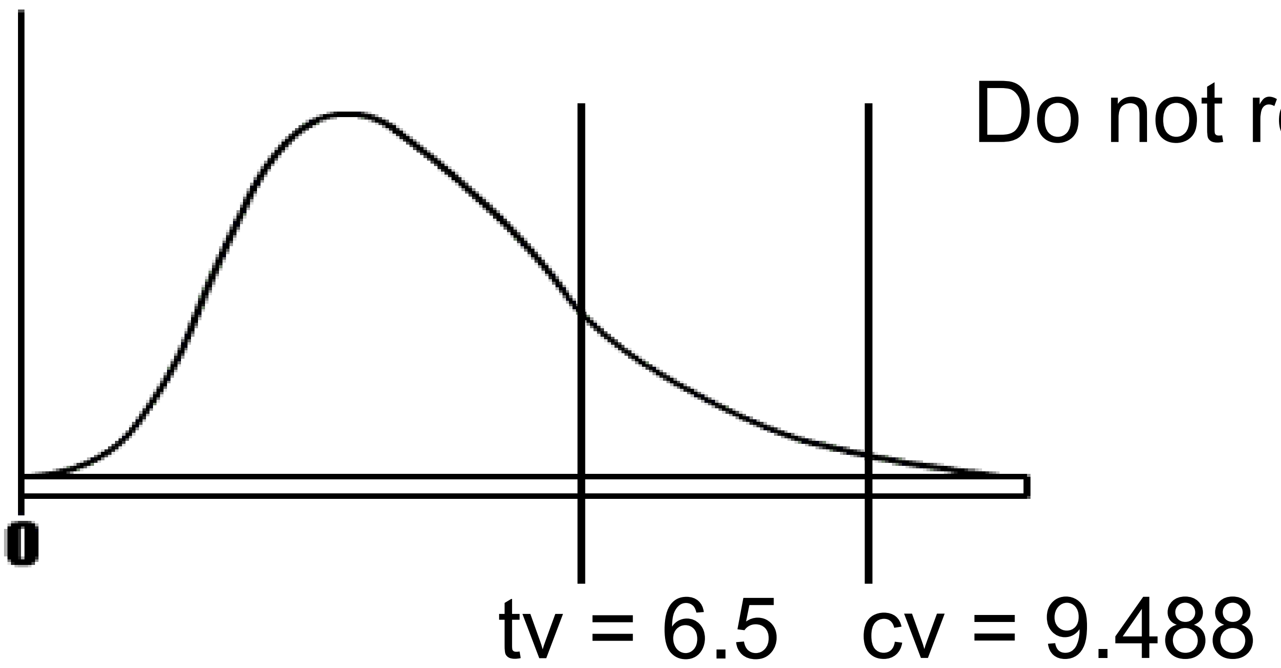
The five step process for the $\chi 2$ Goodness of Fit test.

In full:

4. Make the decision

Draw the graph, label values, state whether you reject or do not reject the null hypothesis.

e.g.



Do not reject H_0

The five step process for the χ2 Goodness of Fit test.

In full:

5. Summarize

If you reject H_0 then:

There is enough evidence to reject H_0 at α = ___, so there is enough evidence to support the claim that ...

If you do not reject H0 then:

There is not enough evidence to reject H_0 at α = ___, so there is not enough evidence to support the claim that ...

Example(12-6)

Do customers prefer any specific color raincoat, or is there no clear preference?

From a random sample of 50 raincoats sold, the colors are in this table. Use $\alpha = 0.10$ to test if there is a preference.

Color:	Yellow	Red	Green	Blue
# Sold:	17	13	8	12

Does it look to you that there is a preference?

Which raincoat(s) would you keep more of in stock?

1. State hypotheses and identify the claim.

H_0: There is no color preference.
H_1: There is a color preference.

2. Find the critical value.

$\alpha = 0.10$
d.f. = 4 – 1 = 3
From χ2 table: cv = 6.251

3. Calculate test value.

$$\chi 2 = \Sigma \frac{(O - E)^2}{E}$$

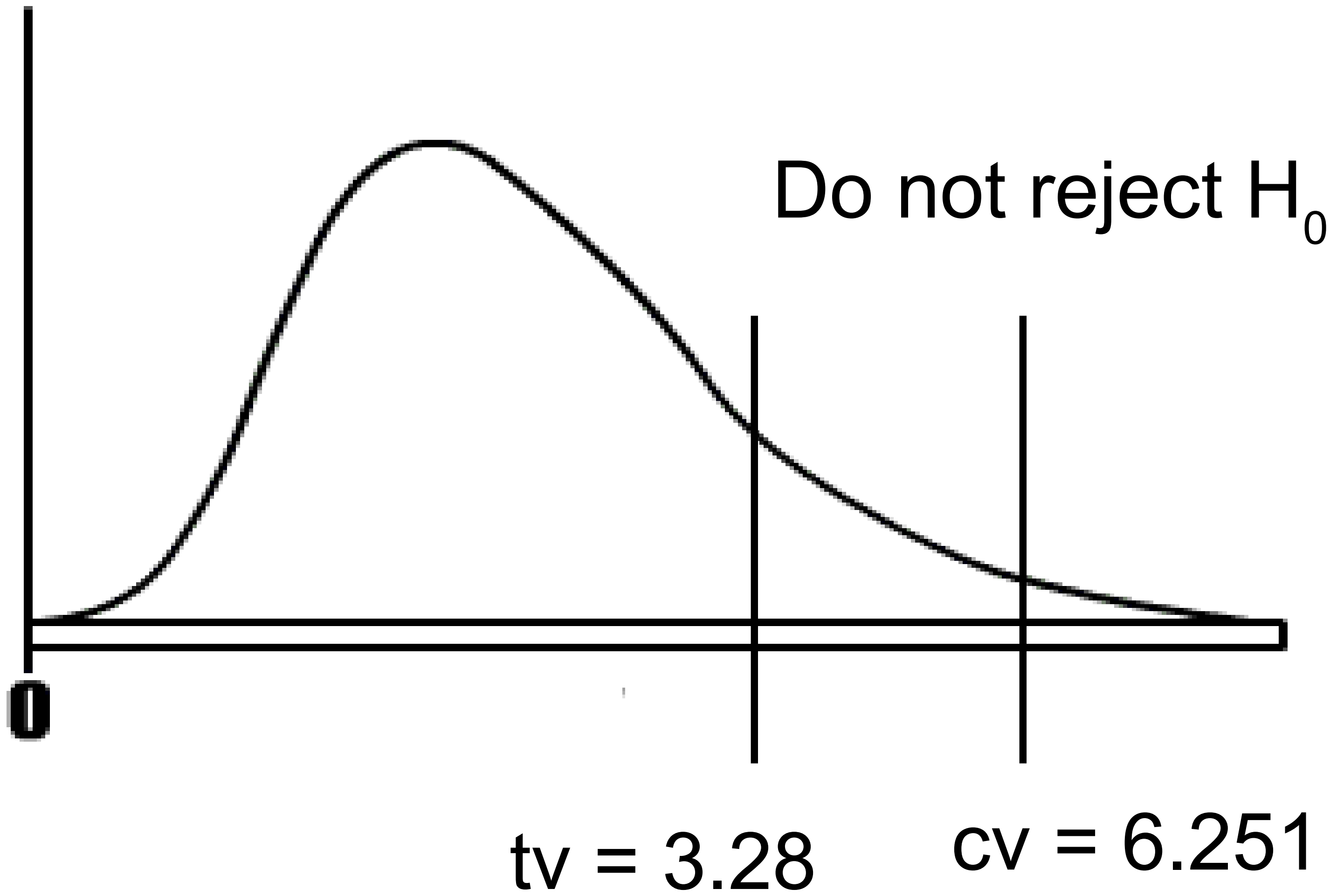
Color:	Yellow	Red	Green	Blue
# Sold (O):	17	13	8	12
Expected(E)	12.5	12.5	12.5	12.5

$$tv = \frac{(17-12.5)^2}{12.5} + \frac{(13-12.5)^2}{12.5} + \frac{(8-12.5)^2}{12.5} + \frac{(12-12.5)^2}{12.5}$$

tv = 3.28

4. Make the decision

Draw the graph, label values, state whether you reject or do not reject the null hypothesis.



5. Summarize

There is not enough evidence to reject H_0 *at* $\alpha=0.10$*, so there is not enough evidence to support the claim that there is a color preference.*

Did you guess correctly? Are you going to miss sales because you shorted some raincoats?